

**The Role of Managerial Vision:
A Cognitive and Social Perspective of I.C.I.
Paints**

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I declare that this thesis is my own work throughout

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Abstract

Failure to properly perceive commercial conditions requiring innovation, and failure to understand the underlying nature of technological change are typically said to engender a reluctance to innovate. Explanations of why mature firms in particular, are slow to innovate, frequently draw upon technological, economic or strategic descriptions. However, human interaction and understanding are also said to be 'at the heart' of the process. Consequently, this thesis considers the cognitive and social nature of managerial vision and its role in stimulating innovation within ICI Paints.

This thesis draws upon a "Situated Cognition" perspective, and provides an exploratory account of the role of cognitive and social mechanisms of vision and of the agency and structure by which technology is shaped and developed. It identifies several conceptual areas where a cognitive approach may complement sociological approaches to technological change.

In particular, the account argues that the content of managerial vision is shaped by personal discourse, shared practice and 'apprenticeship' learning and remains open to revision within the boundaries of 'ground rules' and 'agreed prejudice'. Beliefs concerning future innovation opportunity are exchanged, modified and appropriated through a continuous social narrative, with an order of shared meaning provided by the cultural heritage of the firm, the specification of a particular technology and the 'legitimising' influence of 'communities of practice'. Consequently, the construction, development and transmission of 'vision' is situated within existing practice and technology and the meanings attributed to them by individuals.

Contents

Abstract

Contents..... I

Acknowledgements..... V

1 Introduction	1
1.1 Introductory Background.....	2
1.2 Thesis Outline.....	4
2 Social and Cognitive Theory	10
2.1 Cognition Within the Social Sciences.....	11
2.2 Theories of Technical Change.....	13
2.3 Similarities, Differences and Themes.....	27
2.4 Conclusion.....	30
3 Organisational Innovation and Strategic Vision: A Literature Review	35
3.1 Background to Innovation Studies.....	36
3.2 Categories of Innovation.....	38
3.3 Market-Pull, Technology-Push.....	40
3.4 Organisational Innovation.....	42
3.4.1 Individualist Studies.....	43
3.4.2 Structuralist Studies.....	46
3.4.3 Interactive Process Studies.....	49
3.5 Summary and Common Themes Within Innovation Studies.....	52
3.6 Limits Upon Innovation and the Perception of Future Opportunity.....	55
3.7 Definitions of Vision.....	57
3.8 Vision and Organisational Strategy.....	59
3.9 Differentiated Meaning of Vision.....	61
3.10 Vision as a Determinant of Organisational Culture.....	62
3.11 Summary.....	64
4 Cognitive Science as an Explanatory Force: The Epistemological Position	68
4.1 Introduction.....	68
4.2 Cognitive Science: A Dis-unified Field.....	70
4.3 Cognitive Assumptions.....	72
4.4 Cognitive Individualism and Social Constructivism.....	75
4.5 Cognitive Models of Science.....	78
4.6 The Social Environment of Cognition.....	82
4.7 The Development of Cognitive Representations.....	84
4.7.1 Technology as Problem Solving.....	87
4.8 The Generation of Meaning.....	89
4.8.1 Cognitive Approaches to Constructing Meaning.....	89

4.9 Towards a Cognitive Approach of Technological Change.....	92
4.10 Situated Cognition	94
4.10.1 Cognition as Symbol-Processing	95
4.10.2 Summary of the Different Approaches	97
4.10.3 The Socialisation of Cognition and Learning	99
4.11 Conclusions.....	100
5 Research Design and Methodology	101
5.1 Introduction.....	101
5.2 Research Aims	101
5.3 Research Issues	103
5.4 Methodological Position	104
5.5 The Origins of Qualitative Research.....	105
5.5.1 The Qualitative Approach.....	106
5.5.2 Applied Research: The Sociological Study of Technology in Industry..	107
5.5.3 The Economic Analysis of Technology: A Quantitative Tradition	108
5.6 Conclusion	115
5.7 Grounded Theory Research: Theory Generation.....	115
5.7.1 The Development of Theory	121
5.8 Research Method: The Case Study	125
5.8.1 Information and Data Gathering	129
5.8.2 Interview and Selection.....	130
6 Case Study	132
6.1 Introduction.....	132
6.2 Corporate Structure and Size	133
6.3 History: The Creation and Incorporation of the ICI Group	136
6.4 Organisational Structure: People and Company	144
6.5 Vision, Mission and Beliefs.....	146
6.5.1 Visions of Technology and Innovation.....	148
6.5.2 ICI's Safety, Health and Environment (SHE) Initiatives.....	150
6.5.3 A Change in Business Culture: The Visionary Direction of Miller-Smith	151
6.6 Summary	154
6.7 ICI Paints	156
6.8 Introduction.....	156
6.9 History, Structure and Size	156
6.9.1 Business Mix and Policies	157
6.10 Organisational Structure and Key Personnel	161
6.11 Senior Management Control	165
6.12 Strategy, Vision and Innovative Intent	167
6.12.1 The Importance of Cultural Tradition.....	169
6.12.2 Organisational Innovation and Conflict.....	177
6.12.3 The Innovation Group.....	180
6.12.4 Decision Making and Rules	189
6.13 Conclusions.....	192
7 Vision and Innovation Within ICI Paints.....	196
7.1 Introduction.....	196

7.2 The Complexity of Cognitive Representation	198
7.2.1 Cognitive Schemata	199
7.3 ICI Group's Sense of Image	201
7.4 Cognitive Bias.....	203
7.5 Differences in Cultural Perception.....	207
7.6 Translating Cognition Into Behaviour	210
7.7 Four Levels of Vision Commitment	212
7.8 The Connection and Influence of Levels	218
7.9 Vision to Action.....	220
7.9.1 The Commitment of Resource to Uncertainty	221
7.10 The Emergence of a Shared Cultural Schemata	225
7.10.1 A Plural Perception of an Innovation Culture.....	226
7.10.2 The Learning of 'Style'	227
7.11 Organisational Change.....	228
7.12 Conclusions.....	231
8 Organisational Culture.....	234
8.1 Introduction.....	234
8.2 Cultural Assumptions	236
8.3 Different Approaches to Understanding Cultural Reality.....	237
8.3.1 The Plurality of Cultural Study.....	238
8.3.2 Cultural Paradigms and Revolutions	240
8.4 Analytical Perspective on Organisational Culture.....	241
8.4.1 Summary of Construction of Individual Reality and Organisational Culture ..	243
8.5 ICI's Individualistic Business Culture.....	245
8.5.1 The Day to Day Influence of 'Power'	247
8.6 The Interpretation of New Ways of 'Doing Things'	249
8.7 ICI: A Collective Innovative Organisation	251
8.7.1 Corporate Change and Existing Practice	253
8.7.2 Seeing Beyond Existing Technology.....	253
8.7.3 Managerial Commitment to Innovation.....	255
8.7.4 A Summary of Cultural Belief and Commitment.....	255
8.8: A Situated Perspective of Organisational Culture	257
8.8.1 Theoretical Background.....	258
8.8.2 Individual, Group and Collective Cognition.....	259
8.8.3 Communities of 'Like-Minded' Practitioners.....	262
8.8.4 Kenyon's Interpretation of Innovation	262
8.8.5 Communities of Practice and Cultural Research	265
8.8.6 The New Disorder of Innovation Practice Within Practice	267
8.8.7 Managerial and Culturally-Held Schemata.....	269
8.9 Conclusions.....	271
9 Legitimate Innovation Practice	274
9.1 Introduction.....	274
9.2 Enacting Reality.....	276
9.2.1 Threats and Opportunity as Selection Criteria.....	277
9.2.2 Opportunity Related to Current Practice.....	280
9.3 Social Learning	281

9.3.1. Situated Learning and the Self-Concept Within ICI Paints	282
9.3.2 Summary of the Self-Concept and Identity	287
9.4 Legitimate Notions of Expectation	289
9.5 Situated Cognition as a Metaphor for Learning.....	291
9.6 Learning Through Apprenticeship	292
9.6.1 Cognitive Apprenticeship Learning Phases	293
9.6.2 Summary of Apprenticeship Learning.....	301
9.7 The Learning of Cultural and Technological Assumptions	301
9.7.1 The Learning of Validating Practice.....	303
9.8 The Shared Meaning of Technological Change.....	306
9.9 Conclusions.....	309
10 Concluding Discussion and Future Research.....	313
10.1 Introduction.....	313
10.2 Thesis Outline	314
10.3 Main Findings Summary: Understanding Encultured Practice	319
10.3.1 Innovation Practice Within ICI Paints	320
10.4 How do Visions Emerge and Become Taken up by Others and How Does This Help Direct Behaviour?.....	321
10.4.1 Vision Expression as Landscapes	325
10.5 What is the Significance of Vision and How is it Manifest in the Harmonising and Alignment of the Innovation Practices of the Firm?	326
10.6 What Role Does Vision Play in Setting the Values and Beliefs of the Organisation and How do They Change Over Time?.....	328
10.6.1 Historical Meaning: Action and Creativity	329
10.6.2 Historical Influence on Conceptual Change	330
10.7 Towards a SitCog Account of Technological Change.....	331
10.7.1 Structure and Agency of Sociological Accounts	333
10.8 Analysis of Communities of Practice	335
10.8.1 Vision and Community	336
10.9 Future Research	337
10.9.1 Managerial Schemata.....	339
10.9.2 SitCog as Research Methodology.....	341
10.9.4 Grounded Methodology	342
10.10 Towards Managerial Practice: The ‘Real’ Nature of Culture.....	343
10.10.1 Concluding Remarks.....	344
Bibliography	I

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1

Introduction

Seeking an explanation, it seems, is akin to slaying the Hydra; when one head is severed another two grow in its place. So it seems with creating an understanding of certain events or phenomena. A single phenomenon can be subsumed within a multitude of general or specific explanatory propositions. Uncover one level and others appear.

There have been many attempts to understand technical change, focusing upon differing perspectives. For example, one may examine the macro-level processes that can only be appreciated through a careful examination of the long-term struggle for survival among organisations. Here, it is suggested that a new technology's emergence can be explained in terms of its capacity to diminish or enhance the value of a firm's existing human and capital investment (Abernathy and Clark, 1986). Thus, understanding the characteristics of the technology may help explain whether a firm embraces a technology or avoids it, and consequently, the possibility that its emergence will cause a major disruption within an industry.

Another approach is to examine the micro-level dynamics of technological emergence. In their critique of neo-classical theories of growth, Nelson and Winter observed how classical (political) economics seemed to have been forgotten, suggesting how, at the macro-level, analysis of technical change focuses on firms working with a *given* technology (1982). In this conceptualisation, technological change is seen as a dependent variable that needs explanation in itself.

Historians have also examined how combinations of individuals and events lead to the creation of alternative technological paths (Rosenberg, 1982; Arthur, 1988).

Similarly, other scholars have investigated how individuals create the institutional contexts that shape a technology's development (Barley, 1986; Weick, 1990).

This thesis broadly constitutes an exploratory investigation of various cognitive phenomena associated with aspects of technical change and in particular, the smaller sub-set of 'innovation'. From the outset, it is crucial to both outline the attainable explanatory goals of this present research and understand its limitations.

1.1 Introductory Background

The mature firm, seeking to adapt to new technologies or markets is often characterised as being resistant to change, with their 'inappropriate' managerial practices failing to mount effective responses to changing commercial environments. In essence, the popular view is that high-tech and new firms are innovative, entrepreneurial and flexible, while mature firms are not. Successful innovation in mature-industry firms is similarly said to be all the more impressive as they must overcome many institutional hindrances (Quinn, 1979; Miller and Friesian, 1980).

Market leaders in mature industries have often found it difficult to invest in new technology that may supersede their existing products, processes and services, as well as their human skills and organisational structures (Foster, 1986; Rogers, 1983). Indeed, it may be suggested that only major and dramatic crises can lead to major change, or only an 'outsider' can transform a mature firm. In short, for mature businesses especially, innovation is often seen as risky, poorly understood, and poorly executed, often disclosing a failure to adapt successfully to changing environments.

The Impetus to Change

Explanations of why mature firms are slow to innovate often draw upon technological, economic or strategic descriptions. The key issue instead may be cognitive. Indeed, as Keiser and Sprouall suggest:-

'One crucial component of managerial behaviour in rapidly changing environments is problem-sensing; the cognitive processes of noticing and constructing meaning about environmental change so that organisations can take action' (Keiser and Sproull, 1982; 548).

In this sense, the issue is not simply one of cognition *per se*, but rather the cognitive mechanisms involved in perceiving future problems that may relate to the firm. Others suggest that environmental change evokes modifications in managers' 'cognitive maps'. That is to say, the interpretative schemes by which they make sense of the world (Barr, Stimpert, and Huff, 1992; Huff and Schwenk, 1990). This recognition is central to a cognitive understanding of technological change and innovation, and is especially problematic to mature-industry firms, characterised as possessing a stable and unchanging outlook.

Mature firms have often succeeded in the past with practices that become institutionalised, for example, within their value specifications, performance assessments and reward schemes. Yet when the commercial environment changes, these long-successful activities may hinder effective responses. Institutionalised behaviour often encourages a sense of organisational 'mindlessness', the very antithesis of a commercial awareness to societal or technological 'anomalies', thus signalling a need for change (Langer, 1988; Langer and Piper, 1987). The business rules or 'ways of doing things' of mature firms, are commonly supposed to be the opposite of the exploratory and developmental activities of innovation because they instead often emphasise practices such as efficiency and cost-cutting.

Management literature, focusing upon institutional environments, offers little for understanding how and why organisations and practitioners might change or indeed, resist change? Discussion is often positioned at a high level of abstraction, with much reification, addressing whole organisations' capabilities (often, as if they were monolithic, thinking and acting entities), if not, at the level of industries or nations.

Yet innovation can also be seen as occurring at the level of the *outcomes* of individual decisions and of group members acting in concert with one another.

People innovate, not organisations, even though practitioners require access to organisational resources and ultimately must convince others to co-operate so that the 'organisation' is moved in a particular direction (Silverman, 1971).

Little is known about how practitioners' 'mentally' experience innovation, other than it is a complex and ambiguous process often conducted within groups. In this sense, innovation is a shared social process, not an 'only, lonely inventor', independently creating technological change. Human interaction and understanding are at the heart of the process, hence, it is suggested here that an approach, drawing upon cognitive literature pertaining to these issues, may prove useful for understanding innovation. Indeed, this thesis is guided by the premise that the study of individuals' shared cognitions can offer valuable insight into the generation and communication of a 'need' to innovate in particular directions.

1.2 Thesis Outline

The goals of *Chapter Two* are several. It is argued that a great deal of research focused upon technical change, has its roots firmly planted within developments in the philosophy of science and the social sciences. Indeed, the ongoing study of technology and innovation in particular, has greatly benefited from a heavy reliance on these disciplines (Bloor, 1976; Laudan, 1977). Allied with these traditions however, comes a great deal of epistemological and methodological 'baggage' which has often precluded much theoretical development in other areas of interest.

As to why this might be so, Mackenzie and Wajcman show it to have something to do with the often strongly held *deterministic* belief that science shapes technology, and that, therefore, the process of the development of science and technology is fundamentally intertwined (1985; 8). The attack on any notion of scientific determinism, that suggests that science impinges upon a society from outside that

society, has led to similar technological programs of research that challenge any notion of technological determinism.¹

It is now widely accepted that science is profoundly affected at every level by the society in which it is conveyed. Similarly, it is also recognised that although there may be examples of a strong connection between the development of science and technology², it is a misconception to consider this a one-sided dependency. That is to say, on the whole, advances in technology do not necessarily depend on advances in science. As Mackenzie and Wajcman explain:-

‘Where technology does draw on science, the nature of that relation is not one of technologists obediently working out the ‘implications’ of a scientific advance. Technologists *use* science. They seek from science resources to help them solve the problems they have, to achieve the goals to which they are working. These problems are at least as important in explaining what they do, as the science that is available for them to use’ (1985; 4.).

Such an academic program, centred upon the study of innovation and technical change, typically suggests that the developmental focus of the given technology is the underlying logic of the *social* structure in which the technology emerges. Just as the social structure is all important for proponents of the Sociology of Scientific Knowledge (Bloor, 1976, 1991), it is also important for technological development.

This does not necessarily deny that there are many interesting aspects of technology (and science) to relate, that are essentially cognitive in nature, but that these are not relevant to how they are justified and developed and shaped within the technological or scientific community (Siegel, 1980).

To this end, a brief comparison between a social constructivist and a general cognitive position demonstrates that the latter poses substantially different questions to the researcher of technical change, and requires the establishment of different sets of supporting assumptions, traditions and methodologies.³ This leads to a

¹ For a full discussion of the social factors that shape technology and the instigation of a ‘non-deterministic notion of technological development, see Mackenzie and Wajcman (1985; 2-25).

² For example, Pettigrew argues that many chemical companies follow this pattern (1985)

³ The investigation of cognitive aspects of technical change is nothing new to social science. Although, as I shall discuss in Chapter Four, many within Cognitive Science are shifting away from ‘cognition as symbol-processing’ towards ‘cognition as situated’, and this represents new and

consideration of the similarities (and differences) of several socially-based theories of technical change, arguing that far from being an alternative or competing notion, a better understanding of the cognitive mechanisms involved, represents a serious contribution to many existing social theories.

Chapter Three broadens the discussion by focusing upon a literature review of organisational innovation. Three main areas of research emerge; individualistic; structuralist; and interactive studies. Within this review there is a wide divergence of interests. However, there remains certain common themes arising from these studies that are crucial for the analysis of innovation here.

One theme that is of great interest to this thesis, is the importance of perception and imagination or *vision* in providing both a stimulus and guide to innovative activity. To this end, a review of organisational vision is also conducted, outlining some of the issues to be investigated later within this thesis.

Having discussed the broad aims of this research, *Chapter Four* outlines the epistemological position of this thesis, describing the theoretical approach to cognition that will be developed in later chapters.

It is suggested here that technological change is largely the result of purposeful problem-solving and directed practices of members of a relatively small community of practitioners. Further to this, cognitive activity is (in some fashion to be investigated) directed and constrained by managerial perceptions of what a sense of a 'commercial reality' entails. The chapter concludes with a brief description of a promising line of research that is considered an alternative cognitive model to the pervasive 'Information-Processing' account of 'thinking' so dominant within the field of cognitive science; that of situated cognition.

Chapter Five provides an outline of the methodological position of this thesis, discusses how the case study design is to be structured and suggests the formulated research questions and methodology to be investigated and followed.

Initially, it is argued that a general qualitative approach is best suited to the aims of this research, with the specific research methodology based upon the grounded theory approach of Glaser and Strauss (1967). Their original 'checklist' for research design is then amended to provide a suitable degree of analytical freedom to derive 'theory from phenomena', as they suggest. Lastly, I discuss aspects of the fieldwork and its analysis, based upon the case study method of data collection.

Chapter Six focuses on a chronicle of the ICI Group and ICI Paints, based on my fieldwork research, providing the material from which later chapters will draw. Two main divisions of the chapter focus on the ICI Group and ICI Paints. Specific topics of interest reflect important areas of study for an analysis of organisational innovation; history, corporate-structure and financial performance, people strategy, governance and managerial hierarchy, aims, beliefs, values and decision-making systems. These topics provide a degree of conceptual categorisation to aid the descriptive nature of the case study.

The case study focuses upon how the staff of ICI Paints and ICI Group understand the process of innovation. What emerges is a strong sense of continual tension and conflict as individuals interpret and pursue their own 'vision' as to what the firm is trying to achieve and what is expected of them.

The account shows a company with a long past, sometimes dynamic, sometimes stolid, currently in the process of undergoing their biggest change to its portfolio of businesses in its history. These changes have not effected ICI Paints as much as some of the other Business Units, but nevertheless are being felt at all levels of the firm. The greatest change has been in the realisation of the relative decline in certain historical capabilities exacerbated by certain technological advances, different

systems of exploitation in the value chain, market growth by competitors and a changing Group structure.

Following the grounded theory 'checklist' outlined in Chapter Six, *Chapter Seven* constitutes a re-evaluation of the issues raised within the case study, in light of previous work, identifying coherent concepts, relating and re-evaluating them within established research.

The chapter considers issues of cognitive complexity and outlines the form of cognitive representation most suited to the goals of this thesis. The discussion progresses by considering the prejudices and biases that most commonly effect ICI's managers' decision-making.

When visions are expressed, the different levels of description people utilise is considered, focusing upon notions of the 'self', technological specifications, user functions and broader societal trends. How these levels influence others, (by forming a resource in themselves to facilitate a commitment and 'bonding of like-minded individuals') is also examined. This is followed by a discussion of how shared schemata arise and how these focus practitioners' perceptions of future activity within a coherent and collaborative framework.

Chapter Eight widens the discussion by considering notions of organisational culture, whose importance to practitioners' conceptualisations of innovation are apparent in Chapter Six. The chapter also initiates the development of an exploratory account of innovation in which many of the issues raised can be examined. This chapter also draws upon a wide range of literature, especially from situated cognition, management studies and sociological accounts. It demonstrates the unity of many common themes and outlines the importance of the notion of 'community of practice' in establishing 'legitimate' innovation behaviour.

Chapter Nine continues the development of a situated cognition account within ICI Paints, focusing upon issues of ‘enculturation’ and experiential learning raised in Chapter Eight. The chapter further considers how broad cultural assumptions infer meaning to practitioners that are both pragmatic and ‘real’, suggesting that learning is not a passive process but can itself be ‘bounded’ by practitioners interpretation of future events. The chapter concludes with an investigation of some of the more general aspects of a situated cognition, focusing on the construction of organisational competence and performance.

Chapter Ten re-addresses the research questions and continues a discussion of the ‘bounded’ nature of innovation practice in the light of the findings of this thesis. Epistemological and methodological considerations are also discussed and suggestions made for future research.

In summary, the thesis shows that in the pursuit of innovation, practitioners within conceptually bounded and ephemeral communities, induce variations of a shared reality that reflects possible future events, as well as suggesting ‘right’ and ‘wrong’ ways to compete. This reality remains provisional and is constantly being made and re-interpreted within day-to-day practice.

2

Social and Cognitive Theory

Establishing which aspects of a phenomenon are to be explained and which shall be excluded is critical to any investigation. To this end, discussion of the similarities and differences of several theories of technical change are considered within this chapter. It is argued that far from being an alternative or competing notion, a better understanding of the cognitive mechanisms concerned represents a serious contribution to many existing theories of technical change.

Where researchers have focused on sociological accounts of technological change, inspired by developments within the philosophy of science, they have imbued their understanding with a fuller description of the *social* aspects of the technologies considered (Hughes, 1983; Pinch and Bijker, 1984).

As the social structure within the development of scientific theory is important for proponents of the *Sociology of Scientific Knowledge* (Bloor, 1976, 1991), so the social structure is also the important level of analysis for technological development and not the cognitions of individual technologists or scientists (Siegel, 1980).

The main objection put forward by social constructivists is an assertion that cognitive processes are socially contingent in nature, and should be explained in such terms. For example, Brannigan (1982; 40) asserts the strongest sociological claim that 'any cognitive understanding of a scientific discovery is essentially 'redundant' as it is ultimately and inevitably *post-hoc*'.

Latour offers a slightly less 'socially' radical interpretation, suggesting that a cognitive explanation should only be offered when other sociological descriptions

cannot account for particular practices (1987). Along a similar theme, philosophers, such as Laudan (1977), have suggested that cognitive theories should only explain those scientific (and technological) beliefs that cannot be explained by their 'rational' merits.

Even social constructivists who are considered sympathetic to certain cognitive claims (Woolgar, 1989) are only prepared to consider the possibility of cognitive accounts within the context of issues raised by the sociology of scientific discourse. Potter and Wetherall (1987) have advocated that proponents of a cognitive approach towards scientific and technological change, should develop theories of discourse through the adoption and adaptation of social constructivists epistemology (i.e. Gilbert and Mulkay, 1984).

Several cognitive scientists and psychologists have attempted to develop cognitive theories along similar lines to those used within the philosophy of science (Kuhn, 1962; Laudan, 1977)⁴. It is suggested in this thesis that these attempts are essentially erroneous, as their attempt to force cognitive theories into participating in the agendas, assumptions and underlying conceptual 'baggage' of other disciplines does not appear to 'fit well' within the cognitive frameworks that they suggest.⁵ That is to say, proposed socio-cognitive models are not drawn on well established and coherent notions of cognition at all. Similarly, these attempts, that are seemingly intended to establish disciplinary priorities, have the effect of restricting cognitive research simply to areas not already claimed by other disciplines (Giere, 1988). I shall return to this point in greater detail in Chapter Four.

2.1 Cognition Within the Social Sciences

From the standpoint of many researchers within the social sciences 'thinking is not something that happens inside heads or brains'. Similarly, 'the way to study scientists

⁴ See Thagard (1996), for a review.

and technologists is to look at their interactions with each other and the inscriptions that they produce' (Latour, 1987).

Whilst not denying the impressive strides made in understanding innovation and technical change, and indeed also drawing liberally from them, this thesis aims to take a different theoretical standpoint, one that is more heavily influenced by the cognitive sciences.

An insightful approach for studying the mechanisms of technical change may be achieved by subsuming an inherently 'meta-cognitive' approach towards the subject of innovation. That is to say, what is required is a knowledge about our own mental functioning and processes, and about the information and material to be selected or rejected by the innovators. Indeed, it is a commonly held view that knowledge of one's own performance is required for successful achievement and learning in many areas of study, including business management and economics (Flavell and Wellman, 1977).

A cognitive meta-theory suggests that behavioural, narrative and historical measures can be used to infer underlying explanatory constructs. Indeed, most cognitive theories typically postulate some system that performs a form of information-processing; that is to say, an internal manipulation of mental representations. Such a broad approach has proved very useful in understanding many areas of thought, including perception, memory, language and imagery.

However, critics of the Information-Processing accounts of cognition, that postulate a 'human as computer' view of cognition, suggest that such a position, though well suited to tasks familiar to academics, such as logical deduction, chess playing, and mechanical fault finding, is not well suited to understanding 'social' tasks.

⁵ For an example of such a cognitive model, see Giere (1988)

As I shall argue, technological change is sufficiently removed from these tasks as to require different conceptualisations of cognition. Although drawing from the same building blocks of all meta-theories of cognition, (knowledge bases, heuristics, analogies, metaphors etc.) a *situated cognition* approach, that considers the practical doings of ‘just plain folk’ (Lave, 1988), is better suited to the explanatory goals, and study of innovation, and shall be explored within this study. The beginnings of an exploratory cognitive framework shall be discussed in greater detail in Chapter Four.

2.2 Theories of Technical Change

New technologies can dramatically alter the competitive landscape. They can shake the foundations of the largest and most formidable firm or industry, while encouraging the entrepreneurial ‘dream’ of individuals who often initially possess little more than the power of their imagination. It is precisely this productive and ruinous quality of technical change first noted by Schumpeter’s ‘gales of creative destruction’(1942), that gives technology its allure for the researcher.

The many attempts to understand technological change have demonstrated how even the most basic of questions can become evasive. For example, consider the questions, *how does technology get its shape*, and *how does new technology emerge?*

While cursory consideration of these questions may suggest a linear progression from the conception of an idea to its commercial application, a more probing analysis exposes a complex web of interactions and relationships between the individuals who develop the technologies, the physical artefacts they create, and the institutional and organisational environments that they foster. By scrutinising one or more of these interactions, several different perspectives of technological change can be proposed.

The following overview of several perspectives serves numerous purposes. It reveals common themes and insights one must account for when studying technical change

and innovation and reveals several underdeveloped the theoretical aspects within these theories of dynamic technology change.

Evolutionary Economics

Institutional perspectives have given rise to the view that technological development can be considered a evolutionary phenomenon, where there is a continual and reciprocal interaction between a technology and its environment (Rosenkopf and Tushman, 1993; Van de Ven and Garud, 1993).

When studied over time, an evolutionary perspective provides an appreciation of the view that technological environments are both *medium* and *outcome* of the reproduction of technological practices (Giddens, 1979). This contextual environment both constrains and facilitates the developments of new technologies, even as both are being (re)created in a evolutionary fashion.

An evolutionary perspective underscores the notion that technological development must be studied contemporaneously. One cannot fully understand the emergence of technology by means of an assessment after the fact (Bijker *et. al.*, 1987; Latour, 1987). Within this approach, the *primary* focus is to explain the economic behaviour of agents and their economic outcomes. However, the evolutionary framework that has developed is also important for explaining the emergence of new technology. Indeed the process by which technology gets its shape is considered relevant to the explanation of economic performance.

The basic tenet of this approach is that uncertainty in technological developments cannot be ignored, as has been the case within the neo-classical tradition (Nelson and Winter, 1977). Firms do not know beforehand which technology will be successful. They even lack the possibility to check all technological alternatives, and, as a result, their behaviour should not be understood as 'profit maximising'. Instead, firms have 'heuristic search routines' to which they stick (for a while at least). These routines lead to variations, that may succeed or not in a 'selection environment'.

Within evolutionary economics various strands have developed.⁶ One is the attempt to understand search routines and trajectories (Nelson and Winter, 1982; Dosi, 1988; Hagedoorn, 1989). Another strand is the application of evolutionary analysis to populations of firms (Saviotti and Metcalfe, 1984). A third is the modelling of non-linear behaviour to show path dependencies of developments and 'lock-in' effects (Arthur, 1989). In addition, there is also research on national systems of innovation (Lundvall, 1992).

All these analyses, however, are primarily devoted to the fate of 'firms'. Therefore, the interest is different from the investigation of technology change *per se*. What remains unclear in this approach is, for instance, how and why routines emerge, or how and why they die? Blind variation is often supposed, and as yet there remains little notion of how to link such processes with industrial structure or other inter-organisational factors.

However, evolutionary approaches do possess certain assumptions about individuals or in its own terms 'the economic agents', that may have some resonance with a more cognitive approach to technological change (Dosi, 1991). They are listed as:-

- 1) The agents can never be perfectly informed, and they have (at best) to optimise locally rather than globally.
- 2) The decisions making of agents is normally bound to rules, norms and institutions.
- 3) Agents are to some extent able to imitate the rules of other agents, to learn for themselves and to create novelty.
- 4) The processes of innovation (and imitation) are characterised by significant degrees of cumulativeness and path-dependency, but they may also be interrupted by occasional discontinuities.
- 5) The processes of change occurring in a context described by the above assumptions and characteristics are non-deterministic, open ended and irreversible.

⁶ See Dosi *et. al.*, (1988) for an extensive overview.

In later studies, it has been argued that search processes are not only following internal, firm specific routines, but are also informed by 'technological paradigms' (Dosi, 1982), or 'technological guideposts' (Sahal, 1985). As Dosi suggests:-

'The crucial hypothesis [behind these concepts] is that innovative activities are strongly *selective* and *finalised* in quite precise directions and often *cumulative*. We have firms producing things in ways that are differentiated technically from things in other firms, and making innovations largely on the basis of in-house technology, but with some (and varying) contributions from other firms, and from public knowledge. Under such circumstances, the search process of firms are *not* likely to cover the whole stock of technological knowledge before making technological choices' (Dosi, 82 ;84).

Thus, within this perspective, agents are limited in their cognitive processes and search routines and constrained by the technological knowledge of the firm. Agents are also constrained by 'rules' and 'norms', although explanation concerning how these are constructed and destroyed requires greater elaboration.

Technological Regimes and Configurations

Metcalf and Gibbons (1989) seek to explain technological differentiation across firms, and how the selection environment operates upon the competitive and technological behaviour of the firm. Their analysis focuses upon using the metaphor of evolution and its principles of variety, heredity and selection. An important aspect of their discussion for this thesis is their definition of knowledge as 'structured information', suggesting that 'while information may exist in data banks, knowledge can only exist in the minds of individuals' (1989; 167).

With experience comes commitment and inertia to 'act', so that the 'mind-set' of agents becomes 'canalised' and permits only certain 'internally consistent' paths of future development. As such, their notion of technological change is similar to Nelson and Winters' 'natural trajectories' (1977). As the firm grows, within it also grows is a commitment to specific design configurations. This configuration limits and shapes how the organisation reacts to external technological developments. As a result, firms may react to information and knowledge from the outside differently and be better suited or unable to learn from (or imitate) other firms.

Elaborating upon his model of evolutionary economics, Winter (1988) makes the assertion that firms can be broken down into two types: primarily innovative and imitative. The notion of technological regimes can be introduced depending on whether the source of technical progress is external to the firm, (e.g. from publicly available scientific knowledge bases) or from the firm's own accumulated technological capabilities.

These regimes are referred to as *entrepreneurial* and *routinised* and are exogenously imposed by means of specific firm characteristics. Although firms can be of two types, neither type is capable of learning *per se*. Instead, the market is shown to select between the two depending on the technological regime. This issue of organisational learning, remains largely unexplored.

That the knowledge within a corporation relates essentially to the organisation and the group, rather than the individuals composing them, is also significantly emphasised by Winter (1988). He writes:-

'What requires emphasis is that... the learning experience is a shared experience of organisational members. Thus, even if the contents of the organisational memory are stored only in the form of memory traces in the memories of individual members, it is still an organisational knowledge in the sense that fragments stored by each individual member is not fully meaningful or effective except in the context provided by fragments stored by other members' (Winter, 1988; 76).

Similarly, Aoki (1990) writes:-

'Since learning and communication of employees take place only within the organisational framework, their knowledge, as well as their capacities to communicate with each other are not individually portable' (1990; 45).

Contrary to a view of information and knowledge as somehow 'portable', knowledge is embedded within social structures. This is said to be partly because learning is an instituted process of interpretation, appraisal, trial, feedback, and evaluation, involving socially transmitted cognitive frames and routinised group practices.

Metcalf and Gibbons propose that competition between technologies operates within three levels (1989). Initially, technologies compete within *technological regimes*.

For example, consider the competition between Video-8 camcorders and VHS-C camcorders. Within one technological regime, alternative *design configurations* compete. For example, within Video-8, different combinations of various features may exist between Sony and Panasonic Camcorders. This scope for re-establishing novel design configurations has also been demonstrated when firms adopt technology for their local needs (Fleck, 1993).

The 'binding' characteristic between various design configurations that formulate a regime is the *common knowledge-base*, while the components of the design configuration includes 'facts, hypotheses, operating procedures (know-how and know-what), and design parameters' (Metcalf and Gibbons, 1989; 161).

The firm has greater scope to differentiate itself from its competitors within competition of regimes and little within design configurations, due to a largely common knowledge-base. This knowledge-base is hard to define and represents the starting point for many researchers (Fleck and Tierney, 1991; Faulkner, 1994).

Similarly, Coombs and Richards (1991) suggest that rather than product knowledge *per se*, it is the underlying technological knowledge that is the key source of competitive advantage. They argue that technology as 'units' of knowledge and expertise, influence product development in a variety of ways and are, more or less, firm specific.

That technical change follows broad trajectories suggests an industry technological trajectory, encompassing the knowledge bases of groups of firms. Knowledge and expertise congeal around projects and products in differing ways, such as specific product group or experimental technologies. Firms within sectors share various capabilities as well as expertise and proprietary knowledge. Thus, firms may have individual trajectories of knowledge, manifested within products, as well as a specific development of a firm's capabilities.

Nelson and Winter argue that within a technical regime what matters is 'technicians' beliefs about what is feasible or at least worth attempting (1977; 57). Similarly, Metcalfe and Gibbons suggest that the firms' choices are constrained by its individuals' socio-cognitive commitments and note that 'a great deal depends on expectations of the agenda for change, and thus on the design configuration in which it operates' (1989; 188). Indeed, a more in-depth exploration of such beliefs form an important consideration for this thesis.

Technical Systems

The emphasis of Hughes' *Networks of Power* is the relations among artefacts and other 'entities' in a system (1983, 1987). Network builders bring together social as well as technical elements as a way of interacting with the selection environment. His claims are, amongst others that, the logical nature of the system expands optimally, using such terms as *load factor*, *momentum* and *reverse salients* to describe the development of the system; that different agents of a system or *dedicated network builders*, are crucial for understanding different phases of network growth and the heterogeneous nature of the elements of the system (technical, economic, social, geographic and political). The bringing together of such hetrogenic elements is captured thus:-

'Although utility managers and engineers could not control contingent events such as wars and depression, they nevertheless sought through the organisation or regional utilities and their related technical characteristics to extend their control over factors outside the electrical supply system. In short, the environment became part of the system. In this way, system builders integrated electric power systems into regional industrial systems. (Hughes 1983;407-8). This social and technological network tended to see power - both political and electric - as (..) a means to technological ends.' (1983; 460).

Hence, he highlights the socially negotiated boundaries of the firm rather than taking it as independently given. Indeed, the treatment of the relations among artefacts, as having a reality and a direction of their own, raises important issues of the selection environment and the innate characteristics that shape technical change.

Hughes's approach to system building complements, to a degree, evolutionary theories. However his theory needs to be considered separately from his case studies and the historical descriptions. Where he himself generalises, there is the danger of reiteration of the (technical) system as expanding by nature, showing the necessity of reverse salients, yet not fully explaining their causes. Similarly, he raises the notion of social explanation, yet does not give us an explanation of how various institutions or groups give value or select one development over another.

The concept of 'system' is also used by several economists. Dosi (1988) uses the notion of systems differently, suggesting that competing technologies are examples of self-organising, 'order-through-fluctuation' systems, making the distinction between artefacts, system and techno-economic paradigms. Similarly, Pinch and Bijker's (1987) 'interpretative flexibility', and Fleck's 'technological configurations' (1993), suggest the difficulty for the researcher of being able to disassociate the social context from the artefact, as well as producing 'hard edged' boundaries between the artefact and the firm.

Actor-Network Theory

Actor-network theory arose within science and technology studies as an attempt to understand 'materiality'. That is to say, the ways in which social and technical relationships are embodied and 'perform' in the ordering and re-ordering of texts, artefacts and the natural world. The analysis originates through various heterogeneous relationships which are crucial for the dynamic development of technology and considers that the (re)negotiations between actors is the initial focal point of study.

It assumes that such relationships are mediated through heterogeneous materials in the form of a 'seamless web'. Indeed, for many purposes (e.g. explaining the heterogeneous engineering, of entrepreneurs or scientists) the distinction between human and non-human, for example, is irrelevant. It also seeks to explore the

mechanism of control and power. That is, it attempts to ask; how it is that asymmetries are built in extending networks of relations in a way that leads to a 'centre of translation' which 'speaks and borrows' from that network?

The heterogeneous elements are brought together by means of such mechanisms as mobilisation, enrolment and translation. The result is a 'powerful configuration', the robustness of which is explained by a detailed description of the mechanisms by which technology is constructed.

Actor-network theory is controversial for many reasons. It suggests that the distinction between objects and subjects, or humans and non-humans, is not given but is rather made and remade.

It appears as if actor-network theory is often more interested in the strategies of the 'powerful' than the effects of those strategies on those whom they have a consequence. It also appears *omniscient*, implying, through its use of the network notion, an 'allseeing' capacity to somehow 'know the world'. When we observe technology-in-the-making, there is very little about the process of technological change that is obvious. It involves the 'constant negotiation and re-negotiation among and between groups shaping the technology' (Bijker *et al.*, 1987; 13). Therefore, as social constructivists claim, it is important to closely follow practitioners in order to understand how their negotiations construct the form that technology will or will not take (Latour, 1987).

However, the actor-network approach does provide many interesting insights. Materiality is, or so it is claimed, a relational effect, and is therefore provisional and susceptible to change. Power, which is a term that it often avoids, is also treated as a relational effect. That is uncertain, provisional, and revisable. Indeed, the question of orientation (that is to say, the directions in which the configurations are shaped), cannot be answered directly since every structure is dealt with as an outcome of a negotiated process. Strong links can be made by all kinds of ingredients and the only

thing that can be analysed is how these links are made. More recent versions (i.e. Callon, 1992) have sought to address the problem of structuring more fully. In its use, actor-network theory is a general social science approach but is often applied to technology (Law, 1986; Latour, 1992).

A Social Systems Approach

A social systems approach takes the unique character of societal systems as a starting point for its analysis. They have their own logic and identity. The basic concepts used to explain social developments are functional differentiation and integration. The first refers to the creation of new sub-systems necessary to cope with growing complexities. The latter refers to the connections with other sub-systems necessary to gain legitimisation (Luhmann, 1984).

The treatment of technology within this approach can vary. Some authors view technology as crucial to the social system. An example of this broad type of integrative approach is provided by Molina, within his Sociotechnical Alignment approach (1990,1992,1993).

Sociotechnical Constituencies and Alignments, is based on the premise that the process of technological development entails the build-up of socio-technical constituencies; that is to say, the dynamic ensembles of technical constituencies (machines and instruments) and social constituencies (institutions and interest groups), which interact and shape each other in the course of the creation, production and diffusion of specific technologies.

Following Luhmann, other authors treat technology as an intermediate *between* social systems. Thus, orientation of technological development comes from the social systems between which technology mediates, while some researchers view it as a system in its own right (Stankiewicz, 1992).

Here it is argued that we see a transformation from technology as *local* concrete

systems (comparable to that of Hughes) to technology as a *global* socio-cognitive system itself. Technological activity is increasingly self-referential, the list of priorities become more derived from the needs of the global system than from the local systems. Stankiewicz considers technology as a 'socio-cognitive system' and describes it as a 'meta-technical research agenda'(1992; 32). His main argument is that such a system, plus a research agenda, already exists. However, the question of how it effects technological development is not (yet) dealt with, this being relevant especially for the standards of techno-economic trends.

Social Construction of Technology (SCOT)

The focus of social constructivist accounts suggest that differences in technological development are possible because of interpretative variety, or 'artefactual flexibility'. The varieties are thought to be 'competing' as the different interpretations are, in some sense, judged. Different social groups have different problem definitions and different interpretations and hence, solutions. A technological development becomes successful by means of closure. That is to say, it becomes the dominant interpretation, and therefore known as 'the' artefact, implying that the artefact remains unchanged thereafter.

The methodological force behind social constructivism is essentially linked to the methodological concerns of writing the history of technology (Bijker, Hughes and Pinch, 1987; Elzen, 1988; MacKenzie, 1992). In describing the development of an artefact, it suggests we must be 'neutral' with regard to successful and unsuccessful developments. If not then we will end up with a linear picture of development.

A major concern with social constructivist accounts is that the social groups that play such an important role in this perspective, appear to emerge from thin air. Though the agents' representation of the technology emanate from their experiences and preferences, little is established of the structure of their representation or how these are related to the technology. Similarly, there is no sense of the different

notions of power that the agents can deploy in articulating their preferences (Blume, 1992;53), issues that a cognitive perspective would necessarily seek to address.

While SCOT may have been an incentive to re-construct forgotten views and technological directions, it has often been described as essentially a stepping stone to other theoretical directions (Van Lente, 1997). Indeed, whilst Bijker has specified relevant social groups in his case studies, there does appear to be a broadening focus towards 'socio-technology' rather than purely technology itself, as we have seen within the actor-network account. Another route forward may be to explicitly reconstruct a notion of 'agenda building' and inclusion/exclusion of various cognitive notions as a mechanism of conceptual closure (Van Lente, 1997).

While previous research has focused upon how the socially negotiated order of institutional environments directs technological change, it is suggested here that it may also be useful to examine the negotiated order of beliefs themselves. Beliefs of the future (technology, trends, society etc.) are suggested as a 'generative force' that set in motion path-creation processes; that is, the initial conception and enactment of technological artefacts and evaluation routines.

Capabilities Approach

What may make it increasingly appropriate to speak of *a* capabilities perspective is the small but growing list of authors that have begun to refer to their work as lying within the confines a 'capabilities', 'dynamic capabilities,' or 'competence' approach to technological development (Langlois, 1992; Foss, 1993; Teece and Pisano, 1994).

These contributions take somewhat different starting points from each other. Some begin from 'bounded rationality' and other aspects of cognition and build up a theory of firm-specific knowledge from this (Kogut and Zander, 1992; Dosi and Marengo, 1994). Others begin from the empirical generalisation that productive knowledge is neither explicit nor freely transferable (Langlois, 1992).

In essence, all capabilities approaches subsume within them the recognition that individuals and organisations are necessarily limited in what they know how to do well. Moreover, it is becoming increasingly recognised that approaching the firm in this way, has important contributions for many different notions in explaining areas as diverse as the sources of the firm's heterogeneity, competitive advantage (Prahalad and Hamal, 1990) and for advancing research in the 'economics of organisation' (Langlois and Foss, 1997).

The conceptualisation of the firm that underlies this work is perhaps best expressed in Edith Penrose's *The Theory of the Growth of the Firm* (1959). Penrose states 'the firm ...is a collection of productive resources the disposal of which, between different uses and over time, is determined by administrative decisions' (1959;24). Because these resources are specialised to the firm, they are worth more to the firm than to the market or other firms.

Penrose's work helped define at least three distinct areas of research. The first one partially stems from her insistence that specialised and hard to imitate resources are 'rent yielding' strategic assets. This has helped found what is referred to as the *resource-based perspective* in contemporary firm strategy research (Lippman and Rumelt, 1982; Wernefelt, 1984).

A second area of research that emerged from such work, is the study of *diversification* (Teece, 1982; Dosi, Teece and Winter, 1992). This is characterised by Penrose's notion of excess capabilities. As firms conduct their business, they are likely to accumulate excess resources, for example excess managerial capabilities. However, because of possible transaction costs, particularly severe when the excess resources involved are knowledge resources, in-house use of such capabilities are more efficient and the firm will apply the resources accordingly to 'similar' projects or markets (Langlois, 1997).

The third area of research that Penrose's work helped to establish, is the study of *organisational learning*. Excepting the seminal contribution to organisation theory by authors such as March and Simon (1958) and Cyert and March (1963), Penrose argues that management teams hold *images* of the external environment and the firm's internal resources. These images are produced through internal learning processes and they determine 'the productive opportunity set' of the firm. That is to say, the productive possibilities that the entrepreneurs *see* and what it can take advantage of (Penrose 1959;31). (The issue of learning and 'imagination' are central to the argument of this thesis and shall be returned to in Chapters Eight, Nine and Ten.

The implication is that firms are, in essence, cognitive communities, and as such may provide a basis for understanding not just the effect of routines and recipes within organisational change but also for understanding the creation of the routines themselves and their relationships to the emergence of new technology.

There are within a capabilities approach, several streams of thought focused upon the notion of organisational change. For example, there are the more typical notions of bounded rationality (Simon, 1958) and tacit knowledge in action (Polanyi, 1958) as well as taking the view of the firm as essentially 'processors' of (objective) information (Fransman, 1994). Similarly, Langlois has argued that the set of capabilities available to an organisation, and the way in which those capabilities are arranged, constitute the organisation's cognitive structure (1996). That is to say, its mechanism for perceiving technological and market opportunities. Thus, knowledge within the organisation is perhaps even more widely distributed and variegated than the notion of an 'image' suggests, and is not always confined to management.

Other streams include descriptions of 'framing theories' (e.g. Rumelt, 1987), suggesting innovative change as occurring when 'crisis' provides a stimulus to behaviour.

In summary, there are several theories that attempt to describe the same event of technical change. This is not meant as a complete list of theories of technical change. Others might include; technology as politics (Braverman, 1974; Winner, 1977; Noble, 1984), cultural studies (Sorenson 1986), and neo-evolutionary approaches (Van de Belt and Rip, 1987). However, it is suggested here, that running through the outlined cases are several similarities and themes that are explained in the next section.

2.3 Similarities, Differences and Themes

It is suggested that within all of the approaches reviewed, are several major similarities and limitations. Many of these limitations can be augmented by a discussion of the cognitive processes of the innovators. In the following section, I discuss several common themes. In particular, the social relationships and interaction at various analytical levels of the concept of technological change as a multifaceted and heterogeneous event and the existence and importance of cognitive mechanisms. The major disagreements of the mechanisms of change and the status of 'structure' will also be discussed.

Social Relationship

The first issue that the review demonstrates is that within the dynamic nature of technological development, social relationships are crucial. That agents organise their interactions, interlock their activities, and collectively derive decisions, must be reflected in any investigation.

This notion is the central focus of the actor-network approach and is also crucial to SCOT. Particular social groups interact, on the basis of their perception of a problem and proposed solutions, leading to a stable artefactual design. When a single definition dominates, 'closure' is realised and the artefact is said to *exist*; until then its meaning is ambiguous.

The assumption of the importance of social interactions is reflected in all approaches reviewed, in one form or another. In the evolutionary theories for instance, trajectories arise from the relationships between the learning processes and routines of a firm. Similarly, the capabilities approach has as its main tenet the focus upon the negotiated rules and routines. However, as with all the reviewed approaches, what is lacking is an in-depth understanding of how these rules are created, re-ordered and destroyed, how they are represented within the innovator, and how they are related to the context of selection environments.

The Multifaceted Nature of Technology

The review shows technology to be multi-faceted in nature, involving economic, technical, social and cognitive elements, which cannot easily be considered separately, if at all. Every artefact, component and article of technical knowledge is immersed in a contextual environment constituted by the artefactual, organisational, and individual operators.

Within Hughes's analysis, heterogeneity is the main focus. Within other approaches, a similar assumption lies, or at least they do not oppose it. The 'seamless web' is a typical starting point for sociological studies of technology, alluding to the practical and analytical difficulty of singling out one particular element for study.

This suggests that the researcher cannot optimise one element while ignoring others. However, some approaches, such as actor-network and SCOT claim that this difficulty is more fundamental, implying that one cannot tell beforehand whether an element is economical, technical or social in characteristic. The decision of practitioners (and researchers) to consider an element to be within one of these categories is part of the process in which technology is shaped. The terms of social, economical, technical (and cognitive) therefore need explication in themselves.

The inference of the heterogeneous nature of technology change for its study is clear. Research should be unprejudiced to the many kinds of elements and not simply focus on one, since they are all narrowly interrelated. Second, care should be taken with categories such as 'social' and 'technical'. To categorise an example as such, may exclude much that is crucial to its explanation. Certainly, for example, one does not deny that there are important social-technical or social-political processes. Yet to focus upon one set, is to exclude the *heterogeneous* nature of technology.

Cognitive Structure

The last issue that emerges as common to of all approaches reviewed, is the existence and importance of *cognitive structure*. This notion suggests that individuals do not interrelate erratically, but are influenced by various common cognitive mechanisms. They share ideas and knowledge and from this 'reservoir', they derive the rules by which they can interact and construct practices.

Evolutionary theories, for instance, suggest the phrase 'knowledge base' to assist 'the set of information inputs, knowledge and capabilities that innovators draw on when looking for innovative solutions' (Dosi, 1988; 126). Others use terms such as 'technological guideposts' (Sahal, 1981), 'technological paradigms' (Dosi, 1984) and 'focusing devices' (Rosenberg, 1976), while SCOT considers 'technical frames' as a form of mental representation.

The notion that technology is created (or at least shaped) by these shared structures is held by many of the other perspectives. For example, social systems approaches map them at the level of collectives, assuming a self-referential character of system. That is to say, assuming actors to 'think' and 'act' in terms of the system as a whole. However, the analytical focus is often so far removed from the innovators that the notion is important only indirectly.

As I have intimated in Chapter One, much can be learned on this aspect from the literature on social and organisational cognition (Bateson, 1972; Berger and Luckman 1967; Neisser, 1976; Weick, 1979). From the point of view of a general cognitive theory, a practitioners sense of a commercial 'reality' is selectively perceived, cognitively rearranged, and interpersonally negotiated. At the extreme, social order has no existence independent of its members. Technology, in the abstract, resides in the minds of practitioners and therefore can be understood more clearly through an investigation of the cognitive variables and decision premises, than through simple notions of behaviour (Weick, 1990).

While the outlined common themes suggest a rather chaotic course of events, the idea of a collective and cognitive structure as playing an important role in technological change, may introduce a form of 'regularity and order'. Together, investigating these themes in more depth, constitutes the beginning of an account of technological development. To be more precise, what is required is an advanced understanding of how the interaction between beliefs, artefacts and evaluation routines lead to the creation and perception of alternative technological paths.

2.4 Conclusion

The start of this chapter briefly argues that although social theories have a great deal to offer the practitioner and researcher, they also bring with them a great deal of conceptual baggage that necessarily excludes other important aspects of technological change (I shall expand upon this point in Chapter Four). However, the different perspectives of technical change reviewed offers some 'hints' as to where a cognitive perspective may aid such approaches. The different perspectives also have various degrees of divergence on several key themes, with respect to the focus and role of *mechanisms* and with respect to the *agency and structure* by which technology is shaped and developed.

Agency and Structure

The theoretical approaches view of structure and agency also have several common main themes. To one end, the existence of structure is taken as given, with each theory attempting to describe ways in which they are crucial to the explanation of technical change. For example, one *can* examine the elements of an assumed structure, and stipulate how it influences the shaping of technology. Evolutionary theories and social-system approaches tend to deal with structure in this way (although the actual contents of 'structure' is different). Other approaches, such as Technological Regimes, Actor-network and the Capabilities view, although not necessarily explicitly, make some reference to the role of agency, champions, system builders, heterogeneous engineers and so on, in technological development.

Similarly, one may deny any concept of 'structure' at all. Actors may consider external forces in order to negotiate but this can always be contested, and as long as the external forces are not accepted as such, they can be considered non-existent. What researchers can do instead of creating the notion of certain abstract structures, is predominantly describe every interaction separately and explain outcomes in terms of agent-strategies and their relationships. An approach such as Actor-network embraces this 'voluntaristic' notion more than most.

However, what studies of technology change have demonstrated is that it is the relationships that matter *and* that these interactions are constrained by something that is largely 'out of reach' of individuals. Thus, contingent actions and confining structure are important in a way that is of both primary conceptual and theoretical importance. Whatever 'it' is has a shared quality to it. Consequently, how agents combine their insights concerning contingency and constraint, becomes a crucial question for a cognitive theory of technical change.

Clearly, such a problem of describing both 'structural' and 'voluntaristic' insights is complex. As Elster (1983) notes, many debates on social structure are confused by

not distinguishing between the concepts of determinism and stability. Determinism, as I have alluded to, refers to structure as an external force that determines outcomes irrespective, it appears, of individuals and organisations, in that actors are said not to influence outcomes. Rather, they act in a 'logical' way as if controlled by a structural force. Stability of the mechanisms used in 'choice' refers to patterns and regularities in processes, opening the way for both the practitioner and researcher to predict future courses of action; an issue specifically expressed within the capabilities approach but lacking detailed exploration.

A limitation of voluntaristic approaches is that the analysis often terminates as soon as notions of stability or patterns are established. An analysis tends to stop as soon as an artefact, an organisation or other socio-technical outcome starts to have a life of its own. Indeed, often the end point of 'voluntaristic' approaches seems to be the starting point for 'structural' approaches. The latter considers structure such as markets, disciplines, trajectories and so on, to explain what follows on from previous accounts, and takes their initial emergence as more or less 'taken for granted'. However, questions of technological development in 'emergent' structures are left unexplained. How do the relationships (the processes to construct and shape technology), interlock? How does stability and patterns emerge? How do weak regularities and patterns turn into more durable 'cultural' rules and routines? Although it is not the explicit aim of this thesis to answer these questions, nor are they directly reflected in the research questions, outlined in Chapter Five, it is hoped that this study will contribute to the discussion of the interrelationship between questions of structure and agency.

Mechanisms

Another disputed issue between the approaches reviewed involves what precisely the primary mechanisms of technological change are. The primary mechanism of SCOT, closure, is focused on the relationships of groups with alternate problem definitions and different solutions, a mechanism that often appears inconsistent with

other mechanisms of technical systems, such as ‘reverse salients’ and ‘momentum’.

Similarly, these are not readily combined with, for example, the basic premises of evolutionary approaches; the focus upon the re-combination of firm-specific routines and the selective power of environments. How these critical notions all compare to one another is not clear.

One possible answer is to assume technological development to be a *multi-layered* process taking place at different levels of explanatory coherence. This suggests that the different approaches reviewed are valid *primarily* at specific and differing levels of technological development. Certainly, an inventor designing a bicycle, according to their problem definition (SCOT), or firms following a search routine to discover better dyes (evolutionary approaches), relate to different explanatory levels than say, the processes of a firms differentiation in a social systems perspective.

It remains an open question whether a full-fledged theoretical integration is really possible. That is to say, whether a ‘super’ theory of technical change is a reality. This study does not seek to address the goal of integration, but recognises the issue by explicitly accepting a focus at different levels of analysis with different dynamics.

Technical change is, of course, a huge area of research and one that cannot be covered in totality within this thesis. The aim is a narrower one. The purpose of the review in this section has been to outline a broad conceptual scope and illustrate how existing approaches to technical change, with many similarities and differences, can be addressed by focusing upon issues of the cognition of practitioners involved with the innovation process.

From the discussion, one can conclude that there are broad sets of questions that the researcher of technology change, within *all* approaches, should seek to ask; how does technology get its shape? how does technology development take place? what are the

practices and mechanisms that give technology (and its developmental processes) its final or dynamic configuration?

Also one can add; in what ways are the choices of the innovators constrained? How do the technological strategies of the firm become set and how do rules, patterns, knowledge bases and business routines become created and destroyed? Indeed, importantly for this thesis, how and why do practitioners perceive certain innovation possibilities as viable and not others?

In order to understand these questions more fully, the next chapter provides a literature review of research focusing on organisational innovation. As the chapter explains, although I use the terms 'technological change' and 'innovation' largely interchangeably in this thesis, innovation can be considered a more precise 'sub-set' of technological change and one whose study provides a more focused discussion of the topics raised in the two previous chapters. Chapter Three starts by considering various definitions of some of the main terms used, then provides the review of organisational innovation. The chapter concludes by considering management literature focused upon strategic vision, in order to embellish the reader's understanding of certain critical aspects of innovation. This is done in order to be able to develop several theoretically grounded research questions, that are taken up, in more detail, throughout the remainder of this thesis.

3

Organisational Innovation and Strategic Vision: A Literature Review

Early references to innovation as including 'technological possibilities within the horizon of the producers' and as 'cumulative production experience' (Schumpeter, 1931), provided an initial focus for the investigation of innovation as an activity guided by issues of the cognition of innovators. To this end, a literature review of organisational innovation is conducted that is both relevant to the initial broad questions posed in the last chapter and to the 'cognitive' themes also outlined.

The survey of organisational innovation literature reveals that many researchers have attempted to establish the boundaries, dimensions and categories of relevant knowledge, as well as establishing the importance of expectation, belief, hope and the perception of opportunity as a driving force behind innovation. A review of strategic vision literature suggests that the perceptions of possible innovation are imbued with certain notions of strategy, social trends, organisational structure and so on, constrained by several complex cognitive mechanisms. This chapter draws upon these reviews and the broad questions proposed towards the end of Chapter Two and then concludes with a set of *initial* research issues.

These questions emerge through the process of writing the review and conducting the research. Questions and areas of interest were constantly being reviewed and refined. In order to reflect this, the material derived from this chapter and questions that arise are developed further in Chapter Seven, where the use of more specific cognitive literature illuminates other relevant issues to be developed in Chapters Eight to Ten. I shall explain, in more detail, the notion of theory development, in Chapter Five.

3.1 Background to Innovation Studies

As early as the beginning of the last century Schumpeter observed:-

'The most powerful type of competition is the competition from the new commodity, the new technology, the new source of supply, the new type of organisation. Competition that commands a decisive cost or quality advantage and which strikes not at the margins or the profits and outputs of existing firms but at their foundations and their very lives' (1919; 84).

The concept of innovation was originally introduced as a main causal explanation for changes in routine economic growth. Schumpeter placed the emphasis of study over a relatively long period of time in which pioneering innovations leads to a basic transformation of the system of economic routines (1931; 86). His early work (i.e. 1931;87, 1954; 1026-53) frequently referred to innovation as 'new combinations' of production routines as well as encompassing several other broad topics of interest, such as:-

'The introduction of a new method of production, one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded in new scientific discovery, and can also exist in a new way of handling a commodity, commercially.

The introduction of a new goods - that is one which the consumers are not familiar-or a new quality of a good.

The opening of a new market, that is a market into which the particular branch of manufacture, of the country in question, has not previously entered, whether or not the market existed before.

The conquest of a new source or supply of raw material or half-manufactured goods, again irrespective of whether the source already exists or whether it has first to be created.

The carrying out of new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position' (1934; 66).⁷

It hardly seems surprising then, because of the extensive nature of the research interests, that Schumpeter's early definition of innovative practice has been heavily criticised for being too broad and vague.⁸ Indeed, Schumpeter's reference to innovation in terms of production functions may have been in order to keep much of his early work within the neo-classical tradition that formed the dominant paradigm of that era (Hagedoorn,1989).

⁷For a full appraisal of Schumpeter's definitions of innovation, see Hagedoorn (1989).

⁸For an extensive overview of the various criticisms see Clemence and Doody (1966; 39-50).

Similarly, criticism has been placed on the descriptions being focused on only *new* firms. This is true of his early work. However, subsequent research accepted and included the role of *established* large companies and groups/departments as innovators (Schumpeter, 1949).⁹

Consequently his later descriptions of innovative practice were expanded to include:-

“..a realistic production function to be constructed on the basis of factual observation and factors of production distinct from a ‘logically pure’ production function...‘Blue prints, where every element that is technologically variable at all can be changed at will without expense’...‘The given technological possibilities within the horizon of producers’ (1949; 679).

The last description in particular, is important as it alludes to the technological possibilities and imagination (or cognition) of the practitioner that constitutes the main focus of this investigation.

Schumpeter’s notion of innovation in terms of production functions has a good deal in common with publications such as Freeman and Perez’s techno-economic paradigms (1988), Rosenberg’s meta-production functions (1982), Dosi’s technological paradigm’s and technological trajectories (1982) and Nelson and Winter’s technological regimes and natural trajectories (1982).

Schumpeter’s focus upon production functions of the organisation describes a tendency towards technological similarity among firms as being broken up by the innovative entrepreneur’s ‘visionary’ abilities or as realising the ‘technological possibilities within the horizons of the producers’ (Schumpeter, 1949).

Although by no means fully outlined to any great depth, this essentially ‘cognitive’ notion of the entrepreneur remained important throughout the different formulations of Schumpeter’s arguments. His early Model 1, attributed technological change to

⁹For an explanation of Schumpeter’s two models of innovation, showing the increased role of large company R&D departments, see Freeman (1982).

the profit seeking behaviour of the individual entrepreneur. His later Model 2, placed the focus of innovation (and innovative behaviour) towards the many emerging R&D departments of large organisations. These models have provided the basis for many subsequent programmes of innovation research (Anderson 1994; 133).

Several authors have concluded, even as these models of individual rationality are refined, they are being increasingly rejected both by the raw data of researchers and the anecdotal evidence of the practitioner (Macleod, 1996). This suggests a need to re-evaluate essentially cognitive programmes, such as 'bounded rationality', suggested by Herbert Simon (but not confined to him), and to critically re-examine much managerial and innovation research within the social sciences that stem from it.

All of the approaches mentioned have subsumed within them a notion of 'the cumulative nature of technological development' and the suggestion that there are 'sets of heuristics that guide the process of innovation search' (Hagedoorn 1989;8). A wide range of literature has subsequently propounded the importance of organisational learning and knowledge generating processes, not just within R&D departments, but company wide. Perhaps the best known is Arrow's 'learning by doing' (1962), suggesting the tendency for manufacturing performance to improve with cumulative knowledge and production experience. Similarly, as the next section shows, other authors have explored the nature of the non-formal components of innovation.¹⁰

3.2 Categories of Innovation

Whether large or small, firms constantly encounter difficulties in being able to consistently generate commercially successful new products, processes or services.

¹⁰There are perhaps too many to list in this section but as an example see Cohen and Levinthal (1989)

Over several decades, many authors have attempted to identify and define the 'key and critical success factors' of innovation.¹¹

In this research, when taken in its broadest sense, innovation typically means many diverse things. Traditionally, it is taken to mean that product 'B' is an *innovation* over product 'A'(and therefore newer and better!). This is however, a far too simplistic notion. Rogers and Shoemaker suggest, for example, that innovation can also entail not only the physical artefact or process but an idea, belief or practice (1971; 19).

That is not to say that all artefacts and ideas can be defined as innovation. Innovation requires a 'degree' of novelty. This novelty need not be completely new, but what counts is a perception of 'newness' to the practitioner (Zaltman, 1973; 10). Thus, one can distinguish innovation from technological change *per se*. Hence, while all innovation implies change not all change implies innovation (Zaltman *et.al.*, 1973; 158). There are many proposed classification schemes to categorise different forms of innovation. For example, Zaltman *et. al.*, (1973; 17-32) suggests three broad types of analysis categories; state of the system, initial focus and outcome or effect.

State of the system involves 'programmed' and 'non-programmed' innovations. That is, innovations that follow set routines and those that occur in response to the current lack of success of the firm or simply because funds are available.

An analysis of innovation categorised in terms of its *initial focus* is best demonstrated by Knight (1967; 482). He does not define innovation simply as product centred, but rather chooses to categorise and analyse innovation in terms of production and process innovation, product or service innovation, organisational-structure innovation and 'people' innovation.

for a investigation of 'learning and innovation'.

Utterback and Abernathy argue for a similar distinction of focus between process and product innovation (1975). While process innovation is concerned more with the focus on methods, routines and equipment used to produce products, product innovation typically considers commercially focused artefacts that are designed with specific uses and needs in mind.

Pisano observes that certain industries, such as pharmaceuticals, require simultaneous development of both new products and new processes, yet initially managers pay far too little attention to process developments (1994). As a result, many product launches are delayed by technical problems in R&D and production processes.

Typically authors who propose an analysis of innovation in terms of *outcome* do so in terms of 'incremental' and 'radical' innovation. Within Freeman's taxonomy of innovation, he describes incremental innovation as a continuous activity resulting from engineering and design improvements rather than R&D *per se* (1982). The cumulative effect on the company, and upon the economy, are depicted as highly significant. Radical innovation is often described as discontinuous, leading to totally new products or processes and are usually a result of R&D programmes. At the time however, it may not be apparent that such a product or process is a radical innovation but only becomes so after all aspects of diffusion within the market place, and within the firm, are fully comprehended. Thus as far as the innovator is concerned, all innovation at inception, can be described as incremental. Just as many authors have attempted to catalogue different types of innovation, many have attempted to outline the various impetus that 'force' practitioners to innovate.

3.3 Market-Pull, Technology-Push

Freeman recognises the limited view of the, 'technology-push versus demand-pull' debate, suggesting that it provides only a partial explanation of specific innovation

¹¹For a review see Quinn J. B. (1979).

factors (1982). The influence that project SAPPHO has had on the investigation of innovation factors has been extensive. Characteristics such as, close attention to the needs of potential users/consumers, in-house R&D, communication links with relevant scientific communities and patent protection, have all been regularly quoted as common features of successfully innovating firms.

Project SAPPHO is also important because it fails to support many widely held 'folk' beliefs, or 'common sense' notions, concerning the innovative firm. For example, although it acknowledges the drive towards shorter lead times and the effect of competitive pressures, it observes that neither on their own are factors of success. Similarly, there is little connection between a firm's attempt to innovate in unfamiliar directions or markets and failure rates, or indeed, the firm's size.

Project SAPPHO was for some time used to support 'demand-pull' theories of innovation, concluding that factors relating to the market, such as understanding future user-needs and the analysis of future markets, were often more associated with successful innovation.

Mowery and Rosenberg's review of 'market-demand' literature has since demonstrated that such research does not provide the clear and unequivocal support for demand/market-pull as the only or even major factor, that this purported to have found (1979). They state that the very term 'market-demand' is often used in an imprecise and ambiguous way. They argue that:-

'Demand expressed in and mediated through the marketplace, is a precise concept, denoting a systematic relationship between prices and quantities, one devolving from the constellation of consumer preferences and incomes. To be taken seriously, demand-pull hypotheses must base themselves upon this precise concept and not the rather shapeless and elusive notion of 'needs' (Mowery and Rosenberg, 1979; 229).

Howells, also critical of various issues within certain demand theories, claims that:-

'Such a concept [of demand] gains from existing prices and quantities and from existing traded products. Thus, it can hardly be relevant to innovation where a product or process differs in some way from what is already traded' (1996; 3).

To make a notion of 'demand' a more precise concept entails many assumptions about consumer preference. Demand theories suggest that 'supply and demand curves are continuous functions rather than discontinuous' and suggest that 'incremental shifts are somehow knowable' (Howells, 1996; 3). Similarly, Howells suggests that:-

'Demand is a static concept which does not go any way to informing us of the mechanism by which shifts in supply or demand curves generate new products' (1996;3).

As such, these assumptions are considered to be simply 'convenient' to economists because they make the economy 'mathematically tractable' but do not contribute much to the description of innovation (Ormerod, 1994; Hodgson, 1994). This is not, of course, denying that the firm is contextually embedded within larger social or commercial environments, such as sectors, industries and national economies and that these effect the organisation. As Howells suggests:-

'The firm and the individual are social agents whose 'technological-shaping' actions are mediated by their interpretation of the market trade patterns; all of the mechanisms by which markets affect innovation is within the agency of the firm' (1996; 4).

Certainly, organisations or individuals produce, as well as 'receive', innovative activity from these larger environments, be they market place or new technology driven, yet all are bounded in the same fashion within the organisation. Consequently, it is the study of innovation within an organisational context that is most relevant to this thesis.

3.4 Organisational Innovation

Attempts to distinguish between various types of organisational innovation have included drawing the distinction between process, diffusion and determinants of innovation (Wolfe, 1994) as well as the distinction between process and variance research (King, 1990). The account here draws a distinction between underlying theoretical perceptions of an individual's action and organisational structure.

Drawing heavily from strategic management issues and organisational theory literature, the framework also suggests a third category of organisational innovation work, that of *interactive* research (Pierce and Delbecq, 1977). The aim of this review is to establish several common themes amongst the literature as a way of suggesting a further focus and development for several research questions.

3.4.1 Individualist Studies

Within this approach, innovation case studies suggest the individual as the main focus for innovative change within an organisation. Broadly speaking, the individual is viewed as a self-motivated and self-directed actor, stimulated by personal goals of their own creation and not affected or constrained by factors external to the organisation.

There are at least two discreet levels of research; the personal view, that focuses on the individual characteristics of the entrepreneur; and the social or contextual view that accepts some influence from the social context that the organisation places upon individual activity.

The Personal View

Certain individuals are said to possess various personal traits that give the entrepreneur a critical disposition towards successful innovative behaviour (Scott and Bruce, 1994).

Characteristics such as, values, age, sex, creativity and personality have all been cited as crucial. Similarly, personally held attitudes towards success such as 'willingness to speak up against the grain' or 'not afraid to take risks' are often cited as important (Reich, 1991). These qualities may be learnt, innate or as Schumpeter describes, 'transient' to the entrepreneur (1939; 78).

Although such a perspective is hard to accept as solely responsible for innovation as it seemingly ignores most of the social complexities that are associated with innovation, it can still be found to underlie many 'populist' books dealing with innovation and entrepreneurs. Consequently, this view still influences many aspects of the innovative organisational practice, from company-internal psychometric testing procedures to peer group assessments and informal innovation group meetings.

There are several good reasons for discounting such an introspective and personal view. Firstly, innovation, especially within large mature industry, does not appear to be the product of one or even a few decisions, but the culmination of many. These decisions are made by *many* people, and as such, a claim that suggests that an individual contribution within an organisation as all important may be hard to maintain (Van de Ven, 1987; 17).

Similarly, the individual is subjected to many constraints and influences placed upon them by the organisation. These influences may provide a constraint to many of the personal characteristics or, at the very least, have a crucial role in directing the innovation process (Baldrige and Burnham, 1975).

The Social or Contextual View

Innovation research within this view, accepts that the *social* context in which the individual is placed occupies a crucial role in the innovation process. The context of the individual represents a set of values, accepted behaviours and social relationships that act as a constraining (and possibly empowering) influence upon the individual. Similarly, designated personnel often are *given* the role of stimulating or 'championing' innovation.

Leaders, Champion and Promoters of Innovation

The subject of 'champions' of innovation has received wide attention and typifies the 'social' individualist approach (Howells and Higgins, 1990; Westley and Mintzberg, 1989; 17-31). These suggest several types of champion and ways in which they shape the innovative process; the director, the motivator, the value-setter.

Director: Through their own informal research or search activity, the director becomes aware of potential innovative opportunities and introduces the notions into the organisation. This role may require that the director is empowered to such a degree that they are able to do this unchallenged, or at least possess the political skill to get projects accepted.

Motivator: By the setting of values, goals and directions, the motivating leader can facilitate organisational innovation in others, influencing the innovation environment directly, or indirectly, through setting expectations of subordinates (Daft, 1978). This 'influence' may have several formal embodiments, such as financial rewards and career promotion, that may vary the degree of effect that the leader has on the innovation process. Similarly, while the CEO undoubtedly has an important role, it is the day-to-day practitioners of innovation rather than the 'upper-management' who are most influential (Hage and Dewar, 1973).

Value Setters: Hage and Dewar (1973) suggest that whilst the individual leader may be important, focus should be placed upon the role of the 'group of elites'. Such informal groups were found to play a more crucial role in the setting of values and expectations than CEOs or individual project leaders.

Wind and Roberston reached a similar conclusion, suggesting that 'the predictiveness of innovation would be improved by focusing on the pattern of 'cosmopolitanism' (varied personalities) among members of the decision-making unit' (Slappendel, 1996; 111).

A leader can have certain powers and influences imposed upon them by an organisation in a number of ways. For example, practices or work rules, either formally or informally, are laid down by the social context the person or group is placed within. Such structures may only promote or constrain and do not control innovative activity.¹²

3.4.2 Structuralist Studies

Central to a structuralist perspective is the assumption that innovation and organisational behaviour are shaped by the characteristics of the firm, external to the individual. Innovation is directed by three factors; organisational goals (these may be very general and non-specific to the particular firm, such as survival in a particular market), the external environment and the mechanisms by which the manager optimises the company's performance (Astley and Van de Ven, 1983).

The disadvantage of studies within this approach are their treatment of organisational factors as objective realities whose factual character goes unchallenged. As Benson states:-

'Through the practices of reifying organisational features such as technology and strategy, the processes by which organisational structures are generated and sustained are ignored or at best, simple assumptions about action are held to be valid, e.g. individuals are rational and goal oriented (1977, cited in Slappendel 1996; 114).

The main advantage of studies within this approach is that, far from proposing a restricted focus of the organisation in social and contextual isolation, they consider the *relationship* between the organisation and the environment.¹³ Yet to what degree the heterogeneity of the environment effects innovation is not yet clearly understood. To this end, certain studies focus upon issues such as the selection environment, organisational size and (de)centralisation of control, as well as positing structural contingent models that consider the relationship of several competing factors.

¹²See Zaltam *et. al*, (1973) for a review of resisting factors within the innovation process.

¹³For a review of the 'pros' and 'cons' of the Structuralist perspective see Silverman (1993; 66-67).

The Selection Environment

It is not possible to accurately define the innovative activity of an organisation purely within its own physical boundaries. Suppliers, for example, often provide the firm with a source of new ideas (Utterback, 1982). Furthermore, often suppliers are required to take part in the actual change itself. Similarly, competitors are often cited as a critical source for innovative action (Faulkner, 1994).

Perhaps the most often quoted contribution to innovation is the customer (Utterback, 1982). Indeed, project SAPPHO concluded that innovators that are 'good' at ascertaining customer requirements are on the whole, much more successful organisations (Freeman, 1982). Paradoxically, producer sovereignty is *also* suggested as a critical factor in innovation (Galbraith, 1969).

Freeman draws the distinction between customer demand and firm led innovation strategies in markets such as capital goods or consumer markets. He states:-

'The market has been effective in stimulating the types of innovation which match real customers needs and potentially if not always in practice, social welfare (...) most innovation studies have been concerned with spectacular 'break-through' innovations and have hardly considered the type of *annual mode* changes which are more characteristic of many consumer products. These are reasons for believing that buyers in these areas are less capable of making sound technical judgements that in capital goods areas' (1982; 202-203).

Organisational Size and Resource

Organisational size is often said to have a positive correlation upon innovation (Damanpour, 1992; Baldrige and Burnham, 1975). Freeman notes that 'there is a range of innovations which are not attempted at all by small firms' (Freeman, 1982; 131). Certainly large R&D department expenditure may deter many smaller firms from innovating in particularly complex technological directions. Baldrige and Burnham refer to the tendency of large firms to adopt some innovations and not others as the 'critical mass' required to force one decision over another (1975).

A number of economic writers maintain that, despite a heavy concentration of R&D expenditure in large firms, it is the small firms that account for most of the important inventions and innovations.¹⁴ From a structuralist account, the smaller firms may have, for example, size-related structural capabilities (and the larger firms disabilities) that help the firm to innovate in particular directions. However, Project SAPPHO suggests that attempts to innovate and the size of the organisation did not have a positive correlation (Freeman 1982; 131).

Mohr argues that 'size itself is not related to innovativeness by logical necessity', rather, there are other associated issues that play a crucial role (Mohr, 1969; 121). Similarly, Slappendel further claims:-

'It [size] is only important in terms of its indirect effect on organisational structure. Larger size, for example, may affect innovation by promoting increased centralisation, differentiation and organisational complexity' (1996; 116).

Professionalisation and Centralisation

Whilst bureaucracy is often considered to be negatively related to innovation, the centralisation of power has also been cited as stifling new innovation (Hage and Aiken, 1970).

Certainly, individuals that are empowered to accept or reject innovation projects can have a disproportionate effect, especially if the perception of the individual towards such a project is one of 'threat' towards existing power structures (Pettigrew, 1985). Similarly, Zaltman *et al.* argues that a high degree of centralisation stifles the internal exchange of ideas and values (Zaltman *et al.*, 1973).

Perhaps the most well known description of 'channels of communications' and their effect upon organisational ability is given by Burns and Stalker (1961). They distinguish between the *mechanistic* structure in which organisational roles are tightly defined by superiors who have a monopoly of 'organisational knowledge' and

¹⁴See Freeman (1982) for a full discussion.

the *organic* structure, in which organisational roles are loosely defined and derived by mutual negotiation. Knowledge is dispersed among the employees who possess a variety of expertise relevant to the organisational mission. This seminal work pioneered contingency approaches to organisational structure and attempts to describe the influence of many competing influences upon the innovation processes.

Structural Contingency Models of Innovation

Contingency models of innovation suggest that there is no single structure most effective for all organisations in all environments. Structure varies according to certain characteristics, such as those described above. Thus, the optimal structure is *contingent* upon these factors and involves the construction of theoretical models of 'fit' between contingency and structural factors, testing them against empirical data.

The structural approach assumes that any increase in the innovation rate of an organisation may reflect competition from other firms, so the ultimate cause is the commercial environment. For this reason contingency approaches are often termed the 'organisation in its environment' approach.

So far, I have described how many innovation studies fall between either the individualistic or structuralist approach. Both are characterised by the search for 'key success factors' as pre-determinants to successful innovation. Both have been criticised for excluding much that is important (Mohr, 1979) and much recent innovation research has highlighted a movement away from the 'stage to stage' conception of the innovation process to a more dynamic, continuous and interactive conception of change over time' (Van de Ven and Rogers, 1988; 638).

3.4.3 Interactive Process Studies

Individualist accounts view innovation as stimulated by individual actions and structuralist case studies suggest innovation as caused by deterministic structures. By focusing upon successful practices and characteristics, as these approaches do,

theorists have claimed that the question of how 'normal' organisations become innovative is not addressed to any real extent (Hage, 1988).

Pierce and Delbecq argue that whilst most innovation studies associate variables from more than one level of analysis with innovative action within the organisation, they do not consider the inter-relatedness of these components 'over time' (1977).

Temporal sequences

Van de Ven *et al.* propose an analysis of innovation as a description of activities within the design, development, production and implementation of innovation, in terms of temporal sequences (1988).

Changes in activities can be explained as states, or discrete events, over time, in terms of 'probabilistic rearrangements'. That is to say:-

'The resulting processes should explain the pairing or other rearrangements of mutually autonomous objects whose individual courses are determined independently of one another by forces external to the core of the theory' (Mohr, 1982; 38-46).

These autonomous objects correlate to discrete states or events associated within different levels of analysis. For example, certain states may correlate to the innovative actions of individuals whilst others relate to external structural characteristics. These 'specify the complex conditions under which these multi-level events will join or separate' (Mohr, 1982; 83). It is this interrelatedness of structures and events and the attempt to address the complex nature of action and structure that differentiates the interactive process from the previously outlined positions.

The main criticism of early process models relates to the construction of structure. The concept of structure is described as the configuration of activities in an organisation that are both enduring and persistent and provide the organisation with its 'pattern and regularity' (Ranson *et al.*, 1980). Typically, process models give little countenance as to how these 'regularities' are constructed or broken.

Van de Ven and Rogers state that such problems can be (and have been) challenged in several ways. Firstly, he argues that by *accepting* both 'deterministic and voluntaristic' perspectives of social action, innovation researchers can provide a 'lens through which to view the process' (1988; 82). Thus, one can provide two differing and opposing approaches that address the issue of action-structure and the levels of analysis and precise nature of the relationship between them must be spelt out. Notions of time can be used to relate action and structure, leading to notions of new action and structure that can inform further analysis.

Similarly, Norman, within his model that focuses upon product variation, presents a framework that seeks to specify the relationships between each level of analysis (1971). The model stresses the importance of understanding the characteristics of the organisational sub-systems, such as political and task characteristics, with elements from the external environment in creating a description of the processes involved within product development.

Walton also proposes a framework for understanding innovation also placing the focus of analysis at varying levels (1987). His framework has five basic constituents; individuals with relevant competencies and skills, social values, institutions, economical incentives and values and other social factors. He cites two further external factors; trends and meta-competencies. He does not seek to challenge a structural perspective, agreeing that each constituent has an effect on innovation. Instead, he focuses on the notion that innovative change occurs within the social system of an organisation, influenced by the two external factors. He states that although each basic component may influence the degree of change, change itself is mainly determined by the interaction of these factors over time.

Pettigrew creates a similar framework by attempting to overcome existing problems within models that follow a linear and rational explanation of the innovation process (Pettigrew, 1985). He suggests that allied to the need to make explicit the connection



between the process, context and content of change, a more historical form of analysis is required.

Whipp and Clark, within their organisational research of the Rover car company, also argue the importance of a historical element, allied to the 'enterprise structure' and processes and societal comparisons within this sector as important elements within an innovation case study (1986; 86).

3.5 Summary and Common Themes Within Innovation Studies

Although one can consider these approaches to the study of organisational innovation to be mutually exclusive, most authors except that insights can be gained from the individualist and structuralist perspectives. For practical research reasons however, focus has often been placed on one or another.¹⁵ Each approach though, produces a critically limited understanding of innovation. A structuralist view does not allow for innovative activity to be shaped by individual cognitive behaviour. Similarly, an individualist approach focuses on the actions of leaders but often ignores the innovative characteristics of the structural context in which individuals are placed.

Both perspectives also suffer from a lack of theoretical understanding given to historical influences of the firm. Recent work has attempted a synthesis of these approaches and is often referred to as the 'interactive process approach' (Van de Ven *et. al.*, 1988). These attempt to account for characteristics of both structural and individual approaches.

Interactive process approaches suggest several assumptions. Firstly, stimulus to the innovation process appears closely related to March and Simon's notion of 'shock' (1958). Typically, innovation only occurs when the organisation faces dissatisfaction, or 'shock', such as competitor advantage or falling market share.

¹⁵ Typically a large number of organisations are surveyed, determining the effect of variable (for example, size). This offers a relatively low cost/high quantity approach, but; lacks the ability of measuring interaction affects and measurement of structural variables.

Secondly, the original innovative idea has a multiplying affect, stimulating other new innovation. Thirdly, individuals have different levels of influence upon the innovation process depending upon their empowered and political role within the company. This political context must be accounted for within models of innovative change (Pettigrew, 1985). Fourthly, the organisation can be structured differently to deal, in a more successful manner, with the complexities that the innovation process entails (Pettigrew, 1990). Fifthly, interactive models typically attempt to emphasise the temporal sequences of critical characteristics of the process (Walton 1987; 319).

The studies reviewed reject rational economic models of decision-making, instead promoting the 'non-rational' aspects of organisational behaviour as critical to understanding organisational innovation (Starkey and McKinlay, 1988; 115).

Various early models of innovation focused upon the individual actor as the prime source of analysis. Championed originally by Schumpeter as 'heroes of progress', later models (including from Schumpeter himself) suggested the external environment as a focus of analysis. Certain studies focus upon external factors to the individual, such as firm size and structure, whilst others focus upon the selection environment, external to the organisation. Indeed, recently several authors have demonstrated the need for innovation research focused on the processes of innovation that combine many aspects of individual and structural analysis. Goold gives a list of the minimum aims of technology-focused case studies (1981, cited in Howells, 1995) and the following commonalities:-

- 1) Innovation is rarely discrete and does not develop in isolation from other innovations and products - it has a 'technological context'.
- 2) Innovation often arises as a 'by-product' of the pursuit of other objectives.
- 3) The innovation and its environment are not static during the period of development and diffusion in the environment as many models implicitly assume.
- 4) There are few studies of failed innovation and therefore little chance of an informed debate on the reasons for innovation success and failure.
- 5) There are few studies which compare reasons for the adoption of the same innovation in different companies.

6) There are few studies of the early innovation generation process and of the reasons why managers and scientists pick one innovation over another for development. (Goold, 1981, cited in Howells 1995; 884).

Howells suggests that 'we might add to this minimal list that such a case study should allow for the multiple influences in innovation' and 'that no single factor governs innovation success is a common one and is found repeatedly' (Howells, 1995; 885). From the review of innovation within this chapter one can add the following claims:-

- The process and development of innovation has a dependent relationship on the accumulation of certain types of organisational knowledge.
- The innovation process is a dynamic ongoing one and is often viewed as a continuation of an existing trajectory along the lines of existing products, processes, ideas and 'ways of doing things'. Understanding the innovative history of a company is therefore an important issue.
- Not all individuals within an organisation innovate. Thus, in the sense given here, studies should reflect the fact that various individuals, for formal or informal reasons, have different degrees of influence and empowerment over the process.
- Few studies place the focus of analysis upon issues of the *perception* of individuals, whether these be unsubstantiated 'folk belief' or more fact-based 'evidential' analysis, concerning perceived innovative possibilities.
- Similarly, few studies focus upon the individual's perception of future market technology, societal trends and so on, as a stimulus for innovative practice.

These last two aspects of innovation case studies are suggested as of most interest to the goals of this thesis. That is to say, the notion that the perceptions or imagination of opportunity, in some fashion, can provide a stimulus to innovation activity. I shall

be exploring this notion in more detail throughout this thesis, but from the literature review one can suggest that these perceptions are limited in various ways.

3.6 Limits Upon Innovation and the Perception of Future Opportunity

Within Schumpeter's early work, he suggests that the entrepreneur can be distinguished by, amongst others, the ability to 'leap towards the unknown' (1919). Certainly, innovation is a highly complex process involving many decisions. Such decisions are made often on the basis of intuition, expectations and perceptions; concepts that often prove hard to understand and describe in any 'logical or rational' fashion.

Bounded rationality

That an individual's decision-making mechanisms can be studied as a rational process has been challenged by several authors (Simon, 1955; Cyert and March, 1963). Whilst not completely dismissing 'rational choice' they suggest a far less restrictive description of rationality as directed and reasoned behaviour.

Bounded rationality suggests that managers make decisions based directly on their beliefs and assumptions with limited access to incomplete information. Decisions are therefore, to some degree, rational in the sense that search activities are limited to the extent of managers cognitive representation of the innovation process. Innovation will only take place when the manager observes a divergence between actual performance and what is considered to be satisfactory (the 'performance gap'; Downs, 1966). The search process is 'bounded' to only a few options considered and will cease when the manager considers that a satisfactory option is found.

Cyert and March later amended this notion of 'search activity', suggesting that organisations will not only innovate when their current performance is unsatisfactory but also when it is successful. Even when performance is satisfactory, organisations

always have unused or an excess of resource that can be used to increase the innovative activity (Cyert and March, 1963).

Similarly, theories of organisational learning may also be used to amend descriptions of a search activity to one that includes structural as well as internal factors. For example, managers not only expand their search space through experience, but also can learn and amend their search activities by observing the actions of competitors.

Howells suggests that such an interpretation 'still leaves us with the problem of how to conceive of the organisation if the individuals within it have bounded sense of rationality, incomplete access to information and use heuristics to make decisions' (Howells, 1994; 7). Indeed, the tendency among many writers is still to conceive of organisational processes from a rational and individualist perspective and leave much of the non-rationalist aspects of decision making largely untouched (Pettigrew, 1985; 20).

Hickson *et. al.*, claim that issues of an organisation's structural complexity are the primary explanation of why organisational decision-making follows a given trajectory (1986; 248). A diverse structure requires a range of specialists to perform specialised tasks, making decisions that are taken as a 'foregone conclusion,' then are unchallenged by other managers (1986; 52).

Blau and McKinley go further by suggesting that such structure brings with it conflict, incoherence and confusion to functionally bounded departments, such as sales and marketing (1979). As Walton argues, experts often bring with them high degrees of fragmented knowledge and a lack of integration with corporate values and goals, that is often cited as important for fostering innovation (Walton, 1987).

The ways in which firms attempt to integrate a coherent 'sense of organisation' and generate cohesive innovative purpose, as well as ways in which individuals and firms

perceive future opportunity, receives a lot of attention from 'populist' literature but relatively little from academic studies.

It is suggested here that an investigation of these issues will aid the elaboration of the broad questions outlined towards the end of Chapter Two. To this end, the remainder of this chapter reviews the subject of managerial vision, as a way of further understanding these processes and concludes with several basic research questions to be refined and explored within this research.

3.7 Definitions of Vision

The Collins Oxford dictionary defines vision in a variety of ways: as something seen otherwise than by ordinary sight (as in a dream or trance), a vivid picture created by the imagination, the act or power of the imagination, and as an unusual foresight in understanding what is going to happen (1997). All of these descriptions seem highly apposite for describing the process of perceiving future commercial states by managers.

Despite its obvious importance, vision has no clearly agreed definition within organisational literature, consequently a good deal of phenomenological research as well as empirical research may have been held back.

Within strategic management literature, successful envisioning is prized by all types of organisations, public and private, because it corresponds to an ability to forecast. It has also been related to transforming organisations and is seen as a key to 'leading' or directing people in particular strategic directions (Tichy and Devanna, 1986; Bennis and Nanus, 1985).

Collins and Porras claim, with some justification, that vision (as 'culture') has become one of the most overused yet least understood words in the language of business, conjuring up many different meanings for different people (1996;66).

They suggest that the process of vision consists of two major components; an organisational-wide 'core ideology' and an envisioned future. 'Core ideology' defines *what* and *why* the company exists and is largely unchanging. The 'envisioned future' is what the company aspires to become, achieve or to create. The latter requires significant organisational change to attain, needing visible and realisable goals and a recognised time frame with which to operate in order to be successfully communicated to others.

Kotter observes that vision is 'a description of something; an organisation, a corporate culture, a business, a technology or an activity, in the future' (1990). Whilst Collins and Porras offer a more in-depth description, suggesting that vision is a conceptualisation of a new and desirable future reality that can be realistically communicated throughout the organisation (1996).

El-Namaki describes 'vision' as a mental perception of the kind of environment an individual or an organisation aspires to create, within a broad time horizon, and the underlying conditions for its actualisation (1992).

Thus, the content of vision can be said to influence the organisation and individuals' *direction* of perception, denoting the identification of a future scenario or event, often distant, and a plan for getting there. The agreed organisational direction requires various (re)negotiations of current commercial notions and may ask questions of managers concerning the current business that they are involved in (Kotter, 1990). Similarly, prescriptive in nature, Lipton suggests;-

'A vision must focus on the future and serve as a concrete foundation for the organisation. Unlike goals and objectives, a vision does not fluctuate from year to year but serves as an enduring promise. A successful vision paints a vivid picture for the organisation and, though future-based, is in the present tense, as if it were being realised now. It illustrates what the organisation will do in the face of ambiguity and surprises. A vision must give people the feeling that their lives and work are intertwined and moving towards recognisable and legitimate goals' (1996;85).

Other authors take a stronger view of the process of vision's importance to the firm, claiming that all organisational strategic efforts stem from it and all influence and structure are seen in terms of their relevance towards it. Issues such as reward and

career structure are of secondary importance for stimulating action as strategic attention is focused on the prime target of organisational perception, vision fulfilment.

3.8 Vision and Organisational Strategy

Researches have described vision as crucial to, amongst other notions, strategy implementation, organisational change and leadership (Westly and Mintzberg, 1987). Several researchers have also claimed that the process of vision provides a form of desired leadership characteristic, in which the leader is tasked with stimulating change within an organisation's culture by creating a joint understanding of their own plans for the organisation (Sashkin, 1987). In a similar vein, others have conceived of vision as a presentation of leadership competencies or as outlining pattern of values for others to follow (Sashkin, 1987).

Substantial bodies of research, both 'popular' (Kotter, 1990) and academic (Sashkin, 1987; Westly and Mintzberg, 1987) support the notion that successful strategic leaders can (or should) be able to clearly state their visions for the organisation and communicate it to others.

Visions concerning innovation may be conceptually distinct but are nevertheless empirically embedded in a larger concept of strategy, a view that often differs from a prevalent view in leadership literature. The process of vision is also described as the basis of 'empowering others' to act and behave in particular ways, (Sashkin, 1987; Srivastva, 1983; Mendell and Gerjuoy, 1984) when it is coupled with the leader's ability to effectively communicate to others (Bennis and Nanus, 1985; Gluck, 1984).

In summary these elements, the definition of images of future states, the formulation of an effective articulation of these images, and the empowerment of followers through communication, are seen as three distinct steps (Bennis and Nanus, 1985).

While it is useful analytically to distinguish them, Westley and Mintzberg argue that sequencing them into chronological order does not correspond to what actually occurs in reality, claiming that vision often seems not so much a stable mental process, but a transient, interactive and temporal ability of innovators (1989). That is to say, 'images' of a particular scenario appeared to have had as much to do with the past of the practitioner as with the future.

Much of the literature on visionary leadership suggests that a great deal of importance lies in the cognitive characteristics of the leader who selects, communicates and orchestrates action (Bennis and Nanus, 1985; Meindl, Erlich and Dukerich, 1985; Gupta, 1984) as well as the strategic contexts in which managerial visions arise.

Mintzberg and Westley outline a notion of strategic vision (vision ascertaining to the strategy of the firm) consisting of highly complex, novel images which are both articulate and *realistic* (1989). They contain standard elements of strategy, products, markets and organisational design and are embedded in a commercial context, such as the external strategic environment of market and technological issues and organisational competencies, as well as the personal experiences and expectations of the leaders themselves.

A great deal of literature focusing upon corporate vision (visions ascertaining to the development of the corporation) has tended to concentrate on lone visionaries, the development of vision, on what makes a good vision, how to implement it and on how to overcome impediments to making vision happen (Nanus 1992). These authors often emphasise the rationally controllable and operational aspect of implementing a vision with relatively little or no reference to the non-rational intuitive sources from which 'visionaries' draw (Nanus, 1992).

There is a distinction made between vision itself, its process and communication (Westley and Mintzberg, 1989), and the role that it plays in transforming or stimulating organisational change (Tichy and Devanna, 1986). Researchers have largely ignored the actual cognitive content of visions and its effect upon organisational innovation.

3.9 Differentiated Meaning of Vision

Focusing mainly upon the articulation of vision through the statements, Lipton claims a successful vision has three principal themes; mission, strategy and culture (1996).¹⁶

Certainly words such as mission, vision, strategy and culture are often used interchangeably. For example, Campbell and Yeung's research demonstrates that various organisations view 'mission' as primarily a strategic tool and an intellectual discipline which defines their commercial rationale and target market (1991;145-147). In this context, mission is perceived as the first step in strategic management or the 'cultural glue', consisting of norms and values that influence the way in which people behave. Further, where a 'mission' exists, strategy and culture are mutually supportive of one another (1991; 148).

Similar in concept to El-Namaki, Campbell and Yeung describe vision as a 'mental image' of a possible and desirable future state of the organisation, identified with a leader, which may be something as precise as a goal or a mission statement or as vague as a dream, but nevertheless, provided a driving force for organisational change, strategy and culture. A similar concept that overlaps with these notions is that of strategic intent (Prahalad and Hamel, 1990). Strategic intent is a concept that draws from both concepts of vision and mission and includes goals, defined in competitive terms, and a definition of strategy.

¹⁶ Lipton suggests that a vision statement is not a requirement, but does fulfil a useful function. Firstly, it simplifies the planning phase, giving structure to ideas and provides an organising mechanism. Secondly, it becomes like a constitution, a public document that is perceived as a commitment to act.

However, as Goold and Campbell claim, managers are often motivated by targets defined in short-term objectives or 'local' milestones (1987). Thus, strategic intent may be a less powerful concept than 'mission' or 'vision' as it fails to include a notion of organisational values and behavioural standards that, according to Campbell and Yeung, are the corner stones to long-standing and coherent employee commitment to a particular task or strategy as well as facilitating organisational and technical change (1991).

3.10 Vision as a Determinant of Organisational Culture

Studies at both the organisational level and the sub-unit level have offered empirical support for the effect of the firms type of culture upon innovative choice (Abbey and Dickson, 1983; Siegel and Kaemmerer, 1978). At the individual level of analysis, it is also augured that 'culture' is a cognitive interpretation of an organisation's commercial situation (James, James and Ashe, 1990).

The innovative climate represents 'signals' that individuals receive concerning the organisation's expectation for behaviour, values and outcomes. People may respond to these expectations for certain types of behaviour by regulating their own actions and thoughts to realise a form of 'self-satisfaction' and 'self-pride' (Bandura, 1988).

Few researchers have given attention to specific dimensions of cognitive style as antecedent of innovative behaviour (Barron and Harrington, 1981; Kirton, 1976). Kirton proposes that individuals can be located on a continuum ranging from those who have the ability to do things 'better' to those who have the ability to do things 'differently', reflecting the qualitatively different solutions they produce to seemingly different problems (Kirton, 1976). To do things differently requires that individuals are able to mentally 'operationalise' certain aspects of the firm's vision.

James *et al.*, note that individuals interpret various environmental phenomena by referencing their personal values or internal standards. These, in part, determine which aspects of the environmental phenomena individuals focus upon such that 'based upon these values, the areas of climate that are likely to be highlighted as important for their perception' (James *et al.*, 1978; 792).

Perceptions of technological change within a firm are likely to be associated with visions that are action-oriented, innovative, and responsive to competition (Daft and Weick, 1984;). One of the hallmarks of a successful vision is the ability to be shared as well as create the feeling of self-control in sub-ordinates (Daft and Weick, 1984).

Westley and Mintzberg see a visionary leader as both empowering and empowered by sub-ordinates (1989; 66). The more successful an executive is in inducing others to embrace their vision the greater the individual's tendency to want to reassert and maintain control in the rapidly changing circumstances that result, particularly if the changes are not entirely befitting the original conceptualisation (Westley and Mintzberg, 1989).

Daft and Weick (1984) offer a view of an organisation as an 'interpretative system' looking to react to an environment. An environment is either analysable or it is not, thus the organisation can either be passive or active in its reactions to it. Lawrence and Dyer (1983) extend this notion by claiming that the process of vision is that part of the strategic processes of the firm intended to cope with environmental uncertainty. Consequently, organisational vision may also be limited to actionable and likely events.

Lawrence and Dyer argue that various characteristics of the organisation influence its visionary processes and what can be envisioned (1983). Different groups, such as departments of professional organisations (such as engineering and marketing), may have different interpretative systems. To this end they suggest that there are two basic patterns that corporate visions follow; far-flung corporate entities with large,

loosely coupled structures; and smaller entrepreneurial organisations with more organic central management groups (1983).

3.11 Summary

The aim of this chapter was to provide a conceptual background from which several themes and issues shall be drawn and further developed. Various characteristics of innovation research have been outlined, in particular the importance of the perception of future possibilities and how this perception might be bounded and constrained. Several other themes have also been suggested as highly relevant to innovation, such as the importance of the history of the firm, the importance of particular empowered individuals and the processes and rules of decision-making.

There are also several identified common features within 'vision'. The process involves cognitive perceptions of individuals and organisations, of future states and of the competitive environment, within a given time horizon. They are imbued with a notion of strategy for achieving a desired state, derived from a set of values and beliefs within the organisation and the individual, transmitted through a variety of formal and informal mechanisms.

The mechanisms of transmission and justification are highly complex, forming structures within the firm that provide a guide, or driving-force, for organisational change, and empower individuals to act within a sense of a unified goal or mission.

Visions are often identified with historic events, individuals or champions, or specific competitive goals and have many other benefits (such as employee commitment) to the organisation.

Certainly innovation is a highly complex process involving many decisions. Such decisions are made often on the basis of intuition, expectations and perceptions,

concepts that are hard to understand in any logical or rational fashion. Metcalfe and de Liso go as far as to say:-

No serious student of the innovation process has ever put much faith in the extreme idea of rationality which is otherwise so prevalent in modern economic theory' (1995; 9).

Indeed, that an individual's decision-making process can be studied or modelled as a rational process has been challenged for sometime by several authors (Simon, 1955; Cyert and March 1963). Whilst not completely dismissing the idea of 'rational choice' they suggest a far less restrictive description of rationality as bounded and reasoned behaviour.

Howells suggests that such an interpretation still leaves us with the problem of how to conceive of the organisation if the individuals within it have bounded rationality, incomplete access to information and use heuristics to make decisions (1994; 7).

The tendency among many writers is still to conceive of organisational processes from the rational individualist perspective and leave much of the 'rationalist' aspects of decision making largely untouched (Pfeffer, 1992). Pettigrew observes that even today the tendency is to ignore non-rational models especially amongst economists interested in innovation (1985; 20).

An act of a given kind can signify a particular status within an organisation inasmuch as the two have the same final sense. Hence, any researcher interested in the relation between structure and event, must take into account not only the order of this relationship but also between the contingencies of an event and the recurrence of structures. For example, it is not enough to know that a different person has been brought in to take over a new account or manage a new business, rather it is necessary to understand how an event becomes such as it is, throughout its interpretation derived from other individuals. The event is a relation between a 'happening' and a 'context' and encompasses the 'phenomenon in itself' as a meaningful value from which follows its specific historical effect. Meaningful value

is an expressed realisation in the agents themselves, including their newly re-evaluated interactions.

The formal and informal decision-making rules and routines of an organisation are clearly an important category for discussion. They include the facilitating of organisational structure, as well as directly influencing the practitioners involved.

3.12 Research Questions

So far, the broad area of interest within this research can be defined as establishing the role of vision in providing an antecedent to innovation. However, following the discussion, outlined within this chapter, I can now be more specific in indicating what the research questions are to be and how they shall develop as the thesis progresses.

As I have suggested, the broad question outlined above can be usefully investigated by drawing upon work within the cognitive sciences. The epistemological position to be taken up within this thesis shall be explained in more detail in the next chapter, but suffice to say here, a basic assumption is that an individual's (and organisations) cognition limits the ways in which practitioners can 'think' and 'perceive' possible technological opportunity.

Starting from this assumption, the first question offered is; how are visions taken up within the organisation? That is, what role does vision provide in creating the cognitive frames, mechanisms, organisational structures and other heterogeneous elements, outlined in Chapter One and Two, that together shape organisational innovation?

This basic question can be further refined by considering the notions established in Chapter Two and Three, that while individuals concerned with innovation have many complex activities and influences to consider, they must interact in a coherent

manner to create innovative outcomes (products, processes, services and organisational changes). Therefore an important question to ask is; what role does vision play in the harmonising and alignment of the innovation processes of the firm?

Similarly, vision is part of the organisational and individual process of looking forward to possible commercially advantageous positions. A further question to ask is; what role does the vision process play in setting the direction, values and beliefs of the organisational culture? and what is the nature of information and knowledge that goes into formulating the vision (i.e. folk belief, evidential or historical) and how does this changes over time?

The next chapter outlines the epistemological position of this thesis. This forms the theoretical background from which the discussion and analysis in later chapters will draw.

4

Cognitive Science as an Explanatory Force: The Epistemological Position

4.1 Introduction

This chapter outlines the epistemological position of this thesis. It also describes an approach to cognition from which an exploratory account can be drawn, and investigates several of the important cognitive issues that are to be further developed.

Since the early Seventies, sociologists of scientific knowledge have staked a major claim to what has traditionally been the territory of philosophers, in attempting to explain the growth in scientific and technological knowledge (Barnes, 1985; Bloor, 1976, 1991; Pinch and Bijker, 1984). Naturally, there has been a great deal of intellectual conflict between the two proponents.

There can be little doubt that cognitive explanations, that have seemingly emerged largely unnoticed by the other two explanatory schemes, have developed a 'pool of explanatory resource' that is often far richer than that offered by other traditions (Thagard, 1996). Yet the relationship between the social and cognitive explanatory regimes is a notion that has either been rarely visited or poorly defined.

There have been several notable attempts to describe the process of cognitive change in science, that invariably describe scientific development as the 'product' of the problem-solving activities of the members of a scientific community (Giere, 1988). Yet these attempts have often suffered from a seemingly inherent antagonism by many sociologists towards cognitive explanations. Similarly, many sociologists attack *all* cognitive explanations as being 'individualistic', suggesting that they ignore any notion that knowledge has a social content (Downes, 1993). I suggest that

this is a misunderstanding of much that cognitive perspectives have to offer socially-based explanations.

The position within this thesis starts from the perspective that concepts such as organisational routines, knowledge-bases and rules are a product of individual minds *and* complex social interactions. However, as I shall demonstrate in drawing on established literature, there are two problems that become immediately apparent. Firstly, there are many important differences between the development of knowledge and theories in science and developments in technology. The problem of transferring models from one sphere to another, stems mainly from the fact that cognitive models, governing the 'internal' or mental development of scientific knowledge, are re-focused on issues concerning technological progress that they were never designed, and consequently are ill-suited, to tackle. In essence, as Skolimowski states, 'science largely concerns itself with what is now, technology with what is to be' (1996; 76).

Secondly, to say that what is needed is a synthesis between social and cognitive explanations is one thing; how one goes about this task is a problem of an entirely different magnitude. As I have suggested in Chapter One, an aim of this thesis is to draw upon the vast richness of the cognitive tradition to help develop an understanding of the innovation process. In so doing, this work resonates with many researchers who focus on innovation. For example, Rosenberg and Vinceni suggest:-

'The essential nature of technological change has been obscured by an excessive tendency to treat it as vague, general, or purely abstract terms.... Our assumption is that technological change can more fruitfully be examined as a problem-solving activity' (1978; 19).

Chapter Outline

Initially, this chapter considers a common sociological misconception that when one attacks cognitive explanations, one is attacking a unified field (section 3.2.). This is not the case. Indeed, the problem of accounting for the 'social' within cognitive perspectives is one that has provided an enormous challenge for decades.

Section 3.3 argues that although cognitive science is actually a group of often conflicting traditions there are many unified assumptions that a general cognitive account can draw upon. Section 3.4 argues that whilst many may consider such a stance to equate with an individualistic and 'anti-social' notions, this is not necessarily the case for all.

The chapter continues in section 3.5, with a discussion of the differences (and similarities) of several cognitive models focused on science and technology. Although there are important divisions, much can be learnt from such models. Section 3.6 continues this theme by considering how cognitive explanations may deal with 'social' issues, suggesting that this is both crucial to sociological and cognitive explanation. To understand how cognitive approaches can best include the 'social turn', one must first understand how such a view attempts to represent social meaning and the social reality of practitioners. To this end, section 3.7 outlines how cognitive theories traditionally have gone about the task of representing the cognitive world of individuals and argues that one can view technological development as a form of problem-solving, with special emphasis on reasoning and hypothesis-testing. I suggest in section 3.8, that a cognitive theory of innovation must account for how practitioners apportion meaning and value to their interaction with other statements, beliefs, individuals and artefacts. In section 3.9, I summarise the chapter, concluding with several basic tenets that a cognitive programme of innovation must satisfy to be considered part of a cognitive tradition. In section 3.10 I briefly begin to outline an approach to cognition, that of *situated cognition*, that satisfies many of these tenets and provides a theoretically rich background from which to draw and one that will be developed and adapted throughout this thesis.

4.2 Cognitive Science: A Dis-unified Field

Since Descartes' analysis of epistemology, which separated body and mind, the source of intelligent action has been attributed solely to the brain. Despite several periods where there has been a lack of focus in the role of 'mind' in human

behaviour (e.g. behaviourism), the rise of the computer age has also seen a blossoming of the 'mind-as-computer' metaphor. Here, intelligence is modelled within systems of discrete physical fact or symbols (declarative knowledge) that are processed according to fixed production rules (procedural knowledge).

The resulting cognitive analysis has exhibited some success in modelling certain limited aspects of intelligent behaviour (Larkin *et. al.*, 1980). However, these models are often found lacking when it comes to more 'noisy' or 'socially real' domains, in particular, the modelling of everyday events and phenomena (Dreyfus, 1992).

This lack of progress in moving the focus of investigation away from the laboratory and artificial puzzles to the 'socially real' world has led some to suggest that Cognitive Science is in crisis, and even perhaps that the entire project of Cognitive Science is itself fundamentally misguided (Searle, 1992). No one acquainted with the field doubts that many current approaches in Cognitive Science are less than fully adequate, nor that many over-ambitious claims have been made as to what has (and can) been accomplished (Chalmers *et. al.*, 1992).

Nevertheless, the idea that explanations within Cognitive Science have reached their limitations because they have encountered difficulties with respect to such issues as 'consciousness', 'social aspects of cognition', 'intersubjectively' 'negotiated meaning', 'symbol grounding', argues against the very idea of an *evolving* enquiry.

The major goal of Cognitive Science is to contribute to the evolution of understanding cognition itself. If some of the methods or presumptions about the nature of cognition have been 'strong headed' then a way forward may be to modify certain approaches rather than abandon them.

There is no need to blindly accept *en masse* certain sociologists' claims to be uniquely able to describe various phenomena (Latour and Woolgar, 1987; Brannigan, 1982). Similarly, there is no *priori* reason to accept suggestions that cognitive

science should only develop theories of discourse processes through the adoption of sociological constructivist epistemology (Gilbert and Mulkay, 1984). Or even for that matter, develop theories based primarily upon the logical stance of philosophers of science (Kuhn, 1962; Laudan, 1977).

The field owes its existence to the fact that people from a wide variety of disciplines can often understand and make better local progress on specific problems in which they are interested, if they take into account the perspectives and findings of people with different intellectual roots working on apparently very similar problems. To assume a cognitivist position is, by its very nature, to have a broad lexicon of intellectual enquiry and multi-disciplinary ease in negotiating substantial parts of it.

Within this thesis a major the focus is how locally and culturally situated 'minds' work, or even perhaps and how a 'collective' of interacting minds work, themselves situated and embodied within an organisation. It is now becoming more commonly agreed that no perspective can succeed just by traditional psychological and sociological enquiry (Thagard, 1996, De Mey, 1982). Psychological enquiry, for example, has typically in the past, been largely unsuccessful in developing detailed accounts of dynamic social phenomena. Integrated process models are not just a metaphor for change within complex interactions but a concrete and practical means of expressing and exploring the implications of evolving theoretical ideas.

To claim, or indeed describe, a unified theory of cognition that cuts across all human phenomena is beyond the task of this research. Yet it is suggested that most general cognitive approaches posit certain similar methodological and structural assumptions that must be made explicit.

4.3 Cognitive Assumptions

It is a basic assumption that all cognitive phenomena can be approached in an empirical fashion (Thagard, 1996). Instead of leaving important areas of cognition

outside the scope of methodology, one can liberate cognitive science from what Chomsky has called 'arbitrary methodological restrictions' (1972; 9).

In addition one must also consider where one stands in relation to the subject matter of cognition itself (as compared to that of other sciences) and what this implies for cognitive methods of research. As Kohler (1929) argued, psychologists do not open up 'entirely new territories', in the manner of the natural sciences:-

'...simply because man was acquainted with practically all territories of mental life in the long time before the founding of scientific psychology. In other words, psychologist could not make such startling discoveries as constitute the pride of physics, because at the very beginning of their work there were no entirely unknown mental facts left which they could have discovered' (Kohler, 1929; 3).

One cannot deny that we possess certain 'prescientific' or 'folk' knowledge of our own cognitive phenomena. That is to say, our everyday life involves making assumptions, considerations and forecasts, concerning our own and other peoples mental states, as well as our effects upon them. However, we also possess (to varying degrees) a prescientific knowledge of physical and biological phenomena. Indeed, without *some* conceptual understanding of broad theoretical problems, many questions could not even begin to be formulated. However, in this regard, is there any radical difference between the study of cognition and the natural sciences? Is it true to say, as Kohler suggests, that we are pre-scientifically acquainted with all the possible arenas of mental life and that there are no entirely new cognitive territories to open up?

Certainly, we have our own personal experience on which to base our prescientific conceptions. Consequently, it is an empirical matter whether there are new territories and this is something that should not discourage research. It is this fact that makes philosophical consideration of cognition possible and should be reflected in the theoretical and methodological considerations. For data and predictions we have to rely on theoretical models and the kind of continuous access that we have to our mental functioning. This form of cognitive investigation takes account of all kinds of experimental and non-phenomenological evidence and also draws on several main theoretical assumptions.

Firstly, cognitive science presupposes the existence of mechanisms which function in the same representational fashion as a thinking person. That is to say, a system which analyses, categorises, tests hypothesis, makes inferences and decides.

Secondly, to consider an individual's cognitive 'world' is not only to consider their sense of a cognitive 'reality', in the manner of Krech, Crutchfield and Ballachey (1962; 17). According to these writers:-

'...the response of the individual to persons and things are shaped by the way they look to him - his cognitive world... no two persons live in the same cognitive world' (1962; 17).

A persons 'cognitive world' includes their knowledge and beliefs but also their motivational dispositions and other social influences. Lewin's (1951) concepts of a person's 'life space' refers to what people believe about the world, as well as the positive and negative valences that various regions of the 'life space' means to that person. Amongst cognitivist, such as Fodor (1975), there is a tendency to equate 'cognitive reality' with 'rational'. Indeed, Fodor wants to exclude everything non-rational, not only from cognitive psychology but from all analytical investigation.

Fodor admits that there are such things as emotional influences which cannot be explained as a result of rational computations. However, his conclusion is not so much that computational explanations are sufficient but rather that such phenomena cannot be explained at a psychological level at all; 'explaining them is left to low-level (probably biological) investigations'. For Fodor (1975; 203), cognitive explanations are only to be understood in terms of 'computational value'.

Thirdly, as I have suggested in Chapter two, cognitive explanations are not necessarily antagonistic towards social ones. In certain cases they may offer alternatives (e.g. Giere, 1988). However, in most cases they can be considered complementary and offer analyses that may supplement social ones by describing processes of the thinker who make a transition to new ideas (Thagard 1989, 1996). In one respect, I suggest certain sociologists have correctly identified a source of

limitation in many cognitive approaches. The next section explores in more detail this limitation and the 'cognitive versus social construction' argument.

4.4 Cognitive Individualism and Social Constructivism

There is a tradition in the study of knowledge represented by, for example, Durkheim and Vygotsky (1962), which suggests that sociology studies the universal, and cognition the particular, in pedagogy. The notion is that only through social integration are the most fundamental cognitive processes and concepts understood, with aspects of pedagogy capturing the ways in which members of particular societies are trained to articulate those processes and concepts. Both Durkheim and Vygotsky believe that even the most basic cognitive operations presuppose 'other people' in terms of the way actions are co-ordinated. Whilst this view may be disputed by some, it is not by all.

One can distinguish between two types of cognitive accounts; a strong and a weak version. Strong cognitivism suggests that theory development and change can be completely explained solely in reference to cognitive factors. This is mainly championed by computer scientists such as Sleazak (1989).¹⁷ Weak cognitivists believe that cognitive factors play an 'important' role in explanations (Thagard, 1996; Boden, 1987; Dennett, 1980.). However this distinction is often missed by people that are not acquainted with the field.

Downes, along with many other sociologists, (Brannigan 1982;34; Collins, 1990; 6) accuse cognitive scientists of *cognitive individualism*, claiming that:-

'They [cognitive scientists] suggest the thesis that a sufficient explanation for all cognitive activity will be provided by an account of autonomous individual cognitive agents' (1993; 452).

I suggest that this is a misreading of much of the research within cognitive science. Indeed, many cognitive scientists themselves have argued why any form of cognitive

¹⁷ Slezak's claim was essentially against Bloor's Strong Programme (1976) but also stood against SSK in general (See Lancaster, 1995 for a review of the argument between them)

reductionism within science and technology studies is bound to fail (De Mey, 1982, Thagard, 1993).

Similarly, many within cognitive science (and sociology) have suggested that the anti-cognitive view that Downes seeks to advance, in accordance with sociologists such as Latour, Woolgar and Collins, is also bound to fail (Thagard, 1996; Giere 1988; Bloor, 1991).¹⁸ Indeed, if one considers Downes's description of the social aspects of science, one can see how to deny any form of cognition within social explanations becomes meaningless (Thagard, 1996). Downes identifies three levels of the social aspects of science, each of which can be shown to have an essential and irreducible cognitive component, each also applying to the study of technology.

The first level is the *public embodiment* of ideas and theories. This includes textbooks, research papers, instruments and other shared property of the community and exists outside the mental representations of individual scientists.

However, part of the significance that artefacts have to individuals is also cognitive. The *use* of textbooks, papers, instruments and so on, supposes a mental capacity to read and write, design, problem solve, interpret and plan. The 'public embodiment' of scientific and technological knowledge is meaningless if individuals do not have internal cognitive mechanisms to 'meaningfully' understand objects.

Downes' second level is that of *social interaction*. This interaction is found where no one individual is entirely responsible for the ultimate result. This level is indeed of great importance to sociological approaches as most research and development is clearly collaborative. Yet it is argued that the importance or acceptance of 'social interaction' goes against only the most extreme forms of cognitive reductionism and does not provide any support for 'purely' social accounts.

¹⁸ Two of the main proponents of the Sociology of Scientific Knowledge accepts quite clearly that: 'psychological mechanisms co-operate with social factors' (Bloor, 1982; 277).

Investigating how individuals work with one another requires, in part, understanding how they communicate, which in turn requires cognitive theories of how they represent information, how they use language and how they utilise the myriad of other ways in which we convey information to one another.

The third 'social' level suggests that the activities of technologists and scientists only make sense when placed in the *context* of a broader community. Downes suggests:-

'The difference between someone performing an experiment [or conducting R&D] and someone else doing the same physical motions in a play, or simple rote repetition depends on the fact that the former is part of a community of experimenters' (Downes 1993; 455)

Such a claim may not make distinction between the 'social' and the 'cognitive', yet there are nevertheless some cognitive distinctions that exist. The cognitive representations of a researcher, for example, are obviously different from an actor *per se*, since the researcher has absorbed an enormous amount of both declarative and procedural knowledge in the course of training and experience. The ability of the practitioner to plan, interpret, problem-solve, make analogies with other research and so on, cannot be explained purely in terms of social context, but must also make reference to the mental structures and procedures by which they gain significance.

That Downes' argument can be shown to have crucial cognitive aspects are in no way an attempt to explain them purely cognitively. However, the question remains, *how* the internal and the external are to be reconciled and on what methodological and epistemological assumptions a reconciliation will sit.

Models that have attempted to place cognitive mechanisms within a social framework have been largely unsuccessful as they have used theoretical and methodological frameworks for which cognitive models were not intended (Giere, 1988) The next section outlines several of these 'cognitive' attempts to explain scientific development.

4.5 Cognitive Models of Science

One important attempt to construct a 'cognitive history' of science, is provided by Ronald Giere's 'Explaining Science' (1988). He suggests that most cognitivists focus their 'cognitive turn' towards findings and interpretations that support the image of a scientist as a competent, largely self-sufficient human agent. Consequently, they downplay research pertaining to the cognitive limitations of individuals, especially the failure of individuals to appreciate the context dependence, and hence global inconsistency, of their thought and action. Moreover, they underestimate the cognitive power that is gained via group communication and justification processes.

Giere suggests that similarity of theories does not depend on prior (tacit) social conventions but is often explicitly formulated in the presentation of the theory:-

'The argument [against Cognitivism] assumes that specification of the relevant respects and degrees of similarity remains in the background and is not part of the hypothesis itself (...) but these specifications need not be tacit, and in science they often are not' (1988; 108).

Thus, it is the discourse between scientists that counts, not the social convention or any 'value' of scientific truth. Similarly, he emphasises the biological and psychological explanations of science:-

'The effect of evolution on our sensory apparatus is known to have been particularly strong (...) for at least some perceptual judgements. Therefore, the fact of widespread agreement, does not require a social explanation. The explanations of evolutionary biology and psychology are sufficient' (1988; 109).

Here, Giere appeals to Darwinian natural selection to avoid social constructivism (or at least a strong social constructivism). In his argument, perceptual apparatus have been 'selected' to reliably indicate certain states of the environment. Since our perception of the physical world and our perception of our own mental reality yields empirical evidence, and since evidence plays an important role in the explanation of theory change, it follows that social factors cannot explain *all* aspects of theory.

However, this argument does not distinguish Giere sufficiently from a mainly social constructivist research focus. Observation is theory-laden. What we consider depends, in large part, on what one believes. This being so, it follows that the 'raw data' that Giere suggests constitutes our perceptions of experience may play only a minimal role in the explanation of scientific change. As a result, while the 'cognitive turn' tends to give us a sense of what theorising maybe (e.g. a pattern of neural activation), we are still left with a rather pale and abstract sense of what theoretical output is like. The model does give us a good insight into several problems of attempting to site a cognition explanation within a social constructivist epistemology. Here, such cognitive models seem to often mistake three things.

Firstly, a rational reconstruction is assumed to be the actual history of an event. An ambitious attempt at a cognitive historiography of science is to be found in *Patterns, Thinking and Cognition* by Margolis (1987). In it, Margolis accounts for Kuhnian-style paradigm shifts as the overcoming of cognitive barriers.

Margolis aim was to get students to see beyond the mental boundaries of current frameworks and move to more comprehensive notions. However, this is only possible once that next stage had already been achieved by the scientific community. Thus, his is essentially a method for *meeting* the established standards of a community rather than *making* them. Kuhn himself, said little about how such revolutions occur, lacking an account of the variety of individuals that had interests distinct from those of the original revolutionary, but nevertheless found that person's work of use for their own.

Secondly, cognitive accounts often confuse properties of groups with those of individuals. Kuhn had a tendency to characterise scientists as having a common 'mindset' or 'worldview'. Sociologists regard this typification of the 'group in the individual' as a methodological fallacy or the 'over-socialised conception of man' (Wrong, 1961). Indeed, the main representation of cognition (theories, rationality, concepts) are often considered social in that they exist only in the whole, and not in

'parts' at all. For example, it is common for cognitive scientists to treat conceptual 'prototypes' as templates stored in the heads of all the members of a culture (Lakoff, 1987), when in fact they may be better seen as concrete objects that function as public standards in terms of which the identities of particular items are negotiated.

Thirdly, perhaps the biggest cognitive simplification is its 'visually biased' social ontology. That is to say, social factors operate only when other people are in communication with the individual. If no-one is in the vicinity, then the individual is confronting the problem with only their own individual conceptual mechanisms.

There is typically a failure to see that cognitive patterns are 'socially framed' experiences which may be replaceable only in socially permissible ways. Adopting a new theory may involve the simultaneous evaluation of what philosophers have traditionally called 'pragmatic' and 'epistemic' factors. This serves to bind 'the social' and 'the natural' in one cognitive package that cannot be neatly unravelled into impeded and unimpeded thought processes.

When Latour and Woolgar (1986) declared a ten year moratorium on appeals to cognitive explanations, they at least shifted the status of the 'cognitive' from the *explains* to the *explanandum*. That is to say, from something that can be used to explain human action to something that is itself in need of explanation. One can, of course, rightly argue that such a call amounts to little more than 'rhetoric'. There have, in fact, been several in-depth attempts to integrate a more cognitive account into 'social' explanations (Barnes, 1982; De Mey, 1982; Mackenzie, 1992).

In De Mey's account, for example, he explicitly argues for a synthesis of philosophical, cognitive and sociology of science accounts, by suggesting a form of 'genetic epistemology', in a similar way to that derived within the field of artificial intelligence, which has, in essence, recapitulated the history of science studies.

De Mey suggests several stages within the development of the history of artificial intelligence as 'superimposed segmentation' of a theoretical sequence of explanation. His account differs from purely social accounts in that he suggests the empirical study of knowledge should consist of the study of 'knowing subjects', whether it be the study of computer simulations of an individual or a historical study of a world-view, shared by a scientific community.

Certainly, social studies of science have illustrated how what might appear as a purely inner logic-driven development is in fact a subtle process of practitioner's interacting within larger communities (and with each other). Indeed, is the issue of the locus of 'cognitive structure' as important as some cognitivists claim?

I suggest that the researcher still has to account for an individual's capacity to produce meaning and action within these interactions. Cognitive structures are not simply social artefacts because the community ascribes them as an object of special cultivation to one of its sub-groups. Even if discoveries, innovations, theories and so on, are sole properties of social construction, they require participating individuals with certain cognitive capacities. Thus, the main issue still remains the relationship between social control and cognitive structure.

The work of Latour is a case in point for dealing with this relationship. In his research on Pasteur, he outlines a 'social control' reconstruction of Pasteur's discoveries and innovation in bacteriology. Attention is not placed upon the 'cognitive structure' of the new ideas but upon the exploitation of the social forces Pasteur uses to amplify ideas into discoveries. What is relevant here is the usage of cognitive factors and the fact that Latour suggests them with the same degree of importance as social factors. However, this is not to suggest that by 'putting them on the same line' means that they are reduced to one and the same kind.

Latour suggests that the mental shaping activity of the knower is as important as much as the qualities of the known (1987). Neisser suggests a similar proposition

when he claims that 'perception is where knowledge and reality meet' (Neisser, 1976). Hence, knowledge derived *expectations* about global realities and details are combined with genuine segments of data.

The 'social' is explicitly included in a growing number of cognitive approaches (as opposed to cognitive scientists within a sociological approach, such as Giere and Margolis). Indeed, a major tenet of cognitive science is the importance given to knowledge provided in a social context by the knower, in contrast to the information directly registered purely from empirical data. The next section expands upon this treatment of the 'cognitive' in the social environment.

4.6 The Social Environment of Cognition

Within psychology, an 'ecological' movement has grown since the end of the Second World War, starting with Brunswick and Gibson and now including phenomenologists such as Heelan, which attempts to understand cognitive change in terms of the knower's orientation to their social environment.

Heelan proposes that the geometry of Western civilisation's perception of the universe, changed from 'hyperbolic' to 'Euclidean' during the Renaissance period. This followed the introduction of new perspectives in art and architecture and especially the 'regularity design' of streets, which functioned as environmental cues that space should be 'read' in a Euclidean manner (Heelan, 1983).

Work in this vein claims that our understanding of an individual's cognitive dynamics can be better enhanced by studying real situations, such as the introduction of new technologies into a social arena than by examining the results of either computer simulations or traditional laboratory experiments.

For example, within her study of technological innovation, Elisabeth Eisenstein illustrates how the printing press was both a cognitive and a sociological revolution

(Eisenstein 1979). She also adds that the 'cognition' and 'sociology' of an event must work together in a synergistic fashion so as to constitute a technological 'revolution'.

What is and what is not a technological revolution is described by comparing the 'scribal culture' of books with its 'print culture'. The printed book is not simply a mass-produced artefact that historically was hand-made in previous stages of its evolution. Hand-written works are *qualitatively* different from machine-printed ones. It is this qualitative aspect that the social and cognitive schemata seeks to explain.

That social factors and economic constraints influence the direction of scientific and technological research is fully compatible with the cognitive models of scientific progress developed by philosophers such as Popper, Kuhn, Lakatos, and Laudan. These accounts of science, deal with cognitive standards of appraisal and progress that are supposed to govern 'rational' scientific inquiry. Thus, these provide an external rather than an internal treatment of the subject.

Different sets of principles may be involved depending on the different types of knowledge that arise in science and technology. However, Skolimowski (1996) attempts to locate a common thread that unifies different kinds of technological and scientific innovation, suggesting efficiency or effectiveness (in terms of reliability) as one such case.

In a similar vein, Rachel Laudan (1984) argues that the cognitive dimension of technological progress can be modelled by the same index of problem-solving accounts of scientific progress developed by Larry Laudan (1977). Consequently, Laudan questions the value of 'rational' economic analysis which she claims, 'typically fail to shed light on *internal* dynamics of technological change' (1984; 3).

In short, the industrial, institutional and economic environment is as much 'internal' to the development of technology as it is 'external' since there is no cognitive-noncognitive distinction that can be drawn; that is to say, cognitive processes work

on social factors and vice-versa. The next section considers how these cognitive considerations may be represented in an individual and some of the important meta-schemes that dominate our technological thinking.

4.7 The Development of Cognitive Representations

Most cognitive accounts differ from sociological accounts in that they view knowledge as the properties of the individual rather than of a social group or institution. Cognitive representations provide a symbolic expression of the contents of the individual internal reality. Similarly, they provide a partial mapping of conceptual relationships manifest in that world (Holland, *et. al.*, 1986; Palmer, 1978).

Besides technological concepts, practitioners have beliefs concerning instruments, such as computers and their methodologies, such as experimental or correctional designs, the history of the firm, business recipes, personal credibility and other individuals.

Cognitive scientists have developed a number of representational systems including schemata (Rumelhart, 1977), scripts (Schank and Abelson, 1977), frames (Minsky, 1975), neural networks (Churchland, 1989), and mental models (Gentner and Stevens, 1983).

In all of these notions, 'theories' are used to generate models of an individual's sense of reality. For example, mental models are a representation of a particular situation, sequence of events or explanatory facts (Gentner and Stevens, 1983; Holland *et al.*, 1986; Johnson-Laird, 1983). However, unlike Holland *et al.*, theories can not be simply equated with a particular set of models as they aim to provide abstract generalisations which are not tied to particular situations.

The notion of a cognitive representation also goes some way to explain the nature of an 'idea'. Here, theories are generated from an individual's representations of their

domain (Churchland, 1989; Giere, 1988). However, it is not possible that all of a practitioner's representation can be expressed in their mental theories. Rather, some notion of a theory must be embedded in their cognitive representations.

The study of models of concept generation as a primary means of theory change may prove to be a most powerful source of enquiry for the cognitivist, as empirical evidence is interpreted and tested against notions of mental representation. Indeed, the use of models provides one answer to the criticism of Potter and Wetherall (1987) that cognitive psychologists notions of concepts and thematic categories are too inflexible to handle the variability with which every day notions are utilised.

A practitioner's representation of reality is modified over time as concepts are added and removed. Individuals use a variety of reasoning strategies to mediate the construction, addition and augmentation of their cognitive representations. This reasoning process is 'context-dependent' as it depends on the particular prior knowledge to select an appropriate reasoning strategy. There are several general reasoning strategies that a cognitive theory must explain.

Reasoning and Hypothesis Testing

The flexibility of reasoning processes can be inferred by the fact that practitioners have a multitude of strategies to draw upon, that are applicable in a variety of contexts (Gentner, 1983). But how do people test and judge the applicability of a particular strategy? In science a 'crucial' experiment is an obvious method, but as we have seen, technology is different. Several methods have been suggested. For example, conformity and dis-conformity are often put forward as reasoning strategies used by practitioners during hypothesis testing (Thagard, 1996). Analogical reasoning may also have a crucial role in the development of mental representations in new domains by mapping representations from a known domain to a new domain (Gentner, 1982, 1983).

Because analogy introduces new representations, practitioners can generate new predictions (or visions). This 'analogical vision' is also a prediction of how the world *might* be and not just *will* be or how it is *now*. As Gentner (1982) argues, analogical reasoning is particularly relevant to technological discourse because it uses language to express the causal structure of the world. This is not only relevant to the natural language practitioners utilise, but also to the many ways that a sense of a particular commercial reality can be expressed, such as advertising, documents and memos.

Analogous differences between science and technological change arise if one treats 'theories' not as sets of true-or-false propositions, but say, as structures purporting to model phenomena. Similarly, this is also the case if one regards the cognitive aim of science to be not 'truth' but, say, empirical adequacy or efficiency in solving problems.

An important consequence of this difference is apparent in the dynamics of scientific and technology progress. In science, theories are revised, rejected and overthrown in favour of rivals (Bloor, 1976). The process is not necessarily cumulative, since former beliefs may be readily abandoned with new evidence or better theories. By contrast, technological knowledge is cumulative, in the sense that successful technologies are often not subsequently open to 'refutation' as being 'mistaken', (although obviously they can fail) though they may well become superseded through innovative change.

The Selection of Technological Problems

An important part of any cognitive theory of technological change is that it should seek to investigate how individuals select and solve problems and how they perceive which problems need solving? After all, it may take important resources to solve a problem and the commitment of resources is one of the biggest risks that any firm can take. As suggested in Chapter Three, the perceptive ability of an innovator may be dependent on an organisation's rules and routines. In the light of the research on

problem-solving strategies, one important criteria of selection and solving problems is past experience (Thagard, 1996). The philosophy of science has sought to show that the practitioner does not normally approach the natural world directly, but brings to their investigation an individual familiarity with the scientific trends and institutions of the day (Bloor, 1982).

Similarly, innovation takes place within a context of current technology. They exist within the organisation in a structured background of technological knowledge in which practitioners select problems that they believe to be solvable, a concept similar to notions of bounded rationality, (Simon, 1958), absorptive capacity (Cohen and Leviathan, 1990; Kinder and Lancaster, 2001) and productive opportunity (Penrose, 1959).

The practitioners will have a degree of conscious awareness of the main historical traditions, at least in the immediate past, in their area of technology which is generated by working within a particular organisation or from society at large. They may also be aware that a specific technology is more than a collection of isolated inventions and processes, rather it is arranged in systematic structures. The practitioner therefore has to operate with an understanding, albeit incomplete, of the technological traditions leading up to the present situation and the technological systems currently dominant in their era and area. Indeed, a practitioner may place different values to others upon their specific 'theories' involved in problem-solving. The next section considers several ways in which one can develop further the idea of technological development as a solution to a perceived problem.

4.7.1 Technology as Problem Solving

I have found it useful in understanding technological change to consider a taxonomy of different kinds of problems that technologists may face. The first type of problem, and one that occurs very rarely, is one given directly by the environment and not yet solved by any technology (Laudan, 1983). These innovations are often best at capturing public imagination. However, Laudan suggests:-

'Such immediate perception of difficulties rarely provoke a technological response, unless there is already an existing technology that is directly applicable to the situation, or that can be suitably modified' (1983; 13).

That is to say, perceived opportunity rarely come from a perception of problems in the world unmediated by technology. A second source of technological opportunity is a perceived failure of current technologies (Constant, 1980; cited in Laudan, 1983). Such failure often occurs when a technology is applied in new situations. An engineering failure, such as a collapsing bridge, is an obvious example, but this may also apply to a commercial failure. Indeed, the perceived 'need' for a technology is distinct from its commercial and technological feasibility.

Need and feasibility are not necessarily dependent on each other. Many technologies are adopted because there is an immediate need for them, and not because they work. Certain medical technologies, at least until the twentieth century, fall almost entirely within this class (Laudan, 1983).

A third way in which the perception of technological problems may be generated is by extrapolation from past technological successes. The internal dynamic of technology itself, isolated from more widespread economic considerations, is a potent source of technological problems.

A fourth, category stems from the fact that various imbalances between related technologies are often perceived as technological problems. The practitioner surveying the state of current technology may notice that the effective operation of a particular technology is being impeded by the lack of an adequate complementary technology. Particular variants of these situations have been variously called, 'reverse salient' (Hughes, 1983) and technological co-evolution (Constant, 1980).

A fifth category is related to Simon's notion of 'shock' (1960). Here, the practitioner feels 'threatened' in such a way that the firm's performance is perceived to be at risk from the commercial successes of other firms and are thus, 'shocked' into action.

If these then, are some ways in which the perceptions of 'real' and contemporary problems may arise, how do they relate to the cognitive processes of practitioners and how do these perceptions obtain a sense of meaning to the individual?

4.8 The Generation of Meaning

As Simon first proposed with regard to the firm, what appears at a distance to be consistent decision-making strategy may, on closer inspection, be seen as a series of ad-hoc adaptations to particular practitioners' cognitive perception of environmental change (1960). Clearly, the same situations and events have different meanings for different people. As Gibson suggests:-

Men of different training, interests and convictions' do not, as we say, see the same world. A nickel is not the same thing to an adult as it is to a child. An industrial machine is not the same thing to its operator as it is to the plant owner. The specialised perceptions of the connoisseur, the photographer, the doctor, the woodsman, and the engineer are all different' (1950; 205).

Indeed, investigating a person's many different ways of perceiving the world is an important way of characterising a cognitive approach. To say that each person sees the world in terms of their 'special' or 'specific' meaning structures is not a way of investigating whether meaning structures exist but 'how they are organised', 'where they have their origin' and 'how they develop and change?'

4.8.1 Cognitive Approaches to Constructing Meaning

Most theories of meaning can be ordered along an explanatory spectrum from Behaviourism to Cognitivism. One extreme is represented by Skinner's radical behaviourism (1953, 1974), and the opposite extreme by the cognitivist theories of the kind advocated by Bruner (1957) and Fodor (1975).

According to Skinner (1953; 140), our perception of the world is akin to our behaviour. Perception, he says, is not a camera-like registering of stimuli, but consists of responses to stimuli which have their origin in our genetic factors and learning ability. To investigate the meaning a certain situation has for a person, one

must use both observations of overt behaviour and verbal comments. Of criticism concerning how Behaviourism dealt with the construction of meaning, he suggests:-

'Behaviourism is said to be at fault in failing to recognise that what is important is 'how the situation looks to the person' or 'how a person interprets a situation' or 'what meaning a situation has for a person'. But to investigate how a situation looks to a person, or how he interprets, or what meaning it has for him, we must examine his behaviour with respect to it, including his descriptions of it, and we can do this only in terms of his genetic and environmental histories' (1974; 85-86).

Skinner's concept of 'contingencies of reinforcement' plays an important role:-

'People see different things when they have been exposed to different contingencies of reinforcement' (1974; 88).

Next along the explanatory scale, one can find various forms of 'cognitive behaviourism' and scheme-theories (Piaget, 1967; Neisser, 1976). According to Piaget, an object or situation acquires meaning for the person by being 'assimilated to a scheme', or a system of schemes. Schemes are innate cognitive structures but although Piaget talks about the process as 'cognitive assimilation', the assimilative process is not assumed to involve hypothesis-testing analysis, inference, or any of the cognitive operations, outlined in the previous section.

Other forms of explanation include Kelly's (1955) theory of 'personal constructs', and other moderate forms of cognitivism (Mandler, 1975). Similar to Piaget, Neisser's (1976) and Kelly's (1995) notions suggest we experience the world in terms of innate 'personal constructs'. Mandler talks about 'the cognitive interpretative system' as being an organised system of structures that operates on the input from the external world and interpreting it accordingly (Mandler, 1975; 20).

The difference between these theories is not primarily to be found in their empirical content but in the concepts and models they use. Behaviourism, in particular Skinner's radical Behaviourism, considers mental functioning in terms of the behaviour of individuals. That is to say, thinking, mental images, decision-making and even daydreaming, are described as non-observable 'covert' behaviour. Most cognitivistic theories however, consider *all* mental functioning in terms of the

processes of 'thinking'. Therefore, even the most specific perception of the commercial environment for the practitioner, is the result of decision-making, hypothesis testing and inference.

The same is also true of the theories developed by Bruner (1957) and Fodor (1975). According to Bruner, what we perceive gets its meaning by being placed into a 'system of categories'; a process which involves inferences in accordance with certain rules that specify 'the critical attribute values required of an instance to be coded in a given class' (Bruner, 1967; 698). It is not, however, the person who makes these inferences:-

'When we speak of rules, again it should be made clear that 'conscious rules' are not intended. These are the rules that govern the operation of a categorising mechanism' (1967; 699).

Similarly, Fodor (1975) assumes that perception involves hypothesis-testing and mental computation, but also that this does not mean *conscious* thinking is involved:-

'Thinking is something that organisms do. But the sorts of data processes I have been discussing, though they may well go on in the nervous systems of organisms, are presumably not, in the most direct sense, attributable to the organisms themselves' (1975; 52).

Hence for the true 'individualist', there is no conscious cognitive action *per se*, as we are considered simple rule followers.

The chapter, so far, has sought to outline some of the key areas and problems of cognitive explanations as well as suggesting that various cognitive enquires can propose substantially different descriptions of similar mental phenomena and individual's construction of meaning. Based on these discussions, the next section provides a description of the main conceptual requirements for a cognitive theory of technological development. The last section outlines a view of cognition in which these requirements may be suitably satisfied and is one that seeks to challenge an orthodox view represented by the Symbol-Processing Approach.

4.9 Towards a Cognitive Approach of Technological Change

If a cognitive approach is to be applied to technological change then from the current discussion, one can make several assumptions about what form it may take. First, a cognitive study focuses on the description of the individual's actual practice rather than suggesting norms for an 'appropriate' practice. This recommendation assumes that any prescriptions for a developmental process rests on an *adequate or actual*, rather than a *ideal* description.

Second, a cognitive approach should account for both the positive and negative aspects of reasoning. Previously, certain authors have focused on the bias and errors in scientific reasoning. This research is important in demonstrating that the actual practice of reasoning differs from the ideal norms established by philosophers of science (Kuhn, 1962; Laudan, 1977; Popper, 1962, 1972). However, the process of reasoning is able to draw correct conclusions and inferences.

Indeed, one may suggest that one of the failures of a sociology of science perspective is that it does not seek to explain the apparent success of science (Giere, 1988). Thus, cognitive models of technological change should account for these aspects of reasoning within the same framework.

Third, a truly comprehensive cognitive model must explain the various cognitive activities in which individuals engage and have influence over others. Researchers have typically been interested in isolated areas such as creativity (Langley *et. al.*, 1987) and hypothesis-testing, analogical and metaphorical reasoning (Gentner, 1983) and imagery (Miller and de Vries, 1987). As a cognitive approach develops, a comprehensive model of how each of these cognitive processes relate to each other may be proposed.

Fourthly, a cognitive theory of technical change must be at least consistent with the literature of actual cognitive approaches to meaning, memory, problem-solving,

learning and so on. Although there will be differences between the representations and specific reasoning and problem-solving strategies of practitioners (Chi, Feltovich and Glaser, 1981), technological thinking nonetheless depends on the same general cognitive processes which underlie all thinking.

Fifthly, some would argue that cognitive theories will likely, although not necessarily, be computational in that the processes should ultimately be able to be implemented on a computer (Thagard, 1989, 1992). Computational models should simulate the cognitive processes used by scientists during discourse processing. However, as we shall see in the next section, I suggest this notion stems from a particular view of cognition that I seek to challenge.

Sixthly, a cognitive theory must allow for, and seek to explain, the notion of dynamic conceptual change (Vosniadou, 1989, 1991). Practitioners are constantly defining and re-negotiating accepted meanings and their notion of the commercial world. The influences, stimuli and actions involved must be accounted for in a dynamic process rather than a static 'snap shot'. Such an account would necessarily seek to capture the crucial processes described earlier, such as vision, expectation and perception .

Seventhly, a great deal of cognition relies upon the socialisation of knowledge. Whilst I have argued against a purely sociological epistemology, a cognitive theory that seeks to explain 'real world' phenomena must accurately describe and account for the complex social milieu in which practitioners operate.

Eighthly, a cognitive approach should consider the particular cognitive 'strategies' that individuals use. Science primarily produces knowledge of why things work, usually explicitly formulated by propositions. Technology produces knowledge of how things work, which is dynamic in nature and which is embodied in both 'software' (skills, programmes, business rules and routines) and 'hardware' (machines, production processes and tools). Thus, an analysis should seek to investigate what the underlying strategies that derive these different forms are.

Similarly, there may be separate and pervasive cognitive strategies that individuals follow to create, for example, a differentiation in organisational knowledge bases.

Lastly, certain methodologies are explicitly suited to best illuminate various cognitive phenomena. Qualitative methodologies, such as protocol analysis, literature

Analysis and focus groups (Ericsson and Simon, 1984), are well-suited for the cognitive study of technological change. For example, protocol analysis uses verbal reports as a means to determine their representations of discourse, as well as their reasoning strategies (Ericsson and Simon, 1984). I shall return to the methodological considerations, in more detail, in Chapter Five.

The purpose of the next section is to briefly introduce the model of cognition from which an exploratory investigation of innovation is to be developed. In particular, it is suggested that the approach is best suited to investigating aspects of learning and theory change.

4.10 Situated Cognition

A symbol-processing view of cognition, in which thinking is viewed as akin to a computer performing formal procedures on symbols, has been for several decades, almost the unchallenged leader among cognitive approaches to investigating 'thinking'. This position is being contested however, by proponents of situated cognition (SitCog). These authors suggest that one can conceive of cognition as a process that is involved in the practical doings of 'just plain folks' (Lave, 1988), rather than as formal operations of computers.

The difference between these approaches can be shown by considering the research that has stemmed from each. The symbol-processing tradition has focused on tasks familiar to many academics, such as logical deduction, cryptarithmic, chess-playing, disease diagnosis and mechanical fault-finding. SitCog however, seeks to focus on every day tasks such as 'methods of price-comparison used by grocery

shoppers', 'how dieters calculate their portions by physical manipulation', and 'the way Liberian tailors learn to sew through apprenticeship', and so on (Lave, 1988; Clancy, 1997; Wenger, 1990, 1991). These tasks have embedded within them many aspects, such as the socialisation of knowledge and specific cognitive strategies, that have proved difficult for information-processing approaches to include.

The difference between these two notions of cognition is not a matter of professional versus novice, but of priority given to theory versus practice. While symbol-processing begins with theory and works towards practice, the situated approach begins with practice and works towards theory.

4.10.1 Cognition as Symbol-Processing

One assumption common to theories within the symbol-processing paradigm is the belief that 'individual' and 'environment' are separate and the analytical need for this relationship to be spelt out. In Newell and Simon's (1972) influential model, problem-solving, for example, consists of formal operations on symbols, said to be a token-representation of symbols in the brains of individuals representing objects, properties and relationships in the external environment. Problem-solving occurs within a process of transforming these symbolic structures using a set of rules or operators until an initial state is changed into the goal state. The sequence which achieves this transformation is said to represent the series of actions that solve the problem in the 'real world'.

At its simplest, a symbol-processing view accepts the existence of an objective reality, made up of things bearing properties and entering into relations. A cognitive being 'gathers information' about those things and builds up a 'mental model' which, in some respects, will be 'correct'. That is to say, a faithful representation of reality. Knowledge is a storehouse of representations, which can be called upon for use in reasoning. Thinking is a process of manipulating representations (Winograd and Flores, 1986; 73).

That beliefs are considered to mirror reality has been argued in contemporary

philosophy (Rorty, 1979). Yet, it is hard to understand what it means for there to be a 'true' conceptualisation of reality against which descriptions can be compared (Goodman, 1978). As Bickhard explains:-

How can we possibly know that our representations of the world are correct? The only answer seems to involve checking those representations against the world to see if they in fact match, but, by assumption, the only epistemic contact we have with the world is via those representations themselves, any such check, therefore, is circular' (1992; 63).

Brooks points out that such assumptions also arise in work in artificial intelligence and robotics, in part, because these fields are developed in a fragmented way (Brooks, 1991). Perception systems, planning systems, and motor systems were all developed more or less separately. When placed together to build a whole system (what Brooks calls a 'traditional academic robot') the tendency was to construct it in serial fashion, with the outputs of the perception system feeding into the planning and representing system which then fed into the motor system. Such a system first sees, *then* thinks, *then* acts. Its perception is passive and not related to its activity, giving it no direct notion of the external situation, only descriptions of it. The practical consequence is that most models within this perspective are limited to carefully engineered environments for which they have been pre-set with the appropriate descriptors.

An additional problem involves the tacit separation of 'individual' and 'group'. Thinking, learning, and cognitive development are often thought of as processes taking place inside the individual, with social influences coming from the outside (Newman, Griffin, and Cole, 1989). In essence, this fosters the belief that practitioners operate alone; learning and thinking being a private matter.

One method for separating individual and social influences has often been through the adoption of a notion of a standardised task. If researchers think they know what the task is, then they can compare the performance of different individuals or compare changes in the performance of the same individual over repeated tasks.

Commonly held views of intelligence, problem-solving, learning and conceptual development often presuppose such stable and known tasks. In fact, without this

assumption it is not clear what one would mean by 'learning' (Bateson, 1972). However, knowing *the* task, such as 'innovation', assumes that there is a correct or known interpretation. If subjects have a different interpretation, then judgement based on the researcher's version may be misleading. This is of great practical importance as individuals are often judged not to have learned anything or in some way acted in an anomalous fashion, when they might equally well be seen as having been doing something different from that which was understood by the researcher (Newman *et. al.*, 1989).

4.10.2 Summary of the Different Approaches

The major difficulty with a symbol-processing approach is that presupposing a particular computational system, amounts to adopting a fixed and unquestioningly ridged orientation towards the 'knower' and the 'known', before inquiry begins. If the proper theoretical vocabulary can emerge from *within* the process of acting and inquiring, then our understanding may be changed and adapted as required.

Such a notion opens the way for a situated view of cognition. The aim in this section is to briefly outline a basic conceptualisation and comparison with the symbol-processing approach. In Chapter Eight and Nine, I shall explore, in more depth, this approach and how it relates to the explanatory goals of this thesis.

A common theme uniting many situated approaches is a shift in the way the person/environment relationship is conceived. Rather than a person being considered 'in' an environment, the activities of 'person and environment' are viewed as parts of a mutually-constructed whole. This view is complemented by considering the person/environment in terms of their contribution to an activity rather than as separately described *things*. The adaptation of person/environment involves mutually dynamic modification rather than static one-to-one matching.

Interactivist (Bickhard, 1992), relational (Lave and Wenger, 1991) or dialectical (Clancey, 1991) views have been central to work on SitCog. Research also relating to this perspective includes that inspired by Vygotsky's socio-historical approach

(Newman, *et al.*, 1989; Rogoff and Lave, 1984; Wertsch, 1991), evolutionary epistemology and cybernetics (Bateson, 1972; Bickhard, 1992), philosophical situation theory (Barwise and Perry, 1983), and Deweyian pragmatism (Schön, 1983).

Here, action is a product of a 'history of relating' in which both 'person and environment' change over the course of an interaction (Varela, *et al.*, 1991). For example, consider the process of engineering design. Such a process is a longitudinal event. An engineer designs, builds prototypes and responds to what has been designed and built, designs more, and so on. The goals for, and interpretation of, the design schematics change as one interprets it, it evolves and different mental effects become possible. Acting *with* the environment in this way contrasts with acting *on* it, as it presupposes that it will turn around and alter oneself in return.

Communication between individuals is the means for social co-ordination and adaptation (Winograd and Flores, 1986). Viewed in this way, (and consistent with point two in the cognitive approach checklist section 4.9) it makes no sense to consider utterances as true or false, depending on whether they relate to separately described objects, as knowledge is not a matter of matching concepts of previously agreed data. It is the product of a particular cognitive process of inquiry that arises within a situation which allows action to continue.

Thus, in this interpretation, cognition is inseparable from the occasions and activities of individuals of which it is also the product (Brown, Collins, and Duguid, 1989; 32). The implication is that individuals working within an organisation, constitute a form of situated learning by participating jointly in social activity rather than purely passing on ideas and notions *verbatim* in a transmission from one person to another. Perception is altered by actively doing and manipulating things, just as action is controlled by co-ordinated perception. Thus, perception is part of an active 'co-ordination', rather than a mirror of given objects.

Building upon work by Dewey and Mead certain authors (e.g. Winograd and Flores, 1986) suggests that when conscious problem-solving arises, it does so within a

blinker or 'bounded' activity. The situation in which these boundaries occur forms a practical context for thinking. Different ways in which the situation may be represented to the individual and different hypothetical solutions help select one another, while testing proposed solutions involves practical action to see if anticipated consequences result.

Hence, active problem-solving begins with immediately present conditions, which may be interpreted in any number of ways, rather than with a pre-defined problem space. Different interpretations can be disambiguated by further action and thought, forming a new sequence from which further interpretations are possible. Diversity of interpretation is not only possible, it is a source of novelty needed for learning.

4.10.3 The Socialisation of Cognition and Learning

If 'individual' and 'society' are not separate insofar as activity is concerned, then individual concept change cannot be fully separable from social change:-

'Learning is a process that takes place in a participation framework, not in an individual mind. This means, among other things, that it is mediated by the differences in perspective among the co-participants. It is the community, or at least those participating in the learning context, who 'learn' under this definition. Learning is, as it were, distributed among co-participants, not a one-person act' (Lave and Wenger, 1991; 15-16).

In this conception one cannot describe individual 'learning' separately from changes in a social role or identity. This inseparability of individual and social change leads some to suggest the term 'learning' be removed as being individualistic (Suchman, 1992). Others suggest it be replaced by a more neutral term, such as 'cognitive change' (Newman, *et. al.*, 1989).

In social interaction the definition of what is important evolves out of interaction, rather than being given from outside. In each case, practice comes first, with theory evolving within it. A situated approach can thus, be seen as a type of pluralism rather than a monism (like behaviourism) because of the many emergent ways in which things are defined as useful notions in specific situations.

4.11 Conclusions

The symbol-processing view began as an attempt to use computers to simulate human intelligence. It progressed to *defining* human cognition as computation. Reducing practice to theory in this way, may devalue everyday experience, losing a vital relationship for explaining aspects of cognition.

If the model were a tool, useful for solving certain problems, rather than ‘the way the world is’, then much of the criticism may be unjustified (Goodman, 1972). Computational models would simply be tools for working out the implications of certain formal theories. SitCog arose to counter much of the criticism of symbol-processing theory, and is suggested here as a useful source of enquiry for beginning to consider the questions of technological change and innovation, outlined in Chapter Three. The next chapter formalises these research questions and outlines the methodological position followed within this thesis.

5

Research Design and Methodology

5.1 Introduction

This chapter provides a description of the methodological position, discusses how the case study is structured and outlines the specific research methodology to be followed in this thesis.

This chapter consists of seven main sections. Section 5.2 outlines the aims of this project and provides a summary of the theoretical issues to be investigated. Section 5.3 provides a context for discussing particular assumptions and research questions. Section 5.4, argues for an general qualitative approach, that is best suited to the present thesis, with its origins discussed in section 5.5, with a summary in section 5.6. Section 5.7 expands upon this discussion by outlining; a research methodology based upon the grounded theory approach of Glaser and Strauss (1967); some of its weaknesses and strengths; and suggesting an amended approach that shall be followed within this thesis. Finally, section 5.8 discusses aspects of the fieldwork and its analysis, based upon the case study method of data collection.

5.2 Research Aims

From the literature review in Chapters Two and Three, one may conclude that many authors regard notions of beliefs, values, or meaning in technology as analytically 'fruitless' because of their intrinsically subjective nature. Such researchers may well admit that notions such as *imagination* are part of an individual's experience and effect that person's work, but suggest that they cannot be easily measured. Instead, such authors find it useful to seek an understanding of the wider role of technology in society by discussing, say, the 'political economy' of its development or use.

A popular school of thought suggests that innovation is 'socially constructed', in the sense that there is no one individual *imagination* behind their development, but instead a variety of 'actors' responding to complex of social pressures.

On some topics, it also seems useful to note the conflicts between social constructivists and political interpretations (Russell, 1986). Yet few authors of either school get close to what is seen by some to be a most important aspect of the practice of technological change. This is related to how human minds work and how individuals act and perceive future opportunity. That includes references to how practitioners respond to social and political circumstances, of course, but it is also important to ask how our imagination deals with practical experience.

While acknowledging that studies of social construction may lead to important insights also relevant to the research here, these approaches often neglect a true acknowledgement of individual or imaginative responses to technological change. This in turn, may lead to the innovation, the organisational responses to technological change, and the teaching of technology studies being too narrowly interpreted.

Indeed, certain researchers suggest that beneath the 'public knowledge' of technology and science another kind of knowledge is operating in a less explicit way. Collins, for example, argues for a clear distinction between public knowledge and the individual's personal understanding (1990). Others talk about the unspoken 'tacit' knowledge involved in practical work, and Michael Polanyi includes this in his discussion of 'personal knowledge' (1958).

That there are alternative interpretations of technological change may suggest levels of knowledge, the most commonly available being the most general, possibly best suited for analysis by political writers or Hughes' Network Theory (Head, 1985). On another, still public, level are the published writings of say, engineers and scientists, and the efforts of historians and social constructivist commentators to interpret them.

Beyond that it is possible to focus on the level of the individual within the organisation and the groups we work within.

The aim here is to seek an understanding of a more personal, more inward level that takes account of the subjective nature of practitioner imagination. As Midgley argues, unless we appreciate the significance of people's inner sense of reality, concepts such as creativity, purpose and will, become difficult to understand (1996). With these issues in mind, I can now develop the research issues into a more formulated set of concerns to be considered throughout this thesis.

5.3 Research Issues

An assumption made here is that activity and practice, derives from an outcome of shared belief, negotiated routines and meanings. These are 'bounded' in nature and are only actionable when they enact through application and by the shared adoption of others. Activity is initially guided by practitioners pre-conceived notions of reality and by their 'visions' of future opportunity. The initial question to be asked is; *how do visions emerge and become taken up by others and how does this direct behaviour?*

Vision, as I have described it, is not the single primary input to innovation but rather a part of it. This part contributes to the broader social framework in which innovation is embedded. It can be seen as part of the wider strategic notions of practitioners. An important further question is therefore; *what is the significance of vision and how is it manifest in the harmonising and alignment of the innovation practices of the firm?*

It has been suggested that 'vision', when used as a managerial tool, possesses several characteristics that enable managers to exploit its nature to the benefit of the firm. While the individual, department or firm, is primarily concerned with their own on going activities, these activities interact with others within the broad social milieu of the organisation's culture. Hence a further question for investigation is, *what role does vision play in setting the values and beliefs of the organisation and how*

do these change over time?

The focus of this research is to develop a better understanding of the notion of 'vision' and its role within innovation as an essentially cognitive process. The traditional view of vision, is either as a written statement supposedly constructed to provide a motivational or directional guide to practitioners, or as an abstract and 'mythical' or unknowable process of imagination. From the discussion so far, one can suggest that the notion is more fundamental than this and underpins many other facets of managerial practice.

5.4 Methodological Position

The importance of assessing the meaning and relevance of social and cognitive issues, drives the process of formulating an appropriate research strategy and related procedures. Qualitative measures, such as the case study, are not only different ways of collecting data, but often imply a different type of research design to quantitative methods (Bryman, 1988;189). Indeed as Hughes comments; 'Every research tool or procedure is inextricably embedded in commitments to particular visions of the world and to knowing that world' (1990; 27).

The social and cognitive world of practitioners is not as 'rigid' as the natural world but rather is open to degrees of interpretation and negotiation. Any causal beliefs must be grounded in an event or action and collective notion of the relevant agents for an action to take place. Similarly, beyond the more ephemeral meanings that people ascribe to certain phenomena may lie a more rigid structure of *culture*.

In summary, it is suggested that within the organisational environment conceptual change is a constant occurrence. Allied to this, is a re-organisation or a re-orientation of beliefs based on, or at least mitigated by, prior experience and practice. The research position outlined is characterised by an investigation of the negotiable meanings of change and choice. As the practitioners' notion of innovation changes, a

cognitive perspective must constantly seek to make sense of this.

Thus, if the aim is to understand how practitioners ascribe meaning to actions, beliefs and practice, then qualitative research and in-depth interviews with a wide cross-section of practitioners and observations of their practices is more appropriate than, say, surveys using standard questions seeking 'yes' or 'no' responses (Yin, 1984; Easterby-Smith *et al.*, 1991). These social science research tools do, of course, have limitations. The following sections seek to outline the specific research methodology to be used. I have found it useful to consider the origins of qualitative research, understanding their limitations and strengths, as a means of aiding the development of a research methodology.

5.5 The Origins of Qualitative Research

Qualitative research gained support in the 1960's, at least partially, as an expression of dissatisfaction with the influence of the scientific practices of the day. This dissatisfaction was felt throughout many disciplines. Social science represents an important contribution to a growing stock of epistemological knowledge of technology and the relations between technological advances and society. It is the purpose of this section to assess the advantages and disadvantages of qualitative social research in the study of technologically related issues.

Before embarking on a detailed examination of the qualitative approach utilised here, it is worth beginning with a brief portrait of the general approach as it stands at present. Using this as a context, the intrinsic strengths and weaknesses can be presented, incorporating the various specific qualitative tools of research, namely; participant observation, interviewing, case histories and diary methods.

The qualitative or interpretative paradigm has its origins in several schools of thought that predate its expansion of use. Among these are phenomenology, symbolic interactionism, Weber's notion of "verstehen", naturalism, and latterly,

ethogenics (Bryman, 1988). More often than not, qualitative research is described as diametrically opposed to quantitative research, paralleling the opposition between natural science and interpretative paradigms.

5.5.1 The Qualitative Approach

Qualitative research methodologies are primarily utilised by adherents of the interpretative paradigm, developed in criticism of the positivist accounts and associated quantitative methods such as randomised experiment. Donald Campbell, a modern authority on experimental design, illustrated the antagonism:-

'Such [case] studies have a total absence of control as to be of almost no scientific value.' (Campbell, 1963; 6, in Bryman, 1988; 190).

Other authors countered with comments such as those of Mills, labelling quantitative research as 'abstracted empiricism' (Silverman 1993; 12).

What counts as acceptable 'valid' data, and as acceptable and 'valid' methods of attaining data, is determined by the methodological or theoretical standpoint of the researcher. People who assert the incommensurability of the two research paradigms must necessarily have difficulties combining qualitative and quantitative research methods. More recently, Bulmer advocates a more pragmatic stance:-

'Different research methods are not inherently better or worse than any other on the basis of intrinsic qualities, but superior or inferior for particular purposes' (1986; 187).

Hammersley claims that the two research methodologies are common empirical investigations with different emphases and thus different advantages and disadvantages (1984). The prospective researcher must critically examine each purpose or project and select the most suitable research methodology and technique.

All this is not to say that qualitative and quantitative research are synonymous with each other; rather one can offer a prescriptive definition of qualitative research similar to that put forward by Silverman (1993). In essence, qualitative research generally observes individuals as members of groups in their natural settings in an

attempt to understand the perspectives of the subjects and social processes in operation. As such, the broad approach seems ideally suited to the task at hand.

To attempt to understand the subject's perspective has been called the *sine qua non* of qualitative research by Bryman, and is closely related to Weber's concept of *Verstehen* describing a kind of understanding or 'seeing through the eyes of...' (Bryman, 1988;61). Ideally the relevant 'world' views of the subjects are recognised in the complex social milieu, and description developed. Such rich descriptions build the context in which hypotheses may be proffered and theories developed.

In short, a broad qualitative approach offers the possibility for a flexible methodological strategy, open and unstructured relative to the rigmarole of quantitative experiments, one that allows change in theoretical directions in the light of observation and introduces the possibility of the 'serendipitous' discovery of new important issues and meanings.

In terms of theory development, Bulmer portrays qualitative research as beginning with a minimal amount or underdeveloped theoretical framework so as not to mould the data into preordained conceptual frameworks, and to act as a general sense of reference and guidance in empirical circumstances (Bulmer, 1986; 7, in Bryman 1988;68). Thus, qualitative research builds hypothesis and theory in the process of investigation to facilitate an empathy with those under study.

5.5.2 Applied Research: The Sociological Study of Technology in Industry

Qualitative research methodologies and techniques hold two major advantages in the study of aspects of knowledge. The first is the ability to investigate the phenomenon that is inherently difficult to quantify or measure, and the second is the focus on the often 'tacit' component of knowledge, that sub-consciously 'resides in people'.

Vincenti's study of flush riveting in the aeronautical industry provides a patent example of the benefits of qualitative research because:-

'...shop workers and design and production engineers have more urgent things to do than record their experiences....some help can be had of course by interviewing participant who are still living. Additional insights come from observing how continuing developments in riveting go on today.' (1990;175-176).

Vincenti underscores the importance of illuminating tacit knowledge and incorporates the results of his investigation into a classification of engineering knowledge and practice. More recent work by Faulkner has confirmed the usefulness of qualitative research on this hitherto undervalued component of engineering knowledge and skills (1993). Furthermore, Fleck and Tierney (1991), in examining the implementation of technologies in the financial services sector, report attempts by knowledge holders to codify the tacit knowledge, converting the knowledge into marketable products to be supplemented with training for novices to learn relevant skills.

5.5.3 The Economic Analysis of Technology: A Quantitative Tradition

In contrast to sociological approaches, economists of the neo-classical schools remain the mainstay of quantitative research methodologies, very much in tune with the positivist tradition of obtaining hard, reliable data for prediction. Technology is generally regarded as exogenous, tending to be reduced to quantitative indicators, more easily integrated into rigorous economic models. Economists of the 'evolutionary' school of thought stray from the mainstream by accounting for, at least in part, social issues in their concept of the 'selection environment', a broad concept to include market-shaping factors in their diversity, for example, consumer preference for quality and technological knowledge (Nelson and Winter, 1977, 1982).

Vail (1989), in his exposition on mechanisation within the timber industries of Sweden and the U.S.A. regards the typical market indicators of neo-classical or marxian style economics as 'superficial and misleading'. Going beyond descriptions of causality, Vail adopts a tradition of social research stressing the complex determinations and believes that meaning can be approached through what Geertz (1980) calls 'thick description' (Vail, 1989; 376). Comparisons of the timber

industries of Sweden and U.S.A. reveal that social phenomena (class, state and culture) shaped the market behaviour of each. This serves to show the contrasting economic and sociological approaches to the study of technology and increasing interest in qualitative approaches displayed by those critical of conventional methods.

Intrinsic Strengths: Complexity, Flexibility and Attention to Process

Research on technology by those in political, historical and sociological disciplines are often necessarily quantitative because of the relatively late emergence of field of technology or innovation studies *per se*. Any event prior to the 1960s may require reference to indirect sources, such as patents and other official documents or field notes, diaries and personal memorabilia. Moreover, qualitative research can be more appropriate when the phenomena under study are not congenial to quantitative methods, as in the case of flush riveting or tacit knowledge outlined above. I will now consider the major strengths of qualitative analysis, namely; complexity, flexibility and attention to process.

By applying a qualitative approach unfettered by epistemological sensitivities one is free to use qualitative techniques without being exposed as necessarily 'prejudiced'. This allows the appropriate use of methodology and techniques, such that the data may be triangulated and compared with other results to add to the veracity of the findings (Bryman, 1988). Inevitably resources may limit the ways and degrees to which a study can be verified, forcing the researcher to prudently select the most effective strategies and techniques.

Qualitative research seeks to yield descriptions of the perceptions of subjects, the context, and the 'milieu' and therefore is often suited to the study of the most complex and little understood social and cognitive phenomena and value systems of subjects. The complex views of practitioners about their natural and social environment can be described and analysed through accurate representation in the

exceptionally detailed qualitative data, such as that collected in participant observation. Rich and thick descriptions lend themselves to verbal communication prevalent in public debate and situations where results are transferred verbally, as in some instances of political advice documented by Bulmer (1986). Similarly, tools such as participant observation are often described as a 'luxury' for the researcher as opportunity may be limited for such methods.

Ethnography, or participant observation studies in particular, produce evocative descriptions that familiarise policy makers with social situations, typically through verbal transcripts. These qualities are manifest in Roy's classic covert participant observation of shop floor workers at a machine shop where:-

'As a member of the work group, I had access to inside talk. Where groups are sensitive and skilled at eluding observation, participant observation can be a sensitive detector..' (Roy, 1952; 427).

The study exposed the manipulation of piecework rates, termed 'pacing' or 'gold bricking', where workers restricted output in order to outsmart the department's effort to reduce the timing and piecework rate for operation's (Roy, 1952). Verbatim transcripts thus captured the atmosphere of the machine shop and the rationale of the workers.

Often, policy makers will demand scientific quantitative data for the purposes of prediction and the 'political need for numbers, wins through the researchers best intentions' (Easterby-Smith, 1991; 105). Practitioners of qualitative research would claim that the benefits of "thick" description, and the creation of a context are a strength rather than a weakness.

Another advantage of qualitative methods relates to the flexibility of methodologies allowing for significant change in the direction of study. This is afforded by the minimal amount of *a priori* theories and concepts which ideally are generated in the course of the research. Bryman (1988) describes the role of theories and prior knowledge as 'signposts' for theory building, rather than precise maps to apply to real situations. Pre-ordained theoretical frameworks are viewed as rigid and inflexible

ideas that conform the field, and in doing so, pass over the issues at the heart of the matter, consistent with Bulmer's sensitising concept that accommodates new empirical evidence (Bulmer, 1986, in Bryman 1988; 34).

'It is marked by a concern with the discovery of theory rather than the verification of a theory' (Bryman, 1988; 97). These words are echoed in the findings of Hughes, in his historical case study 'Networks of Power' on the evolution of the modern electrical network, from the pioneering work of Edison (Hughes, 1983). Hughes' uses the concepts of the 'heterogeneous engineer' and the 'seamless web' of the technological and the social (the sociotechnical) as examples of concept and theory building from 'the ground up' (Bryman, 1988). Critics point out that Hughes' theory of sociotechnical systems cannot accurately match all technologies and societies, being best suited in application to large systems of technology such as the electrical industries and telecommunications industries.

It is not uncommon for the aims of research projects to become rephrased or rewritten in the light of the new empirical evidence that rendered the previous aims irrelevant. Theories are developed in the course of qualitative research distinct from quantitative analysis where theories and concepts are fixed prior to fieldwork. Even positivist quantitative researchers may accept the potential of qualitative research to construct appropriate theories and concepts within exploratory research. While acknowledging the power of the methodology in making sense of little understood problems or phenomena, researchers may deem the approach unsuitable as a 'stand alone' or primary research methodology. I shall expand on this notion of theory generation within the topic of grounded theory to be discussed later in this chapter.

Qualitative research monitors social processes, constituting the longitudinal element of case studies. Qualitative researchers prefer to identify the nature of links between variables and outcomes that are the quantitative researcher's goal. Furthermore, real experiences are dynamic, occurring as a series of interconnected events and therefore should be recognised as part of the individual's perception of reality. This is

consistent with the aims of interactive process research, outlined in Chapter Three.

As I have suggested, an attention to process is crucial in understanding the research issues raised so far, and is a salient feature of fieldwork; that is to say, analysing the *processes* of change culminating in the *outcomes* of change. Thus, students of policy research find qualitative research useful in documenting the important aspects of policy implementation, including the perspectives of subjects before, after and during implementation, and how they relate to those of the policy makers (Bryman, 1988).

In summary, the qualitative research strategy and associated techniques are most appropriate when it is necessary to comprehend the beliefs, values, and value systems of individuals and groups. Similarly, they can be effective in constructing an understanding of the subject's reality, for the purposes of deliberately affecting it. These value systems are inevitably complex and often inadequately described by tables and graphs.

Intrinsic Weaknesses: External Validity, Interpretation, and Analytical Process

Is the particular case representative of all other cases? To what extent can the findings and theories generated be generalised? These are questions that ought to be asked when considering the tendency of qualitative research to focus on a particular group or set, in a specific community. If qualitative strategies have improved internal validity, the cost is often external validity, and researchers may display unease about the extent to which their findings are capable of generalisation beyond the confines of a particular case (Bryman, 1988; 88).

The problem of external validity is shared by quantitative methodology especially where survey techniques employ a non-randomised sample within the population and concentrate instead on a community selected for qualitative reasons, as a control, for instance (Bryman, 1988).

Several remedial strategies can increase external validity, the most obvious being an increase in the number of cases examined or the use of teams to investigate an increased number of cases. Furthermore, a qualitative logic of selection can be used to substantiate sampling in that qualitative logical reasons are given for the selection of the case, justifying its relevance to the research aims. For example, Allan and Skinner justify qualitatively the selection of highly paid manual labourers across a number of industries for evaluating their 'embourgeoisment' theory whereby high salaries influence social outlooks and promote assimilation into the middle class (1991). Alternatively, a selection logic of diversity can be adopted where cases are selected on the basis of their perceived potential to produce findings. Findings need not apply to whole populations but only to the relevant social groups.

Is the concept of 'verstehen' possible in practice? Is it possible to postpone the use of theories and concepts until the research is well underway? Can qualitative research be replicated? These questions pertain to problems of interpretation of the subject's experience. In 1928 Margaret Mead published the results of an anthropological study of child rearing in Western Samoa (Bryman, 1988; 75). These describe the relatively easy transition from childhood to adulthood in contrast to their American counterparts. Mead also reported the low levels of violent crimes, rape, and sexual repression. Freeman then revisited Samoa twenty years later and gave a completely contradictory account of adolescence, sparking an intellectual debate.

Interpretations offered by Mead and Freeman gave a professional analysis to the detailed description of Samoan life, an analysis influenced by the researcher's previous experience, analytical stance, and any partisan objective. Given that the researcher begins with a unique theoretical framework, and that the assertion of 'theory neutral' observation is suspect at best, the qualitative theories must be rooted in the 'subjective' to some degree. To cope with the sheer volume of sensory input, a researcher must impose, either implicitly or explicitly, some order through concepts and theories, though the differing roles of theories in qualitative and quantitative research should not be forgotten. The explicit statement of allegiance to broad

theories, or partisan objectives, can be helpful in assessing the researchers interpretation of the data. For this reason, I also have chosen to make this explicit and describe the theoretical background from which I wish to draw.

Replication is more problematic because of the many transient factors in societies, including time, major external events and changing attitudes. The Mead-Freeman controversy, and those like it, highlight the need for a means of judging, at least to some degree, the empathy and interpretations of a researcher. Part of the problem stems from the fact that field notes are generally not available to the wider academic community, with papers usually limited to small verbatim transcripts. Even so, field notes become highly personalised and require the individual's translation to impart the full meaning. Alternatively respondent validation may be employed whereby subjects are given copies of the findings for approval. Respondent validation can be highly successful, and even a condition of research in management research dealing with confidential or material of commercial value (Easter-Smith, 1991). However, respondents may not always understand an academic analysis or be interested enough to respond, and the dilemma remains should respondents be divided over contentious issues (Bryman, 1988).

Qualitative researchers often prefer to postpone theorising until the end, or near the end of investigations preventing premature closure on potentially crucial issues. Analytical techniques of systematic theorising were invented to give the approach enhanced credence in the face of criticisms of the impressionistic and journalese styles of description (Bryman, 1988). The absence of a general schema of systematic analysis raises problems in that the researcher is left to decide how to divide attention between the prior knowledge and empirical evidence.

To allay concerns that qualitative methodology skews attention from analysis to description, several analytical techniques were invented; analytic induction, and grounded theory developed by Glaser and Strauss (1967). The latter shall be discussed in more depth in the next section. Briefly however, the analytic induction technique involves creating hypotheses to be tested against cases, akin to Popperian

falsification in that hypotheses are to be recreated or rephrased in the instance of poor correspondence. Grounded theory begins with broad, flexible categories that are saturated with cases and reorganised if necessary before relations between categories can be stipulated and theories constructed (Bryman, 1988).

Certainly, the ability to test theories against other cases, and the method of triangulation will add to the veracity of any results. Bryman points out that the inclination to the subjects perspectives and a commitment to context act as barriers to analysis (Bryman, 1988). Fears of reifying the perceptions in the former and the context in the latter must be offset against the benefits of yielding a more general, and more convincing theory.

5.6 Conclusion

This section has assumed that a degree of reconciliation between 'numbers and ideas' may be practical and essential for the development of the field of certain research, arguing for an appropriate use of qualitative and quantitative methodologies and techniques where best suited. Qualitative research can be prescriptively defined without recourse to the stagnating conflict between the positivist and interpretative schools of thought. For their effective utilisation, the researcher must clearly understand the aims of research, and recognise the strengths and weaknesses of the most suitable approach.

The next section extends the discussion of methodology design by considering Glaser and Strauss' (1967) grounded theory approach in more detail.

5.7 Grounded Theory Research: Theory Generation

Deriving its theoretical underpinnings from the related movements of American pragmatism and symbolic interactionism, grounded theory inquiry is portrayed as a problem-solving endeavour, concerned with understanding action from the

perspective of the human agent. Grounded theory is typically presented as an approach to qualitative research, in that its procedures are neither statistical, nor quantitative in some other way. It begins by focusing on an area of study and gathers data from a variety of sources, including interviews and field observations. Once gathered, the data is analysed using theoretical sampling procedures. Theories are then generated, with the help of interpretative procedures, before being presented. This latter activity Glaser and Strauss claim is an integral part of the research process.

Glaser and Strauss regard grounded theory as a general theory of scientific method concerned with the generation, elaboration, and validation of social science theory. For them, grounded theory research should also meet the accepted canons for doing good science (such as consistency, reproducibility and generalisability). The general goal of grounded theory is to construct theories in order to understand phenomena. A good grounded theory is one that is inductively derived from data, subjected to theoretical elaboration, and judged adequate to its domain with respect to a number of evaluative criteria.

Criticisms of the Method

Grounded theory has been the subject of a considerable amount of criticism, principally on the grounds that the approach signals a return to simple 'Baconian' inductivism. However, this embodies a conception of inquiry that is far removed from such a naive account. Indeed, one may suggest that suitably constructed grounded theory offers the researcher a most comprehensive notion of research procedure.

This thesis takes the view that grounded theory is best regarded as a general theory of method concerned with the detection and explanation of various 'real' phenomena. To this end, it is constructed as a problem-oriented endeavour in which theories are generated from stringent data patterns, elaborated upon through the construction of

plausible models, and justified in terms of their explanatory coherence to existing research. This section proceeds on the assumption that grounded theory can be strengthened by constructing it in accordance with developments in methodology.

Problem Formulation

Glaser and Strauss recognise the importance of understanding methods in the context of problem-solving. Yet, although they offer some remarks about research problems, it is not given much systematic focus. In fact, there appear to be several misunderstandings that are characteristic of problem-oriented thinking.

One misunderstanding presupposes that problems and methods are distinct parts of inquiry. They maintain that, because one does not have to prepare an articulated problem in advance of inquiry, researchers may come to their problems at any point in the research process. This, however, fails to appreciate that one typically initiates an investigation with an ill-structured problem that is then developed in the course of inquiry. A related misunderstanding is the apparent belief that the researcher can effect a break from linear thinking, thus insisting that the research methods can come before the problem is understood. The belief here is that the problem component of method is a temporal phase that is dealt with by the researcher, who then moves to another phase.

The Identification of Phenomena

A major criticism is that grounded theory often fails to distinguish between data and phenomena. The view held is that 'theory' explains and predicts facts about observed data. The failure to draw this distinction results in a misleading account of the nature of what is being described, for it is typically phenomena, not data, that our theories are constructed to explain and predict.

Phenomena comprise a varied ontological mix, including objects, states, processes

and events, and other features which are hard to classify. It is therefore argued by Glaser and Strauss that it is more useful to characterise phenomena in terms of their role as the proper objects of explanation and prediction. Not only do phenomena give scientific explanations their point, they also, on account of their generality and stability, become the appropriate focus of explanation

Data by contrast, are recordings or reports that are perceptually accessible and open to public inspection and are often specific to particular investigative contexts. They are not as stable and general as phenomena. Data serves as evidence for the phenomena under investigation. In extracting phenomena from the data, one frequently engages in data reduction using statistical methods. Generally speaking, statistical methods are of direct help in the detection of phenomena, but not in the construction of explanatory theories. As Layder (1990) suggests, properly conceived grounded theory ought to be 'grounded' in phenomena, not in data (as Glaser and Strauss suggest). According to Layder, data provides the evidence for the phenomena or theoretical categories which social science researchers must investigate.

What is the criteria for establishing the existence of phenomena? According to Layder, reliability of data forms the basis for claiming that phenomena exist. However, while reliability is the basis for justifying claims about phenomena, judgements about explanatory coherence are the appropriate grounds for theory acceptance. Though Glaser and Strauss comment a little on 'checking' the data, this research takes a far stronger line and seeks to reliably establish phenomena in multiply-determined ways before one begins to generate grounded theory.

The Generation of Theory

Grounded theory has been depicted as a *tabula rasa* view of inquiry, which maintains that observations are not theory or concept dependent. However, Glaser and Strauss explicitly note that the researcher does not approach reality as a *tabula rasa*, they must have a perspective in order to see relevant data and abstract

significant categories from it (1967).

The Investigation of Cognitive Processes

Glaser (1978; 7) and Bailyn (1977) have both drawn attention, in different ways, to the centrality of cognitive processes in certain aspects of research. Accordingly, it is suggested the decisions about which issues to pursue are made by the researcher's 'subconscious' perceptual processes which influence what is observed. The notions that emerge from such research must therefore be considered as the product of the interaction between the researcher and the phenomena under study. This is true of all forms of research, including natural science investigations (Polanyi, 1958; Ravetz, 1971) and quantitative social science (Bailyn, 1977). It is, however, particularly salient for the researcher pursuing qualitative social science investigations. The competent development of grounded theory rests, in part, upon a sensitivity to the often tacit processes of perceiving and understanding and upon a willingness and an ability to bring them out into the open for discussion.

A few writers, to a greater or lesser degree, have touched upon the cognitive issues central to theory production and upon ways of practically dealing with them. Mills (1959), Hammond (1964), Schatzman and Strauss (1973), Bailyn (1977), Barzun and Graff (1977), and Stinchcombe (1978) are all concerned, in various ways, with the basic but crucial research problem of how to record data and how to label or classify data, in ways that facilitate the rearrangement of the material to reveal new properties, and how to tackle this reshuffling process. Bailyn's account is something of a landmark in this respect, not only because she reviews the cognitive processes involved in dealing with data, but also because she submits for consideration two possible general principles of data analysis. First, that to be maximally useful, data must be maintained at a 'proper' level of complexity, neither too simple, nor too complex. Second, the process of analysis is understood as proceeding by a continual interplay of concepts and data (Bailyn, 1977; 101).

For Glaser and Strauss, grounded theory is said to emerge inductively from its data source in accordance with 'constant comparison'. As a method of discovery, constant comparative techniques are an amalgam of systematic coding, data analysis and theoretical sampling procedures which enables the researcher to make interpretative sense of much of the diverse patterning in the data by developing theoretical ideas at a higher level of abstraction than the initial data descriptions.

The Testing of Theories

Glaser and Strauss make it clear that there is more to theory appraisal than testing for empirical adequacy, although they do not expand upon this point. Clarity, consistency, scope, integration, fit to data, explanatory power, predictiveness, heuristic worth, and application are all mentioned by Glaser and Strauss as pertinent evaluative criteria, although there is no coherent view of theory appraisal. Phenomena are usually complex and theories are typically underdetermined by the relevant empirical evidence. Proper theory appraisal has to be undertaken on evaluative dimensions in addition to that of empirical adequacy.

Thagard has developed an account of theory evaluation which takes inference from the best explanation to be centrally concerned with establishing explanatory coherence (1992). Thagard's notion is not a general theory of coherence; rather it is a theory of explanatory coherence where propositions hold together because of their explanatory relations. Relations of explanatory coherence are established through the operation of seven principles: symmetry, explanation, analogy, data priority, contradiction, competition, and acceptability. The determination of the explanatory coherence of a theory is made in terms of three criteria: consilience (or explanatory breadth) simplicity, and analogy. The criterion of consilience, which Thagard believes is the most important for choosing the best explanation, captures the idea that a theory is more explanatorily coherent than its rivals if it explains a greater range of facts. The notion of simplicity that Thagard deems most appropriate for theory choice is captured by the idea that preference should be given to theories that

make fewer special assumptions. Finally, explanations are judged more coherent if they are supported by analogy to theories that scientists already find credible.

Indeed, Thagard's theory of explanatory coherence has a number of virtues: it satisfies the demand for justification by appeal to coherence considerations rather than foundations and it takes theory evaluation to be a comparative matter and one that is centrally concerned with explanation. The notion of explanatory coherence, offers the grounded theorist an integrated account of many of the evaluative criteria deemed important for theory appraisal by Glaser and Strauss.

Observation of those embarking on qualitative research studies relating to a wide range of substantive topics suggests that they frequently encounter obstacles when attempting to use the grounded theory approach because of the absence of detailed information about exactly *how* qualitative data should be processed in order to develop grounded theory.

5.7.1 The Development of Theory

The dynamic perspective of theory construction held by Glaser and Strauss claims that the strategy of comparative analysis for generating theory puts a high emphasis on theory as process; that is, theory as an ever-developing entity, not as a perfected product. In this regard, Glaser and Strauss advise the researcher to be constantly on the lookout for new perspectives that might help them develop their grounded theory, although they do not explore the point in detail.

This section discusses some of the difficulties posed for qualitative researchers by the absence of detailed guidelines for the handling of data. It does so by setting out a series of nine stages in the considerations of theory generation within a grounded theory approach, which are extracted from Glaser and Strauss's account (1968), but which, in some cases at least, need additional clarification. The nine stages are set out in Table 1.

Stage	Main Activity	Comment
1	Develop categories	Use the data available to develop categories which fit the data closely.
2	Saturate categories	Accumulate examples of a given category until it is clear what future instances would be located in this category.
3	Abstract definitions	Abstract a definition of the category by stating in a general form the criteria for putting further instances into this category.
4	Use the definitions	Use the definitions as a guide to emerging features of importance in further fieldwork, and as a stimulus to theoretical reflection.
5	Exploit categories fully	Be aware of additional categories suggested by those you have produced, their inverse, their opposite, more specific and more general instances.
6	Note, develop and follow-up links between categories	Begin to note relationships and develop hypotheses about the links between categories.
7	Consider the conditions under which the links hold	Examine any apparent or hypothesised relationships and try to specify the conditions.
8	Make connections, where relevant, to Existing theory	Build bridges to existing work at this stage, rather than at the outset of the research.
9	Use extreme comparisons to the maximum to test emerging relationships	Identify the key variables and dimensions and see whether the relationship holds at the extremes of these variables.

Table 1: Nine Stages of Grounded Theory

With these nine stages in mind, Strauss and Corbin (1990) offer a comprehensive set of procedures and techniques for analysing and generating qualitative data as well as theory generation. Easterby-Smith *et al.*, (1991), also offer a structured approach to grounded theory, but their approach is more loose, with much less detailed prescription. While both approaches recognise that analysis or interpretation is an iterative process (Easterby-Smith *et al.*, 1991;108) and demands ‘openness and flexibility’ (Strauss and Corbin, 1990; 26), Strauss and Corbin’s procedures are so specific and detailed that the mechanics of analysis overshadows any possibility of openness and intuition. Whilst I have tried to remain true to the general method outlined, I have found their approach useful as a guide rather than a formal procedure to be adhered to, in moving between the main components they suggest, as several criteria prove impractical.

Strauss and Corbin appear to regard *creativity* and *good science* as opposites. Good science, here, is taken to mean being committed to providing a faithful, robust and

coherent analysis of interviewee's meanings; respecting the principles of validity, reliability and generalisability, as outlined previously. The notion of subjectivity is illuminated as the focus of the research when making sense of people's understanding of aspects of the innovation process, rather than seeking to establish a statistical correlation between, say, a firms' return on net assets and investments over a given period. Being creative can still be good science by making novel connections between existing ideas and new contexts that shed a different and possible useful light on phenomenon. In the interests of doing 'good science' the Easterby-Smith *et. al.*, (1991; 108) research checklist, proved useful within this thesis as its components are structured as to facilitate creativity, and are outlined as follows:-

1) *Familiarisation with the empirical information.* This arose as a function of two tasks. One was trying to write a narrative account of the organisation from the interviewees perspective. This required establishing a high degree of prior knowledge of projects and terminology by 'shadowing' key personnel and undertaking company training programmes. The other came later in trying to understand and construct an analytical account from an academic perspective in Chapters Six to Ten.

2) *Evaluating the data in light of previous research, theoretical ideas, personal experience, discussion with others.* This required revisiting many article, books and journals, as ideas that previously seemed irrelevant, often because they inhabited a different context from original research issues, were subsequently found to be highly relevant. The importance of the organisational practice and 'learning' were acknowledged as crucial in Chapters Three and Four, but there 'increased' importance to a SitCog account of innovation became apparent through reflexive analysis focused upon the case study. These issues consequently will form the basis of the discussion in Chapters Eight and Nine of this thesis. Similarly, certain ideas that initially seemed to be important were left undeveloped because they did not seem to further an understanding of the empirical evidence. These processes represent personal learning, both about the research process and its content.

3) *Identifying or otherwise forming coherent ideas through one and two above.* During the interview period I noted any ideas and themes that became apparent to me at the time. I re-visited this list of ideas during later interviews and within my analysis, elaborating some, found similarities between others, but abandoned many. Having read many internal documents to familiarise myself with some of the technical processes and commercial projects, several initial interviews were conducted to obtain more knowledge of the scope of information available, so cutting down to a reasonable level the degree to which I had to re-evaluate and reconsider interviewee responses. As the interview schedule progressed a degree of 'conceptual triangulation' became apparent as the same topics and issues arose in discussion. The repetition of such topics was taken to represent a level of internal validity to the importance of certain shared phenomena.

4) *Cataloguing and recording concepts identified in the transcripts.* This is an extension of point three, but as noted earlier I did not apply the detailed coding procedure of Strauss and Corbin (1990), but rather, used this adapted criteria for my research and theoretical context.

5) *Linking.* Similar to point four, through drafting and re-evaluating accounts of emerging themes, I have considered new ideas and adapted older issues. This point is crucial within the notion of theory development, outlined in Thagard's concept of explanatory coherence. In chapters Eight to Ten, I have drawn heavily upon other research as Thagard discusses, and is also consistent within the cognitive 'checklist' discussed in section 4.9, to reflect upon the issues arising within the case study.

6) *Re-evaluation and cycling through all of the previous checklist.* Rather than following a structured cycling throughout the analysis, my emphasis has slowly cycled from Stage 1 through to Stage Five, but not in a static and ordered way. For example, in linking empirical material with general models (Stage Five), I have engaged in stage two activity, revisiting previous research and ideas.

This amended notion of grounded theory offers many advantages for the researcher. It promotes the development of theoretical accounts and explanations which conform closely to the situations being observed, so that the theory is likely to be intelligible to, and usable by, those in the situations studied. Similarly, it directs the researcher to the creative core of the research process, and facilitates direct application to the demanding process of interpreting research data.

5.8 Research Method: The Case Study

The chosen research method within this thesis is the case study. The choice of one rich and extensive case study (as opposed to several weaker cases, for comparison) is also, in part, based upon a pragmatic reason, that of confidentiality. As my project is sponsored by I.C.I. Paints, their wish to provide in-depth and *confidential* information in return for a specific and detailed report was paramount in the decision of method.

Also several authors (Clark and Staunton, 1989, Rice and Rogers, 1980) suggests that ideas tend to proliferate into divergent and parallel notions during the innovation process and it is this re-configuration and re-conceptualisation of innovation beliefs, as a dynamic process within the firm, that the case study is best suited to capture.

Business Research Methodology and Case Study Research

Although direct and casual relationships are often difficult to assess in a complex business context, they are generally thought of as a requirement to developing theory. If a theory can be said to be a set of interrelated propositions which describe and explain certain cognitive and social phenomena (Thagard, 1996; 10), and propositions are general statements regarding relationships between concepts, it is important to use the carefully constructed statements from practitioners to organise the categorised concepts knowledge with in a business context.

Yin suggests that the case study investigates contemporary phenomena within a real life context and that it is most relevant when the boundaries between phenomena and context are not clearly evident and when multiple sources of evidence can be used in support of research issues (1989).

The foundations of the case study method within the business context derives from several of the major issues of qualitative methodology, described earlier. For the case study, the theoretical orientation centred on identifying and assessing the holistic features of a phenomenon in its natural setting and is ideally suited to the qualitative approach addressed here.

The case study allows the researcher to focus on specific instances in an attempt to identify detailed interactive processes crucial to understanding subtle theory development, but which are perhaps not clear to other research techniques, such as a large-scale survey or experiments. The relevance is found in the ability of the researcher to identify these detailed interactive processes and has particular relevance for process-orientated research (Bryman, 1988; 187). Additionally, Yin suggests that the case study best suits investigating cognitive phenomena in an organisational context where the phenomena-context boundary is often blurred (1989;23).

Another strength of the case study method utilised here, is the use of multiple information and data sources to corroborate and cross-reference. This process is part of a conceptual triangulation that can enhance the validity of the case study. An example would be the view of a particular corporate strategy, say, focusing on environmental concerns, from the managing director, the workers in the assembly plant and competitors. This evidence may then be corroborated by reference to annual accounts, articles, and internal reports. That is to say, the *doing* and *knowing* are important aspects of the cognitive process. Thus, a written vision statement is one thing; what counts as its effect on practitioners, is another.

A danger with utilising historical research within the case study is that previous

decisions, processes, and measures, are often difficult to detect and can influence future decisions. Although, this of course, depends upon which aspects the researcher seeks to illuminate. Having warned the reader of the dangers of focusing upon the wrong 'types' of historical information, Hertog (1994; 5) suggests that the case study often explicitly neglects the role of history as an influence upon the future.

A case study needs to assess more than the change from one point 'in time' to another, in order for research to identify and assess attributes that support the conceptual framework that is developed and then re-defined after research commences. The use of case studies in business research can provide in-depth analysis of the dynamic reactions of businesses to change, but each case often reflects different aspects of the change process within a particular commercial context. However, the unique interplay between the company and its external environment creates individual 'stories' that can be assessed to uncover common themes within a common broader historical context.

Within Yin's notion of research, the case study is independent of the research strategy. A single case study can establish the existence of a phenomena. Yet, one case study, like one experiment, cannot provide sufficient evidence to enable robust generalisations. Often business case studies are exploratory in nature, in that no one business context, company, or industry, can provide high degrees of confidence in utilising a well-defined conceptual structure and pre-structured data collection techniques. Previous research in business must be scrutinised if it is to justify a confirmatory study, as the business context is ever-changing (Hertog, 1994), this however, is beyond the aim of this thesis.

Types of Case Study

Hertog (1994) describes four types of case study research, focusing upon the testing of a theory, the solution of a definable social problem, the development of a theory, and the pure description of a social phenomena. The four types reflect two main

epistemological positions and traditions. One tradition, as I have outlined, is Glaser and Strauss' (1967) notion of 'grounded theory'. The other is Yin's (1984,1989) account, reflecting the testing of a hypothesis, and a deductive analysis. With the former, the researcher tries to generalise from the 'particular', while in the latter, they start from a 'general' proposition and apply it to the 'particular'.

Whilst this thesis did not begin with a clearly defined hypothesis, I have outlined several assumptions and issues concerning the processes that I wish to investigate. These assumptions were considered and then formally posed as sets of open-ended research issues. These issues have arisen as a product of a selective literature review as well as pre-interviews and participant observation. Such a process is far removed from the 'unbiased and open minded observer' that Glaser and Strauss espouses a position that may be unattainable for any researcher given necessary notions of pre-conceived ideas and assumptions (Strauss and Corbin, 1990).

Robson outlines six different uses, or foci, that the case study can be used to investigate (1993; 147). *The individual case study*; provides a detailed account of one person or organisation. It tends to focus on antecedents, contextual factors, perceptions and attitudes preceding a known outcome (such as drug users). It is used to explore possible causes, determinants, processes and experiences, that contribute to the outcome. *Sets of individual case studies*; this is similar to the first but a small number of individuals with some features in common are studied. *Community studies*; involve studies of one or more local communities, and describes and analyses relationships between the main aspects of community life such as its politics, work, leisure, and family life. It is commonly descriptive but can explore specific issues or be used in theory testing. *Social group studies*; involve studies of both small, direct contact groups such as families and larger, more diffuse ones, such as occupational groups. They tend to describe and analyse relationships and activities. *Studies of organisations and institutions*; concentrate on studies of organisations such as firms, work places and schools. They possess many possible foci, such as best practice, policy implementation and evaluation, industrial relations,

organisational cultures. Lastly, there are *Studies of events, roles and relationships*; these investigate specific events (in this sense, they overlap with the third and fourth type). The focus can be extremely varied, and have focused on issues such as police-citizen encounters, doctor-patient interactions, specific 'incidents' such as natural disasters, and studies of role conflicts.

The present study can be seen as a contribution to the first and fifth type of case study. The project is concerned with an in-depth investigation of the specific issues discussed within a business organisation. Whilst an investigation of one organisation raises problems of external validity and does not necessarily aid and enable comparative analysis, it does allow for a highly in-depth and thorough investigation that can better facilitate the generation of grounded explanations of phenomena.

5.7.1 Information and Data Gathering

The primary sources of information gathered were the semi-structured interview and archival (computer and written) sources. Additional evidence was collected from internal reports and plans, promotional literature, public performance accounts, press cuttings, public industry reports, and direct observation.

Despite the limitations of interviewing within qualitative analysis acknowledged earlier, the use of interviews is recognised as appropriate for case study research (Yin, 1984). A semi-structured interview has no less validity than a structured interview, and in Robson's terminology still remains a 'respondent' interview (1993). That is to say, the interviewer still has his 'shopping list' of topics and issues that they wish to get a response to, but as a matter of research strategy, they have greater freedom in the sequencing of questions, in the exact wording and in the amount of time and attention given to different topics. Indeed the interviewer also has the freedom to pursue topics that they 'serendipitously' had only just been made aware of.

The interview is also appropriate where the purpose of study is to solicit the meanings that individuals ascribe to situations and events in a particular context that has not been structured in advance by the researcher (Easterby-Smith *et al.*, 1991).

5.7.2 Interview and Selection

Initially, the project was discussed with my internal 'sponsor'. This was to achieve a 'best fit' between mine, and the organisations, interests and requirements described at the start of this chapter. Initial discussions helped to define the project aims as well as help to identify which individuals should be interviewed first. Additional interviewees were similarly identified during these discussion. Further, the current interviewee was asked for additional names and cross referenced with other suggestions. The individuals interviewed were selected for a number of reasons, including:-

- 1) They were regarded as key staff who took part in innovation processes.
- 2) They were regarded as key staff who took part in strategic and innovation decision-making process.
- 3) Their opinions were highly regarded by their peers even though they might not have been a regular or formal contributor to innovation or planning and strategy.
- 4) They led departments directly responsible for the development and realisation of products, processes or services to the consumer.
- 5) They had worked in a number of positions throughout the firm.
- 6) They were willing and able to be interviewed.

In order to develop a clear picture of the performance of the organisation, the experiences, perceptions and opinions of the individual interviewees were solicited through the in-depth semi-structured interview and tape recorded. Within each interview the emphasis was placed upon a range of issues through a series of open-ended questions. For example, interviewees were asked to discuss their opinions, perceptions and beliefs concerning vision and innovation, and the relationship between leadership and the innovative behaviour of the organisation. Interviewees

were asked to give examples of innovative projects they had worked upon and the effects that they had, or still have, upon the firm. Full verbatim transcript was prepared after each interview that reflected the perspective of each interviewee. A total of forty two interviews were conducted, each one 60 to 100 minutes long.

In the next chapter, I shall elaborate fully, the specific aspects of the case study as it relates to the practice of innovation and managerial vision within ICI Paints.

6

Case Study

6.1 Introduction

This chapter contains a study of ICI Group and ICI Paints, based on my fieldwork and provides the material from which later chapters will draw.

There are two main divisions the first concerns ICI Group, the second, ICI Paints. Each division is further split into several sub-sections. These sub-sections, drawing from Chapter Three, reflect important thematic areas for the study of organisational innovation. The first theme consists of the firm's history, corporate-structure and financial performance; the second, consists of the key personnel, strategy, governance and managerial hierarchy; the theme consists of, aims, beliefs, values and decision-making systems of the organisation. These sub-sections provide a conceptual categorisation, aiding the descriptive nature of the case study, but are not mutually-exclusive and naturally there is a degree of conceptual overlap.

The study includes information from a host of sources, such as interview and participant observation, as well as public speeches and corporate/public documentation, over two years, from early-1997 to the middle of 1999. Whilst it is accepted that the major restructuring within ICI was still in progress at this time, this was a suitable place to discontinue considering new information as this time-frame provided a 'natural break point'. As the 1999 annual report suggests, 'although the transition process is not yet complete, the shape of the new ICI is becoming clear'.

The following account highlights the extent to which the organisation has been shaped by the individual and shared belief in its commercial future and past successes and failures. Risk-taking, corporate control and the influence of those who communicate the strategic vision of the firm are crucial features of management,

providing continuity and a collective sense of 'ownership' of the organisation's heritage. It also shows the Group's governance to be largely a 'top-down' affair, even though managers often refer to a flexibility and interpretative freedom to pursue their own innovation agendas.

An Overview of Corporate Change

It is of course a truism, to say that organisations are in constant flux. However, this appears to be more true for the ICI Group over recent years, than for many other firms. Beginning in the early 1990's with an analysis of major changes in the chemical industry, followed by a demerger in 1993, the large scale acquisitions in the Speciality Chemical (SC) sector and the divestment of its traditional Bulk Chemical industries (BC), the radical corporate change effected all aspects of ICI Group.

6.2 Corporate Structure and Size

ICI has four groups of businesses. *Coatings* (which includes Decorative Paints), ICI Autocolor, Packaging and Industrial Coatings, the new category of *Speciality Products* (which includes the recently acquired First National Starch and Quest, as well as the Performance Chemicals, such as Unichema and Crosfield); *Materials*, (which includes Acrylics, and Polyurethane), *Industrial Chemicals* (made up of mostly the old BC businesses and includes ICI Chemicals and Polymers).

As of mid-1999 world wide, the ICI group has approximately 58,721 employees, (down from 67,546 in 1997), and manufactures over 50,000 separate products at 201 locations in 55 countries. The Group's headquarters are at Millbank, London. Outside the UK, operations are conducted by locally managed subsidiary companies staffed almost entirely by nationals of the country concerned.

Research Development and Technology

Research, development and innovation was regularly cited as being 'at the very heart' of the Group's success and a function that everybody, to varying degrees, should concern themselves with. Indeed the opening page of the 1999 Shareholder Report makes this joint responsibility clear:-

'ICI seeks to promote a culture in which the responsibility for technology and innovation is shared and the stewardship for key technology capabilities is clearly understood, defined and monitored by all staff'.

This notion of the stewardship or 'ownership' of culture and technology shall be discussed in more detail, later in the chapter.

Group Technology Strategy

The Group's overall technology strategy is the responsibility of the Vice-President, Robert Margetts, working with the individual businesses and R&D directors on large and high-cost projects. Each business, is responsible for its own specific research and technology policy and for driving innovation within business units. Providing an overall group strategy has the aim of integrating business and research and promoting a closer alignment of technology programmes within the overall business strategy. Large technology programmes are also supported by a 'shared technology' group, ICI Technology, which provides organisational support in a number of technological and organisational areas.

The Technology Group was formed in 1996, with the initial aim of bringing together the Group's science, engineering, manufacturing and supply chain skills. During 1998, the group aligned itself more closely to the 'market focused' portfolio of businesses, mirroring the changing emphasis of ICI's new speciality businesses.

ICI Technology has five working groups, covering different customer requirements; Product Science, Process Technology, Manufacturing Technology, Knowledge

Management and Project Technology. The Group works as a profit centre and is used on a self-referred consultancy basis.

The Growth of the Specialities Business Sector

The recent acquisition of two companies in particular, National Starch and Quest Plc., are widely accepted to have had the most dramatic effect on the overall business direction, performance and technology base of the Group.

National Starch is a leading manufacturer of adhesives, sealants, speciality foods and industrial starches. The business operates an international network of more than 158 manufacturing and customer service centres, located in 36 countries. Their main headquarters is in New Jersey, USA, but there are also regional headquarters worldwide, including the U.K.

Quest is a leading manufacturer of fragrance and food ingredients. Fragrance products are sold to producers of perfumes, cosmetics, soaps and household products. Flavour and food ingredient products are sold to manufacturers of prepared foods, beverages and confectionery products.

Several research scientists interviewed suggested that the potential of technological synergies between the ICI Group and the new SC businesses was extremely promising:-

“Going into these firms and talking to the R&D staff about possible future collaborations was rather like being a child in a sweet shop”(Dr Philip Taylor Interview).

As of mid-1999 there were no formal project groups set up to develop product synergies between the new firms, but this was said to be occurring soon, along the lines suggested by a recent ‘Cross-Businesses Synergy Analysis Report’, under the guidance of Vice-Chairman, Margetts.

The Chairman's and CEOs Statement on Corporate Re-structuring

Perhaps the strategic position of the ICI Group is best summed up by the comments of the Chairman, Miller-Smith in the Share Holders Year-end Report.

'Our transformation strategy, that of shifting away from commodity chemicals towards high-technology customer specific specialities, will be vindicated. ICI's focus on speciality products is founded on a belief in the prospects for superior long-term growth and return. ICI has continued to invest in its core speciality products and paints businesses, where substantial opportunities remain available to the Group to expand both organically and through acquisitions, partnerships and other strategic combinations' (1999 Shareholder Report; 2).

Although the change-process is still continuing, the shape of the new ICI Group is beginning to take place. At the centre of the Group remains the headquarters at Millbank which performs a host of managerial co-ordinating functions. Underpinning the new ICI is a range of technology requirements that have become more 'market and customer' focused, as the portfolio changes. There exists a strategic commitment to the Group's technological needs in the remaining businesses, as well as the potential, as yet unrealised, of technological synergies within the newly purchased businesses.

If this is the situation of the current ICI Group, how has the need for this course of restructuring come about? The history of ICI Group is long and complex and impinges on British business society in a way that very few firms have done. The history of the firm tells us a great deal about the traditional 'route' of innovation within the Group, the changing roles of managerial hierarchy and the great store that ICI places on the 'way of doing things' that is said to be a highly pervasive feature of the business culture.

6.3 History: The Creation and Incorporation of the ICI Group

The ICI Group was formed on December 7th, 1926, largely as a response to the creation of the German chemical giant IG Farben the previous year, but also to create a British company able to compete in world markets. ICI's creation was heavily

influenced by the Government of the day, which was firmly in favour of an 'Imperial' preference to the creation of large organisations. The influence of government was also a 'response to the Post-War problems of re-building industry, looking to both rationalisation and the elimination of foreign competition' (Paterson and Witson, 1988;25).

The formation of ICI drew together four of the largest chemical companies in the UK. They were Brunner Mond and Limited, Nobel Industries Limited, British Dyestuffs Corporation Limited and United Alkali Company Limited. The merger also brought some sixty of their subsidiary companies (a lot of them overseas), into the new ICI Group. The name 'Imperial Chemical Industries' was chosen as representing a company that was 'imperial in aspect and imperial in name'.

Initially with 33,000 employees, ICI's main products included chemicals, explosives and accessories, fertilisers, insecticides, dyestuffs, domestic chemicals, leather cloths, printing, sporting ammunition and paints. In its first year of business, ICI sold £27 million worth of these products and recorded pre-tax profits of £4.5 million.

A Special Relationship of State and Firm

The range of products, especially in potential war materials has ensured a favourable relationship with successive British governments. Initially, the notion of the 'special relationship' owed much to the creation and smooth parliamentary passage of the Import Duties Act of 1932, which created a 'favourable export environment' seen by many as the initial purpose of the act (Peterson and Witson, 1980; 39).

This relationship was especially apparent during the Second World War as ICI was the largest single agent of governmental wartime-procured production (Reader, 1977). Reader suggests that the importance of ICI to the state was immense and that 'the war, consolidated ICI's position within the state' (Reader, 1977; 240). Indeed:-

'Although in control of ICI's entire business, the governmental ministries were obliged to rely on ICI to make its control effective, rather than purely there to follow government strategy' (Reader, 1977; 396).

Post-War Booms in New Innovations and Changes in Management Structure

ICI Group aided the war effort by providing (among other products), Perspex and polythene, aviation fuel and medical products to prevent malaria and aid the wounded. Indeed, Bill McGowan, son of the then Chairman, badly wounded at El Alamein in 1942, became the first Allied soldier to be treated with penicillin.

Peacetime brought many of these new technologies to public notice. New kinds of products regularly appeared, together with new process applications, such as Nylon, Terylene, reactive dyes, petrochemicals, the age of the big plants, and expansion into Europe and the United States, all appeared immediately after the war.

The rationale underlying the corporate structure, composition and expansion of Post-War ICI, like that of other leading international companies dominating the chemical industry, was based on technological advancement and vertical integration. Investment in R&D traditionally ensured the continuing flow of new products. High-growth activities supplanted older businesses as they reached maturity, usually requiring the development of huge chemical complexes (such as enormous tioxides or agrochemical plants), and in turn, the by-products stream were transformed into new businesses.

Historical Legacy

ICI differed from its international peers in that it was also the dominant producer in its home market, covering virtually the entire range of chemical processes. ICI was a full-line chemical company, able to manage a wide variety of products and processes that supported a world-wide network of sales and manufacturing subsidiaries. The main managerial problem of the time was to maintain the co-ordinated structure of

the group. This caused the ICI board to wonder, as early as the 1940s, whether the company was too big and diverse to manage effectively.

A strategic reorganisation in the 1960s aimed at clarifying the relationship between the centre and outer businesses and delegated more profit responsibility to the product divisions. ICI headquarters continued to provide central managerial services and exercised a co-ordinating role through a network of control groups and committees.

During this phase, ICI set about converting itself into more of an international company, by expanding into continental Europe. Joint ventures and acquisitions in the United States came a decade later, with most of these investments replicating ICI's UK based chemical activities, with little change in the technological profile which continued to be highly diverse with a bias towards bulk chemicals.

The managerial problems of controlling a highly complex and diverse range of technologies and products increased throughout the 1970s. Import tariffs were reduced, oil companies and other new entrants challenged established markets. The growth-rate of new business markets slowed down, as did the flow of 'block buster' innovations (such as Nylon and Polyester), that had arisen out of ICI's existing Post-War chemical processes. However, the organisational structure of the company, with the powerful divisional CEO's, determined to preserve and expand their 'fiefdoms', made it difficult to strategically change the direction of the Group.

The recession of the early 1980s appeared to *shock* ICI out of its inertia. Under Sir John Harvey-Jones, chairman from 1982 to 1987, ICI underwent enormous upheaval that included the loss of some 50,000 jobs, while the product divisions acquired still more strategic autonomy.

Throughout the 1980s, ICI began to dramatically change its technological portfolio. Between 1980 and 1990, while gross sales more than doubled from £5.7bn to £12.9bn, the share from pharmaceuticals, agrochemicals and seeds, paints and other 'effect' products, grew from 34 to 56 per cent. The corporate strategy initially appeared to be a success with pre-tax profits peaking at £1.5bn.

There was a willingness to withdraw from traditional technological areas in which the company no longer had a price-premium advantage. The plastics division swap with British Petroleum in 1982, exchanging ICI's polyethylene for the oil company's PVC division, was the first divestment of what had once been a core product.

ICI continued with high-value acquisitions, adding mostly to existing technological capabilities. The US take-overs, including Glidden Paints in 1986, made ICI the world's largest paint producer. At this time, through organic growth, the pharmaceuticals division became ICI's most profitable business. However, the increasing scale of geographical and product diversity remained a source of major concern for ICI's senior management. During the early 1990s, the issue facing Harvey-Jones's successor, Sir Denys Henderson, was whether the restructuring was successful enough to impress shareholders and maintain its share-price. Increasingly stringent environmental controls began squeezing profits and a down-turn in profits, in several key businesses with already slim margins, began to make further corporate change likely.

Managerial Styles and Task-Forces and an Impetus for Change

Post World-War Two, ICI had developed a more consensual style of decision-making at Board level, with the Chairman seen to act more as a 'referee'. This made for continuity and stability but also promoted an inward looking organisation (Pettigrew, 1985;303). Changes in the early 1980s broke this mould with Harvey-

Jones promoting a more market sensitive, consensual and internationally aware style of leadership, albeit led by a person of strong belief and style (Pettigrew, 1985;345).

This style of leadership was exemplified when his successor, Henderson, launched another round of major restructuring in September 1990. The impetus for this change was Alan Clements, ICI's finance director, who reported 'bad news' about the Group's third-quarter results for 1989. The shortfalls came in areas on which the company had pinned much of its hopes, such as the existing speciality chemicals and advanced materials (Kennedy, 1993; 9).

Henderson had what he calls a flash of 'instant vision' that undermined his assumptions about the re-focusing of ICI's business throughout the 1980s. He described a 'nasty feeling in the pit of my stomach' about the direction in which the world economy, and ICI, was heading (Kennedy, 1993;10). He set up two task forces, drawn from members of the executive team, to review the direction in which the world chemical industry was heading and to determine whether the restructuring changes of the 1980s were sufficient to successfully place ICI within it. The Chairman subsequently commented that :-

'It became immediately apparent from the conclusions drawn that ICI was facing a critical moment in its history'. A sea change had been taking place in the world chemical markets and ICI was not properly equipped to respond to it' (Kennedy, 1993;12).

The *strategy taskforce* concluded that ICI was spreading its expertise too thinly. The conventional approach to portfolio planning (based on the Boston Portfolio Analysis Tool) was no longer considered adequate to conceptualise the range of technological products within the business units. Businesses now were to be considered either 'winners or losers'. The former to be driven harder, the latter to be handled more ruthlessly or jettisoned. They recommended a more selective strategy, with resources concentrated in seven sectors; pharmaceuticals, agrochemical and seeds, specialities, explosives, paints, materials and industrial chemicals.

The *organisation task force*, under Ronnie Hampel (later to become the Group's CEO), were asked to design a new and relevant organisational structure. It reported that there were too many administrative overhead and that Line-Managers should have unambiguous responsibility for their businesses, with territorial companies playing a support role, simplifying its control procedures.

As a result, and as suggested, the company focused on the seven main businesses, eliminating the ambiguity between divisional and territorial responsibilities. They also established a new Policy and Performance Committee, bringing the heads of ICI's core businesses into closer discussions with executive directors about the groups results and strategy. Hampel was soon appointed CEO and all business heads reported directly to him.

The Shock of Forced Change

Hanson Plc, the British conglomerate (with a reputation for taking over badly managed companies), announced that it had acquired 2.8% of ICI in May 1992. ICI regarded the move as hostile even though Hanson soon announced that, for internal reasons, it would not be launching a take-over bid. However the lesson of a 'potential' for take-over was not lost on the Board, aware that any more serious drop in performance might leave room for another hostile bid. Henderson brought in S.G. Warburg who concluded that the key was to reorganise along a major technological 'fault-line', each being managed as separate companies, with pharmaceuticals and other bioscience-related activities remaining on one side; the traditional chemical businesses on the other. By mid-July 1992, the directors discussed a plan for work towards a demerger. Again, a number of task-forces and project-teams were established to consider the implications of demerger for ICI's 400 companies in 150 countries. Soon after, formal approval by the ICI board was given for the demerger.

Managerial Parents

The demerger offered potential benefits, both to the businesses of Zeneca (the new name for the demerger unit) and the new ICI, and demonstrated the importance of matching a company's parenting skills to the technological needs of the businesses that it controls.

The ICI Group provided common services, managerial skills and resources, such as engineering and construction, toxicology and environmental control, at a level that separate divisions could not afford their own. Also, the group's heritage provided an established network of overseas subsidiaries with 'international visibility'.

Although the divisions were responsible for their own R&D programmes, in principle they drew on the same base of science, technology and administrative knowledge. However, the task-forces showed that this was not necessarily the case for all sub-units. The pharmaceuticals division, handled its own sales and distribution as its products and customers had very little in common with others in ICI.

Zeneca's bioscience businesses possessed differentiated products, designed to produce a specific effect for which customers paid premium prices. The chemical companies sold less differentiated products in much bigger volumes and at much lower bulk prices. Two other businesses had similarities in manufacturing and technology to pharmaceuticals, agrochemical and the dye businesses, (which was the original incubator for pharmaceuticals in the 1930s). This group, far more than the other ICI businesses, required specific skills in handling national regulatory authorities. This cluster of bioscience businesses became Zeneca.

The chemical group was more diverse and contained some units, such as paints and explosives, that could be considered strong enough to stand as independent companies. However, the Groups technical, engineering and managerial capabilities were said to provide a basis for a coherent 'grouping' (Kennedy, 1993; 13).

To bring the historical description of ICI full-circle, after demerger, Henderson brought in McKinsey & Co Consulting Group to aid a portfolio reorganisation, thus prompting the full move towards the SC sector and the buy-out of the SC businesses from Unilever, from which Miller-Smith was employed to manage the change process, described earlier.

6.4 Organisational Structure: People and Company

ICI Board

From 1998 to mid-1999 there was a great deal of change in the membership of the Board. To date, the ICI Board consists of the Chairman, with Charles Miller-Smith taking over from Sir Ronald Hampel, the Chief Executive, Brendon O'Neil taking over from Charles Miller-Smith. Three executive directors are James Kenny, taking over from Mike Brogden (Retired), Rob Margetts (Vice-Chairman and Director of Science and Technology Development), and the Financial Officer Alan Spall. The non-executive directors are Lord Butler, Paul Dreshcher, Sir Roger Hurn, and Lord Simpson, who also sit on a variety of well-known international companies.

Executive Management Team

The general management of ICI is through an Executive Management Team (EMT), headed by the Chief Executive and comprising the Vice-Chairman, Chief Financial Officer, five Executive Vice-Presidents (the CEOs from the major businesses), the Senior Vice-President of Human Resources and the General Counsel, consisting of several key personnel from around the sub-units. Recently, an executive for ICI's Safety, Health and Environment (SHE) initiatives has also been appointed. The EMT is responsible for delivering the Group's strategic thrust of driving performance and for reshaping the portfolio.

Chief Executive Officers

ICI's international businesses are headed by CEOs, who are responsible for the financial performance of the businesses, under the strategic guidance of the EMT. In April 1999, Brendan O'Neill took over from Miller-Smith who moved up to become Chairman. He was actually recruited over a year ago from the Guinness brewing business. Mr O'Neil's appointment was part of a recent policy of producing a 'blend of the historic and new executives' with the experience to reflect the change to the more customer-focused speciality chemicals business (Financial Times, 31st February 1999; 23). This also reflects a long-term tendency of ICI to employ senior managers and CEOs for specific business tasks.

Responsibilities, Decision-Makers and Chains of Command

The Board is responsible for the effectiveness of the systems of internal control with the Group's strategic decisions, regularly reviewed. The EMT reviews the strategy for the individual businesses on a biannual basis. Performance targets are also set by the EMT and reviewed by the Board, in the light of the Group's overall objectives.

On completion of all major investments, post-event reviews are carried out by the relevant businesses and reviewed by the EMT with the aim of 'improving the quality of the business judgements and processes involved' (Dr Richard Skyes Interview).

Responsibilities for ensuring compliance with group policies and guidelines has been delegated by the Board to nominated senior functional managers. These nominated managers receive annual compliance reports from EVP, and CEOs and from other nominated senior managers. In turn, the nominated managers provide annually separate reports to the Audit Committee, on behalf of the Board, on the degree of compliance with Group policies and guidelines.

Summary

This section demonstrates the highly diverse and complex nature of the organisational structure of the ICI Group. The broad performance targets for each unit are set by the Board and the EMT, then passed to the individual businesses to interpret how best to achieve them. There are no direct targets for innovation rates.

The tradition of senior managers rising through the ranks of the Group is being slowly replaced with appointments by more 'market-focused' experienced managers from other organisations. Similarly, senior managers are being employed to conduct specific strategies or follow through specific 'strategic visions', such as refocusing the business towards different sets of end-users. The group is highly technologically diverse, although the existing Group now draws, more closely than before demerger, upon common managerial skills provided by Millbank.

6.5 Vision, Mission and Beliefs

ICI's *mission* statement, outlined in the Annual report of 1999, suggests the rather typical goal of being 'world leader and providing shareholder value'; although as the Senior Planning and Strategy manager for ICI Paints suggests:-

"I know everybody has one, it's the fashion, but we really do sit down and think about this. We consider what we think is achievable and where we would like to be in the next few years" (Viner Interview. Senior Planning and Strategy Officer).

The full mission statement, constructed at an Annual Strategy meeting, reads:-

'ICI intends to be the world leader in the chemical industry in creating value for customers and shareholders and to achieve it through the following means: market driven innovation in products and services; winning in quality growth markets world-wide; inspiring and rewarding talented people; exemplary performance in safety and health; responsible care for the environment'.

Rather than a trivial statement written simply as a 'PR' exercise, I suggest that this reflects certain *real* and *active* issues considered to be important by senior managers. For the first time in ICI's annual report the notion of 'market-driven' innovation is

mentioned. There is also a clearly expressed interest in environmental concerns, again something that has only recently been included.

ICI's *strategic vision* statement for the year (2000) ahead gives more detail concerning the issues outlined within the mission statement and has only been included in the Annual Review since Miller-Smith joined as CEO. The purpose of this statement is, as a senior marketing manager, suggests:-

"It is not only important to give some notion of the general ideas important to our business direction, but also important to give some idea of where we are and how to get there" (Hulme Interview. Senior Marketing Manager).

Strategic Vision

The Group's outlined vision (with no time-frame attached), repeats much of the mission statement, although it describes, in more detail, *how* they aim to achieve the broad remits. They are as follows:-

- *Market-driven innovation in products and services.* The Group's innovative skills are a major competitive strength which are driven by the marketplace. The Group sets out to meet the needs of its chosen customers in ways that deliver the desired effect and service and create value for both parties.
- *Winning in quality growth markets world-wide.* The Group will invest in growth markets in which it has leading market positions. It aims to have all its businesses in such positions and it will do this by concentrating efforts on what it believes are the best quality growth opportunities around the globe.
- *Inspiring and rewarding talented people.* The Group is determined to create a way of working that attracts and retains high calibre individuals and that releases the energy and talents of everyone in the organisation. It aims to be an organisation in which all employees know what is expected of them, have the freedom to take initiatives, are accountable for the results and are properly rewarded for success.
- *Exemplary performance in safety and health.* The Group's goal is to have a high performance in safety and health and become the world leader.
- *Responsible care for the environment.* Tough targets for the Group's environmental performance have been set. The guiding principle is 'Responsible Care', the international chemical industry's programme for continuous improvement in safety, health and environmental performance. The Group applies its standards with consistency around the world. The roll-out of new and improved products which are designed to have less impact on the environment will be a key feature.

There is little reference to technology *per se*, other than using its 'innovative skills as a competitive strength, driven by the market-place', an important claim that is at odds with the historical route of innovation.

Within the Vision Statement, there is reference to past actions, as well as the perceived consequences of current actions and the position of the Group's businesses and skills within a future business landscape (made up of technology, legislation, techniques and so on). It amounts to more than a 'wish list' but perhaps somewhat less than a strategic outline. It also views the Group as a guiding hand, formulating ways of working by the dissemination of managerial skills, expertise and knowledge.

The most telling statements about the future direction and belief of the senior managers are those made by the individuals involved with setting the corporate policy. The next three sections consider several issues raised within the statements.

The areas scrutinised are technological development and attitudes to innovation and the environment and business culture of the ICI. These relate, in part, to all of the outlined aspects of the statements, suggesting that they, far from being simply 'promotional talk', represent the beliefs and visions of senior managers, giving us important insights as to the 'mind-sets', preferences and 'intellectual boundaries' of policy makers.

6.5.1 Visions of Technology and Innovation

In mid-1999, Rob Margetts, the Vice-Chairman of ICI Group and charged with the development of the overall technology strategy, gave a presentation at a conference at Cambridge University, that outlined his beliefs concerning the future of the chemical industry, technological development and ICI's environmental position. This was subsequently echoed by him in later press articles. He suggests, 'innovation is our lifeblood', defining it as 'the successful application of science to bring a new and better product to the market'. He continues:-

"Science enables one to look at events, devise a model, then test it thoroughly. Only then can we use technology to extrapolate beyond the data and build new constructs. Technology is driven from two directions; physical needs and comfort."

This demonstrates an acknowledgement that, despite the reorganisation, ICI is still very much a technological-oriented company yet the increased importance of listening to the ‘market-pull’ is clear. Technological progress is described as desirable to society because it has brought direct and real benefits to individuals. Indeed, many research scientists interviewed expressed the belief that:-

“The industry at large really *does* provide a benefit, although not everybody may think so. What we do really does matter to everybody in so many ways that not everybody appreciates” (P. Taylor interview. Senior Research Scientist.)

This pride in the company and its achievements was borne out time and again by others and shall be discussed in more detail later in the chapter.

Environment as an Innovative Driving Force

ICI’s environmental policy stretches back 30 years, focusing on developing new products, such as water-based paints and ecologically benign pesticides, as well as:-

“...tackling the inherently *dirty* chemical industry’s legacies. Lead times of 5-15 years are normal for developing this type of technology, a fact often overlooked by regulators and pressure groups. This takes real commitment” (Downing Interview. Special Products Manager).

Similarly, Margetts suggests that ‘there will always be legacies of our industrial past’, but does not pretend that these issues can be tackled at once. A notion in use throughout ICI is to consider the problem as immediate and in need of a solution only if three conditions are satisfied; that there is a source of pollution, a path for that pollution to reach something and a ‘sensitive target’. Margetts continues:-

“We do not just develop the technology but also own it. We must be able to sustain our policies of action.”

This notion of commercially sustainable environmental action remains a core theme of ICI environmental policies. He suggests:-

“Environmental concern is now maturing into the concept of sustainable development. What is important is to concentrate on this new driver, what it has meant for a company like ICI and what it means in the future”.

Innovation Within Sustainable Development

Within ICI's environmental policies, issues of improvement, economic growth, and social enhancement, are described as the 'Three Pillars of Sustainable Development'. The social dimension, similar to social improvement, is seen as increasingly important in strategic decisions and as having a major impact on how companies develop and commercialise the latest advances. As Margetts explains:-

"Every mission statement now seems to suggest that the firm must 'listen to environmental concerns, have constructive debates and learn and act accordingly'. Firms that do not include specific reference to specific social issues will not survive".

Changing Lifestyles

Margetts' vision of the future of innovation in ICI suggests that more products will satisfy customers' desires at a 'high level'. It is not entirely clear what this refers to, but seems to allude to more abstract, non-specific, environmental concerns allied to notions of improvement and social enhancement. Attempting to 'ground' his vision in the concerns of the ICI managers, he suggests:-

"The essence of research, even in an uncertain business, is discovery and invention. But the directions are clear. We need to understand the criteria for sustainability, and to understand them in a quantitative way so that we can plan our progress, and share it effectively".

By making reference to 'uncertain business research' and methodology, as well as to 'effective sharing', Margetts appears to be 'imploring' the managers to make a mental connection to his vision and align their beliefs with his own. Consider now how these statements, descriptions and visions are grounded in current Group environmental policy.

6.5.2 ICI's Safety, Health and Environment (SHE) Initiatives

ICI Group has set itself environmental targets in its SHE and product performance, with the aim to delivering 'new and better products to customers while using less raw

materials and energy to help ensure a move towards a sustainable and competitive future' (SHE Annual Report 1999).

Expenditure on safety, health and environmental improvement in 1999 is estimated at over £310m (about 54% on the environmental aspects) and most aspects of the Group's business are subject to laws relating to SHE. ICI has published a comprehensive annual environment report since 1991 which was extended in 1996 to include performance in safety and health.

In order to ensure that the SHE policy is carried out correctly ICI maintains a central SHE management system governed from Millbank. It sets out the standards required and gives best-practice guidance to enable the design of local procedures to meet the standards, and requires annual audits to ensure procedures exist, staff are trained and performance is measured. The auditing process involves auditors, external to each specific business, and forms the basis of annual compliance reports from the CEO of the businesses.

The policy, practices and procedures reach down throughout the entire group. There is no specific mention of 'Sustainable Development', although as one senior R&D manager commented:-

"We know what we are supposed to do in this area and what rules we have to follow. Sustainable development is more of a guide than a rule to our thinking. It is left to us to interpret the best ways our area [businesses or department] can include it" (Joyce Interview. Senior R&D Manager).

The last area of importance within this section that needs further explanation and interpretation of the public and private comments of senior Group managers, is that of the business culture of the Group. As I shall explain in more detail later, it is seen as the job and 'duty' of the Board to foster broad cultural themes.

6.5.3 A Change in Business Culture: The Visionary Direction of Miller-Smith

Miller-Smith is often described as a 'cultural revolutionary' who intends, progressively but radically, to transform ICI over the next decade. Indeed, Miller-

Smiths' opinions on ICI's culture is an issue much talked about by senior managers. He is widely reported as critical of many of the traditional aspects of ICI culture. Soon after becoming Chairman, the former Unilever executive tasked with overseeing corporate change, suggested that:-

'There is a genuine emotional thing about ICI. It touches nerves in British culture' (Sunday Times 12th May, 1996;43).

He demonstrates a typical use of 'mental imagery' when talking about broad 'visionary' issues, and continues:-

"We need to retain the best of the past while grafting on, as you do with a rose, the best of the new so that you get a new flower which is taking three strains rather than one. It is a sensitive, delicate thing to do and it doesn't happen over night, but I am absolutely clear we need to change."

Miller-Smith suggests that ICI is still dominated, psychologically, to its detriment, by its UK origins. In essence, ICI is still a quintessentially British company. He explains, proving a rare example of a senior board member relating the topic of product innovation to issues of 'culture':-

"We may be an international business but the culture is still British, it is a fair, decent company, it understates, rather than overstates itself, and its genius has been in technical innovation rather than being market-driven, as it must become."

The need to change technological focus is not denied by the senior managers interviewed. Indeed most wholeheartedly concurred with such a programme, considering cultural change to be the main goal of the Chairman and CEO. But that this change is not 'wholesale' rather:-

"The basis for a new ICI will be to build upon the *existing* technological specialities realigning them to be more 'market focused'" (Joyce interview. Senior R&D Manager).

As the CEO of ICI Paints Decorative Business, Ian McMahon, suggests, relating technology to the competitive position of the firm :-

"Going forward, ICI aim to have a leading global position in paints as well as adhesives, food additives and industrial flavours and fragrances. These are all specialist business protected from direct competition thanks to our complex chemical and technology expertise" (McMahon Interview).

This echoes the initial restructuring programme, along technological fault-lines, that lead to demerger. This suggests a shared, and as yet unproved, belief in a market-

premium, placed upon a technological distinction of the SC businesses as a source of competitive advantage, an advantage that ICI once held with its BC businesses. Indeed, Miller-Smith alludes to the focus on growth of existing 'technological core-competencies' to underpin the corporate re-structuring programme by suggesting:-

'If you wanted to go into food ingredients today you wouldn't be able to sell any. Speciality chemicals depend on technical skills and selling skills, not capital spending and engineering. ICI going forward will not be a monolith but a collection of businesses within a single framework based upon what we have always done well with some new commercial skills added' (Chemical Week, 1st March, 1997; 3).

The view of ICI Group as a solid and yet *stolid*, non-risk taking firm remains fixed in the minds of some managers. Miller-Smith believes this to be a legacy of the late 1980s and early 1990s:-

'ICI had come through the worst recession since the 30s, had survived demerger, downsizing and de-layering. People were uncertain, particularly with pharmaceuticals no longer there. Many managers doubted whether the new ICI would survive. You could feel that leeching into the bloodstream of the business' (Chemical Week 1st 1997, March; 4)

His practice of hiring new senior managers from outside the firm, is seen as a direct attempt to counteract this and he has avowed his determination to continue this and 'fill between 30 to 40 of ICI's top 150 jobs with new talent' (Chemical Weekly, 8th May, 1997;1-2).

Considering the major cultural issue referred to by Miller-Smith, as moving towards the 'market' and away from the technologically-pushed products, Miller-Smith comments:-

'ICI has been trying to push towards market-driven businesses, like Paints, for 15 years but not really with conviction. If you look at the ICI portfolio, it still leans towards the middle, intermediate, and the lighter end of paints and performance chemicals. ICI has to make a significant shift' (Chemical Week, 30th October, 1996; 3).

The Business-Mix of the Future

The business-mix being fundamentally re-shaped by Miller-Smith, is a constant topic of discussion amongst the business press and managers alike. Certainly as intimated, the overall strategic direction towards more market-oriented SC is clear, but the role each unit will play in this change and how they are to achieve this, less so. Asked in

an interview with the major trade magazine 'Chemical Week', 'how will the Group look in 2005?', Miller-Smith replied:-

'It will be much more international than it is today, with an even greater proportion of its businesses in the Americas and Asia. It will have an increasing focus on the Paints businesses. We'll stay in the remaining bulk chemical regional businesses as long as they can make money. Where we aren't certain we shall seek other solutions. There will be no big-bang, but we are moving progressively towards our goal of restructuring' (30th October, 1997; 4).

One thing that does seem certain is the role of ICI Paints at the core of the restructuring. This is acknowledged by all the managers and staff at ICI Paints who are acutely aware of the focus placed upon them by the group. As a senior R&D manager suggested:-

"They [the Board] are moving towards making paints the *banker* to underpin the group, it may not necessarily be the most exciting business, but it is relatively stable and has the most fluid market contact out of all the traditional ICI businesses. We consider ourselves to be a link to the past and the lynch pin to the future" (P. Taylor Interview).

This sense of tradition, stability is a common theme as the next main section shall demonstrate, within the culture of ICI Paints. Miller-Smith's first two big purchases, *Grow* in America and *Bunge* in Brazil, were both paint companies, giving effect to Miller-Smith's vision of ICI Group as international, and no longer Imperial, as well as demonstrating a commitment to making Paints the key market-oriented business in ICI's extensive, but radically altered portfolio of businesses.

6.6 Summary

This section has sought to demonstrate that far from simply being an 'empty PR exercise' the mission and vision statements of the ICI Group represent a formalised expression of concerns and issues considered important in the minds of senior and executive managers. These are supported, time and again, by the public announcements, comments, actions and policies of the senior staff.

The larger and more 'culturally important' issues are 'owned' by the firm in the sense that they become an important issue for everyone. Such issues as for instance, the environment performance, have an impact on the entire Group and provide a

common conceptual thread throughout the businesses. These broad beliefs are communicated throughout the Group and in some cases are supported by a system of policy measures, but often are left to individual interpretation. This interpretative style of management will be discussed in more detail later.

Lessons to be Learnt

As ICI's technologies evolved and the character of competition changed, ICI's parenting skills became obsolete. Indeed, a corporate 'child' can outgrow 'its parent', developing in ways that make the established systems of guidance and control, irrelevant or burdensome.

This negative development 'smouldered' within ICI's senior management for some time, until the 'shock' of a hostile take-over bid jolted the Group out of complacency, eventually leading to a demerger along a technological 'fault-line'. This enabled existing ICI management skills and expertise to be focused upon the remaining businesses in a more applicable manner. Upon investigation, the shock was not as immediate as it initially seemed, more a growing realisation, accompanied by a series of 'reaffirming' smaller events.

Various aspects of ICI's management hierarchy and governance have changed dramatically over the years, with more autonomy being given to the divisions and divisional CEOs. The Groups headquarters provides the overall corporate strategy and several common services, such as IT infrastructure and environmental policies. Joint R&D centres are no longer a feature of the ICI Group, rather, they have been replaced by several thematic technology groups and programmes that underlie and influence major R&D projects that are singularly too expensive or beneficial to the entire Group.

Senior managerial jobs have traditionally been filled by men 'groomed' through the ranks, usually with an academic background in chemistry, although this is changing.

The CEOs and Chairmen have traditionally been described as ‘men of vision’, guiding the organisation and informed by a host of committees and consensual task-forces, at a highly abstract level of management, allowing sub-ordinates to fix and interpret strategic goals and aims.

Tradition, heritage, a sense of cultural ‘ownership’ or cultural baggage, were all terms and issues regularly alluded to by individuals and were said to pervade all decisions and practices. Lastly, ICI Paints is considered by the Board to be at the core of the restructuring plans as the most ‘market oriented’ business of ICI’s portfolio of businesses; a fact of which the staff of ICI Paints are acutely aware. The next section describes the in-dept case study of ICI Paints.

6.7 ICI Paints

6.8 Introduction

This case study centres on the innovative and strategic practices of ICI Paints, a sub-unit of the ICI Group. The story highlights the centrality and unity of ICI Paints’ place within the ICI Group, the sense of patrimony as a source of continuity and coherence within its culture, the possession of a collective and disputed sense of ‘vision’ and the essentially political and personal pursuit of new technological opportunities. It shows the notion of a cultural heritage and innovative agenda of the company being fostered as a top-down process, with managers often left to interpret the precise strategic messages and directives of their seniors.

6.9 History, Structure and Size

ICI Paints, with its headquarters in Slough, UK, is a core component of the ICI Group, and has one of the widest geographical and product spreads of any international paint business. Its main areas of business are decorative paint, automotive refinish coatings and coatings for food and beverage cans. ICI Paints sell

in 120 countries, have 60 factories and manufactures in 25 separate countries. It currently employs 19,000 people around the world.

Decorative Businesses

The decorative businesses provide coatings for the interior and exterior of buildings, account for over half the world's consumption of paint and comprises three quarters of ICI Paint's overall business turnover. ICI Paints holds a leading position in most of the 120 countries in which it operates. The decorative paint business currently possesses several well-known brands such as 'Dulux', 'Glidden', 'Fuller', 'St.Clair', 'Valentine', 'Coral', and 'Alba'.

Automotive

Automotive refinish paints for re-spraying and repairing damaged vehicles are sold under the 'ICI Autocolor' brand. The brand, Autocolor, is a market leader in paints for the repair of damaged cars and the re-livery of commercial vehicles. Automotive refinish paints are supplied mainly to professional users by selected international suppliers and ICI is the market leader in this sector in the UK, Spain, China, India and Malaysia.

Packaging Coatings

In terms of sales, the packaging coatings business of ICI is a world leader in the specialised market for internal and external coatings for food and beverage cans and other metal containers. The business includes in its portfolio, packaging inks and laminating adhesives and coatings for flexible packaging.

6.9.1 Business Mix and Policies

Since purchasing Bunge Paints in Latin America in 1996, ICI has further strengthened its position in the Americas with the acquisition, in 1997, of most of the assets of St Clair Paints and Wallpaper of Canada. Also in 1997, ICI purchased

Superior Paint Manufacturer in Puerto Rico, giving the businesses further opportunities for growth in the Americas.

Dubbed ICI's 'Year of the Dragon' (Financial Times, 31st May, 1998; 35), 1998 saw the company open its second 'state of the art' paint plant in Shanghai. This was ICI's second largest decorative paint plant world-wide with a capacity some 50% greater than the group's first plant in China which was opened in 1994 and which was also built in a joint venture with Swire.

In 1999 ICI Paints continued with the acquisition programme with the purchase of Vina Paints of Vietnam, the acquisition of 'Colour Your World' the retail and wholesale decorative paints business in Canada, the purchase of a majority stake in the Pilawa Paint Company based in Warsaw, as well as current building plans for further paint plants in Thailand, China and India. These all demonstrate a commitment to make ICI Paints more international and the core of the restructuring programme.

Markets and Distribution

The Group traditionally sells its products through an extensive network of subsidiaries, associates and distributors. Speciality products are sold direct by sales forces, primarily to other manufacturers, but also in diverse markets to consumer-oriented manufacturers of branded goods and those involved in surfactants, lubricants and paper making.

Branded paints are sold through a combination of both independent retailers and the Group's own retail units, particularly in North America. Automotive refinish products are sold predominantly through independent distributors. Can coatings are supplied directly to beverage and food manufacturers in Europe, the Americas and Asia. These products are either marketed directly or through independent merchants, wholesalers and distributors who resell to small users.

ICI Paints Environmental Policy

I have suggested the importance of environmental issues to the ICI Group. The following section outlines, in more detail, the connection between Group policy and ICI Paints' policy. In a series of publicly available worksheets, separate shareholder reports and publicity documents, ICI Paints outlines its environmental policy, amounting to a series of strategies, initiative and 'declarations of intent'. The Environmental Vision of the policy is described as:-

'Ensuring that all our activities world-wide, are conducted safely; the health of its employees, its customers and the public will be protected; environmental performance will meet contemporary requirements and operations run in a manner acceptable to the local communities' (Environmental Report 1999;2).

There is no notion of a time-frame or specific technological direction that might be taken to pursue these goals, however, specific key areas where ICI is committed to improving the environmental performance are spelt out. The specific areas of the vision are as follows:-

Decorative Products:-

'We will strive to develop new products and containers that have minimal impact on the environment whilst maintaining our quality performance standards'.

The reference to 'containers' is a rare example of innovation, other than actual product launches, being considered by the management. Indeed, one of the greatest effects of paint on the environment is the solvents given off during the painting process. Much of the R&D work within ICI Paints in the last five years, has focused upon this area, aiming at offering water-borne alternatives or at reducing the amount of solvent in existing products.

Customers:-

'We will provide our customers with clear, accurate and helpful information on environmental aspects of our products, including guidance on safe storage, handling, use and disposal'.

ICI provides comprehensive SHE information on all products. Innovations such as Colour Cards, fact-sheets and computer aids are available at point of sale, and the 'Dulux Advice Centre', recently launched, provides advice to the public and trade information, on a range of topics such as applications and health issues.

Manufacturing/Distribution and Suppliers:-

'We will take practical steps to ensure our manufacturing and distribution processes are carried out to minimise their impact on the environment and work with suppliers to minimise the environmental impact of their own activities'.

The target set for all the Group's businesses is to reduce the waste from its factories by 50% against targets by the late 90s. All the personnel within ICI Paints receive a broad training course and information on environmental issues and are made aware of the Environmental Policy as a matter of course. The ICI Paints newspaper, COVER and the Decorative European Newspaper, DECOR, thrive with stories of individual initiatives that help achieve these goals.

Other Environmental Issues:-

Other environmental issues outlined are the disposal of waste paint and containers. ICI Paints sponsors 13 programmes within 'Community Re-Paint', which collects leftover paint and redistributes it, free of charge, to community groups, charities and other voluntary organisations. There were no figures available as to how successful this project was, but it was thought by many to be widely used.

Summary

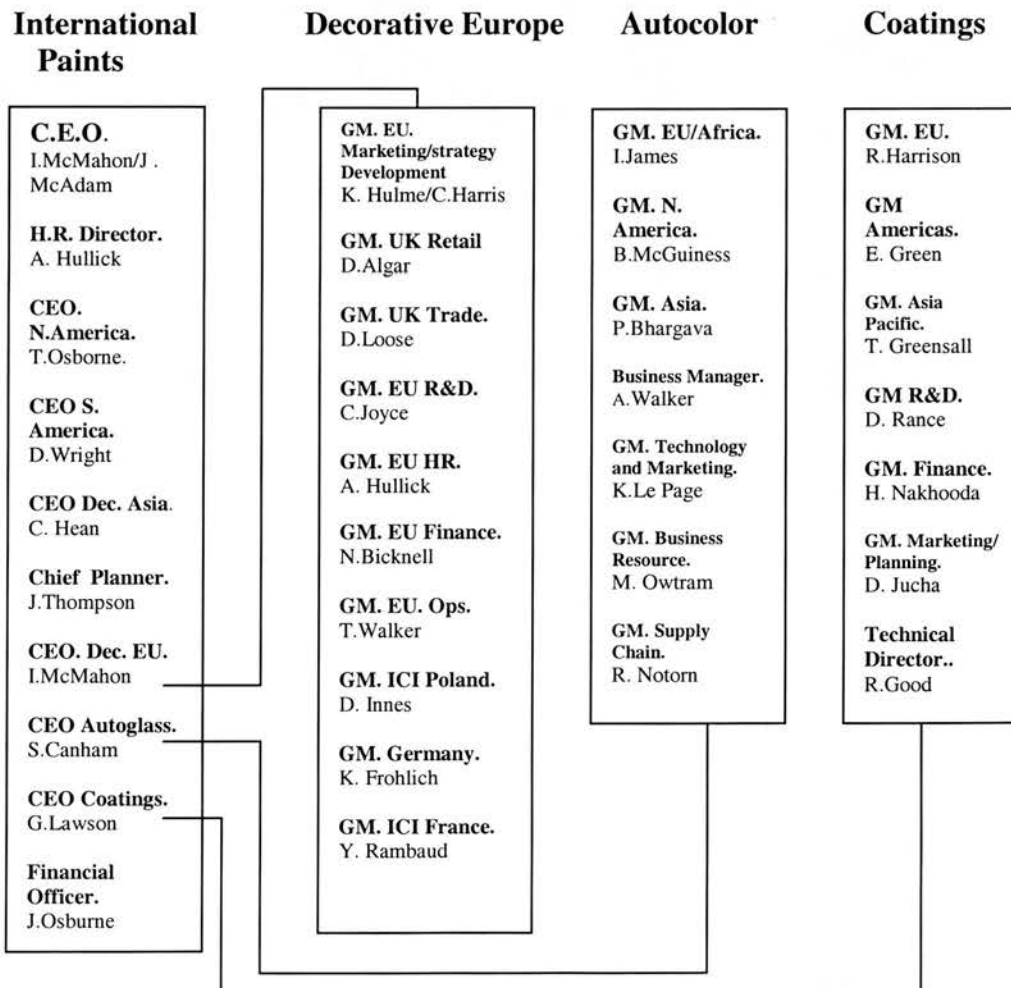
In summary, this section has demonstrated the expanding importance and size of ICI Paints to the ICI Group. Connecting the two are several broad policy programmes such as the SHE programme and ICI Paints' interpretation. This not only gives impetus to a host of environmental products, but also focuses individual's strategies upon the process and impact associated with production.

6.10 Organisational Structure and Key Personnel

The managerial hierarchy and structure is highly complex and devolved. It would prove impractical to describe, in detail, the entire organisation hierarchy. Instead, the aim of this section is to outline the important areas for innovation strategy, the critical personnel and the different and generic responsibilities of the commercial and R&D staff.

Figure 1, outlines the executive's positions, their areas of responsibility and the subordinate general managers (GM) responsible for the different sectors, areas and business functions. As I have explained, the Decorative Division is the biggest in terms of turn-over, and also size of staff, although this function did cut across divisional boundaries.

Figure 1: Senior Managers of ICI Paints



Each General Manager has a system of functional managers responsible to them. For example, in Figure 2, David Loose, the General Manager of UK Trade has a system of logistics, marketing information

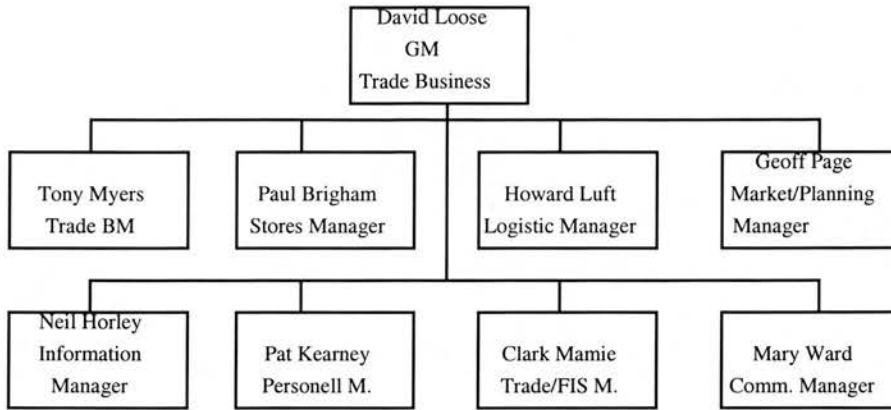


Figure 2: General Manager Responsibilities

and Personnel for the Trade sector of the Decorative Business Division reporting to him. These managers have a system of sub-ordinates, reporting directly to them, along more specific functional and area responsibilities, as Figure 3 shows.

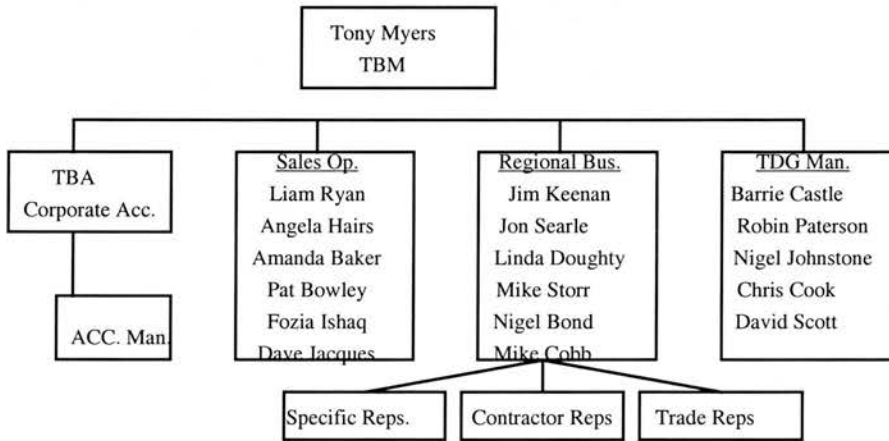


Figure 3: Trade and Business Manager

Two areas that were important for this thesis, were the R&D and Marketing/Planning departments. The R&D Department is structured as shown below.

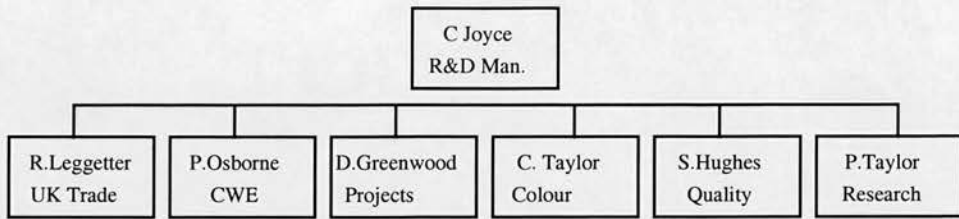


Figure 4: R&D Hierarchy

In this department, (with the exception of Ray Leggetter, who is specifically associated with the Trade division of Decorative Paints), the other staff are associated with various aspects of product or technology function. Sub-ordinate to these individuals are a 'pool' of junior research staff, who have crossed functional, technological and area boundaries on a project by project basis.

The Marketing and Strategic Business Development for Europe is structured as follows in Figure 5:-

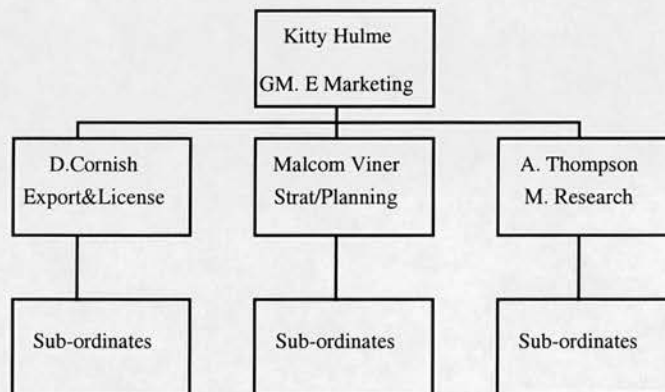


Figure 5: Marketing and Planning Hierarchy.

All the UK and European General Managers report directly to Kitty Hulme, who in turn reports to the International Marketing Director, Chris Harris. In early 1998 Harris moved to take over a Senior Executive position in ICI North America. Important to this thesis were the sub-ordinates to Malcolm Viner, as follows in Figure 6:-

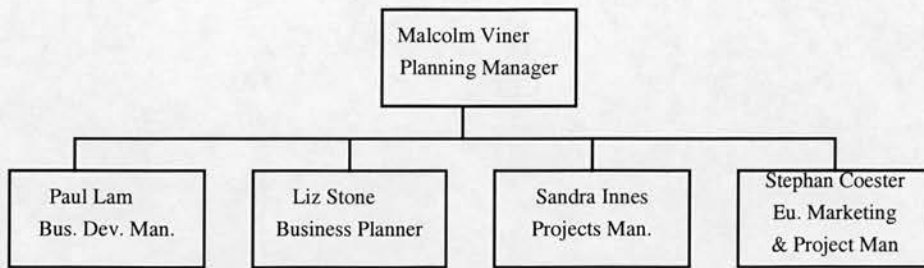


Figure 6: UK Planning Hierarchy

This group was responsible for the Decorative European Sector. Absent from this hierarchy, for reasons I shall explain, is the newly created Innovation Group, reporting directly to Chris Harris. This group was managed by Ian Kenyon, who had previously held a number of jobs within ICI, in Marketing and Sales, in particular various project management positions. Late in 1998 when, again, for reasons I shall explain, Kenyon left the UK Headquarters to pursue another senior job within the ICI Group. Stephan Coester, after a lengthy delay in filling the Innovation Manager position, took on responsibility for the group. The Innovation Group drew mainly from junior staff, from the R&D and Marketing Departments.

The Plant of Two Halves

There is a clear distinction between R&D and Commercial activities. This is historically based as well as from necessity. Physically, ICI Paints, is split into two halves by a main road running through the site (they are connected by an underground walk-way). On one side, the factories and R&D facilities, on the other the offices. In the canteen, as is often the way with manufacturing industries, there are separate places for people in dirty overalls to sit, and a 'them and us' attitude was often said to exist between the two groups.

Anyone entering either of the two sites would be immediately struck by the differences in attitude. The commercial office side is rather modern, with a pleasant reception hall, tastefully furnished and decorated with promotional displays of the latest products. There is a high-tech personal 'pass-gate' that lets staff into the rest of

the building, where visitors are treated with a degree of etiquette, always offered a cup of tea or coffee, often a choice selection of biscuits.

On the R&D side of the plant, one was met by a different set of circumstances. Although no less friendly, one had to register with the security guard at the gate, in much more austere circumstances, and was issued with a pair of plastic safety goggles and waited to be shown to the host.

There were markings across the road and pavements and all guests and staff were expected to follow these markings that directed the person in a 'safe route' all the way around the site. These markings were not always the most direct route and this researcher once made the mistake of crossing the road at an 'illegal' crossing point and was 'told-off', in no uncertain manner, by several people at once including, security, office worker and factory staff. Similarly, when attempting to find my way to my next interviewee on one occasion and wandering lost around the factories, I was told off in an extremely curt (and totally correct I hesitate to mention) manner for not wearing my safety goggles. The reason was the Safety, Health and Environment charter that has proved to be so important and influential to ICI. Indeed, at the gates of the R&D side is a huge board notifying everyone about how many injuries and 'safe' days ICI has had and the importance of safety at all times, as well as what to do if an accident did happen.

6.11 Senior Management Control

ICI's organisational structure and managerial control practices have developed in ways that reflect its history whilst attempting to meet contemporary demands for more transparency and accountability at the top layers of management. Indeed, the company's Annual Report and Accounts stress these particular codes of corporate governance.

The typical senior manager had been described by many people as a long-term ICI worker, university educated (often in chemistry based subjects, even those in non-chemical disciplines), but not particularly ambitious or possessing a market orientated experience. This is seen as changing, a direct result of the intervention of Miller-Smith. A good example of this is the CEO, Ian McMahon:-

“I have been recruited in from outside; culturally for ICI Paints this is quite unusual. When Miller-Smith joined ICI, he went public saying that he wanted to change the culture of ICI. He brought in new blood because we have a huge number of people who have worked for no one but us. This brings ‘real’ knowledge and understanding of the business but also ‘blinkers us up” (I. McMahon. CEO).

The company is considered rather paternalistic towards its staff and their careers, although again, this is changing:-

“In the 1950s, 1960s, 1970s and early 1980s, it was very paternalistic with jobs for the boys and rewarding ones own pockets. It was stakeholder driven. When Harvey-Jones arrived in the early 1980s and got rid of 50,000 people, no-one really spotted a difference in terms of work loads. Imagine the shock in the mid-1990s (under Miller-Smith) when it changed to a shareholder value. There is now much more accountability and no one is going to look after you and your job apart from you” (I. Kenyon Interview).

It is not just the recruitment of new managers but the training of existing manager’s, who had been with the company all their working lives, that has caused a good deal of discussion among the many individuals interviewed:-

“We are starting to get a composite of senior managers. I also think for internally promoted people, internal senior managers, they’re being put through leadership and development processes to ensure that people who have been here a long time are actually exposed to external influences perhaps more than they have been in the past” (Chris Harris Interview. Senior Marketing Manager).

The current organisational structure was said to provide a clearly defined structure of communication and reports, but often lacked any real career progression or structure. At senior and project manager level people often commented favourably that they were frequently being moved around within departments as well as other ICI units, and this helped them to understand many aspects of the business. Although each person was aware of their direct line manager, they would often be ‘loaned’ out to other managers. This fostered a conviction of the ‘empowered’ worker. Indeed, people suggested that they felt that they could speak their minds, without fear of ridicule. However:-

“Failure sticks. We are perfectionists in the sense that we do not recognise that to get 90% of the way quickly is enough. The final 10% isn't worth the navel gazing. We hate loose ends and everything has to be neat and tidy. There is a tremendous urge for self-flagellation” (C. Joyce Interview).

The expectation of ICI's leadership was that individual and accumulated competencies of practitioners will contribute to the firm's competitive advantage by fostering profitable ideas that push at the boundaries of innovation but are unlikely to overthrow existing guiding principles.

In short, the firm's history, top-down management approach to strategy and the account of decision-making and vision-building, reinforces the sense that ownership of projects and the cultural heritage of the firm remains a main focus point of reference for innovative behaviour.

Whilst the main section of this chapter, focusing upon ICI Group, put a good deal of emphasis upon 'history' as a guide to the heritage of ICI, the next section, focusing upon ICI Paints, emphasises how the specific beliefs and visions of the managers concerned create the innovative direction of ICI Paints.

6.12 Strategy, Vision and Innovative Intent

The ICI Group has sometimes been seen as a chemical company with a branded paints business attached. The news of Brendan O'Neil's appointment to the CEO position reinforced the notion that branded goods and a stronger market-focus, are now seen at the very heart of the company. Indeed, this is the first person from a non-chemical industry background to assume the role. At the forefront of a move towards a more 'market-focused' group is ICI Paints whose main strategy is described as to:-

“Maintain and develop branded products, leading market positions in the global business” (I. McMahon Interview. CEO).

Innovation as a source of competitive advantage is not mentioned by senior manager as an explicit issue in the overall strategic direction of the firm. Indeed, at the moment 'innovation' *per se* was said to be on something of a 'back-burner'. The 'flavour of the day', as one senior manager put it, was 'acquisition'.

The acquisition of Williams Plc was seen as most crucial to the policy of increasing brand visibility, adding many well-known brand names to the portfolio, broadening

ICI Paint's decorative product range to include wood care, metal care, adhesives and fillers. The purpose of this acquisition is multi-fold. Thus,:-

"The acquired business provided a strong entry position into European markets, which offers high growth potential on higher margin products" (C. Harris Interview).

Indeed, this acquisition, and others, were seen as critical to the ambitious sales and profits targets that have been set for ICI's world-wide paints operations in 1999 and 2000 (Financial Times, 27th March, 1998; 53).

Targets, Goals and Impetus for Innovation

ICI Group's Board are responsible, in partnership with the CEOs of the sub-units, for setting the yearly financial targets of each business. These are expressed in terms, such as the expected turnover, or RONA, but few guide-lines or direction is given for specific product ranges. These targets are left to the particular product and senior managers and, to a lesser extent, the CEO. Paradoxically, the senior managers of ICI Paints felt that although there were far too many rules and regulations handed down from the Group, they did not feel 'creatively stifled' and had a degree of freedom to pursue their own goals.

In terms of specific projects, the technological emphasis has changed over the last few years. Prior to the early-nineties, ICI Paints was seen as essentially a 'technology-push' company, in so much as R&D personnel would have only nominal input from marketers before developing a product that was then given to marketing to promote and launch:-

"Little actual consumer research was conducted to find out the needs and wishes. We gave, they accepted" (R. Leggetter Interview. UK Trade R&D Manager).

Both sets of staff suggest that now one must 'listen to the customer' far more than in the past. Consequently, as a senior R&D manager comments:-

“What happens now is that we get requests from the marketers. We also identify trends that may be occurring, particularly in environment, coming up with ideas of how to tackle them. But mostly, this, as well, is largely market driven. But if we spot an interesting technical opportunity or piece of chemistry then, we do have the power to run with it. It’s now done pretty formally. We will explore the possibilities and marketing comes and sees me and I can say what do you think about this” (C. Joyce Interview).

There is a ‘Blue Sky’ research unit, run by one of the few remaining career scientists, Dr Phillip Taylor, although they do not play as an important role as they once did:-

“It is just from day to day stuff really. We are relatively small, working on specific projects which we have - targeted in terms of the areas we are interested in. It used to be the case, that we were expected to generate many ‘spin-off’ firms and new products, but this is no longer considered the case.”

Indeed, this changing importance of marketing and R&D is seen as reflecting the focus placed upon innovation in a mature paints industry:-

“We are a very mature technology and over the years it has been relatively straight forward to innovate the product in the can. We have reached the point now where consumers by and large are relatively satisfied with paint in terms of what it does for them. I think we have almost reached the point where actually innovating in the product itself other than to maintain the image of paint is pass...almost” (C. Joyce Interview).

This can be seen as reflecting the common ‘mind-set’ amongst senior managers that ‘brands and image’ is the way forward for the innovation strategy of ICI Paints. This seems shared by most, although some managers offer an alternative route:-

“There are going to be some opportunities to innovate for environmental purposes, in terms of what we do to that paint on the wall that will make it better for the end-user, is not a lot. Where there will be opportunities for innovation is in niches in terms of fashion effects on wall, stencilling, paint transfers - these sorts of areas” (R. Leggetter Interview).

6.12.1 The Importance of Cultural Tradition

Staff see themselves as being ‘owners’ of the traditions and products of ICI, but see these traditions as changing. There is an expressed belief that they are there partly to develop and strengthen the values of the company for the next generation of the staff.

ICI’s staff expressed an impression of being proud to work for the company, if not rather frustrated with its highly conservative and stolid culture. There is a feeling that the company is terribly British, decent, if not a little slow, awkward and cumbersome. A comment early on within my interview schedule, suggested an

additional question asked in subsequent interviews; 'which film star is ICI Paints most like'. This was meant as a way of 'breaking the ice', yet nearly all interviewees suggested, without hesitation, Hugh Grant!, a bumbling decent, intelligent but awkward and introspective Englishman.

Miller-Smith and Harvey-Jones, often compared in their 'visionary' styles, were perceived as changing the 'inbred' British culture of the ICI Group, something that strikes a chord with many managers at ICI Paints. One senior manager commented:-

"The propagation of culture comes directly from Miller-Smith who has tried to articulate a vision for ICI and 'touch' the staff in a way that has not been done since the days of Harvey-Jones. Even then Jones did not do it like Miller-Smith who has modern communication technology. However as far as innovation goes- nothing! What he is doing is for corporate culture and portfolio management. We don't really know where we are supposed to be innovating" (M. Viner Interview. Senior Planning Manager).

The belief in a lack of a coherent innovation direction was espoused by many. Although ICI Paints was seen as having the capability to be *extremely* innovative, this has tended to happen in 'waves'. Historically certain particular innovative cultural characteristics have emerged in different time periods, supported by strong leadership:-

"In the 1970s ICI created the best innovation of all, the DIY market. It didn't really exist until Philip Hanscome [who later went on to become Chairman] spotted an opportunity. From that we added products that were technically advanced, such as non-drip gloss. In fact, the 1970s were typified by a whole stream of technically driven products. Mostly, it is all about Brilliant White Paints and Dulux. Over night we went to about 25 to 31 % of market share. This led us to think that innovative products was the thing. In the late 1980s it was like something out of James Bond. Then in the early 1990s there was a down-turn in the market, lots of cost cutting exercises and the innovative attitude dried up" (I. Kenyon Innovation Manager).

Within ICI Group, and ICI Paints in particular, innovation is seen as stemming from a culture, created top-down, supported and fostered by senior managers. This is not considered to be the case at the moment, because of the current corporate focus on divestment's and acquisitions.

Interpreting Miller-Smith's Vision for ICI Paints.

The responses to Miller-Smith's public comments on ICI Paints were varied and largely split among lines of functional responsibility. The CEO of Decorative Europe reported:-

"When I joined, I talked to Miller-Smith and considered some strategic plans and a number of targets were set, but it was only when I met the people that I understood what we had.. One of my criticisms is the desire to have a formula for everything. Miller-Smith understands brand-management instinctively, that is why he identified Paints as a core part of ICI. My background is also branded product businesses. The product is irrelevant - it's the commitment to the brand that counts" (I. McMahon Interview).

Whilst both 'sides' (R&D and Commercial) accepted that Miller-Smith was right to challenge the stolid culture of ICI, the degree to which he seems to be focusing on the 'soft edge of marketing and not the hard edge of technology' is hotly disputed.

Harris recalled the presentation where he heard Miller-Smith vision for ICI Paints being considered at the centre of the group for the first time. The notion was not presented as a directive, with names, dates and strategies attached. Rather, he left it up to individuals to take up and interpret his comments. He considered this and subsequent pronouncements to be:-

"(...)rather loose at the detail end. He is saying everything we already know without any direction of how we personally achieve it" (C. Harris Interview).

All staff, however senior or junior, suggested that Miller-Smith's vision of the new ICI Group as presenting an opportunity for ambitious individuals, was making an outstanding contribution to ICI and their own careers.

Core Business of ICI Paints

The different views of the business and innovative processes of commercial and R&D staff is further borne out when asked 'what is ICI's core business'? The R&D people, were more inclined to say:-

"ICI is there to make paint and this will never change" (D. Taylor Interview. Regional Manager).

Whilst senior commercial manager's typically suggested:-

"ICI is there to provide shareholder value" (I. McMahon Interview).

This distinction can be dissected further. The junior members of the marketing disciplines and the Innovation Group tended to reply along more conceptual lines, such as to 'enable the customer to express fashion statements' or 'to provide colour into peoples lives'.

These comments reflected the function the individuals were required to spend most of their time doing. Certainly, all the staff interviewed had, at various times, an input into the technological, commercial or marketing process. Indeed, a degree of cross-functionalism is something that managers prided themselves on. The R&D personnel however, mostly concerned themselves with how to develop and manufacture paint, the Innovation Group were minded to consider the process more conceptually.

Increasing Innovation Capabilities

As I have suggested, there did not seem to be much agreement among senior managers, that sustaining competitive advantage requires continuous innovation. Once a product was 'signed off', that was it. The product simply sank or swam.

R&D staff believed that their ability to make major technological leaps in the past had underpinned ICI Paints long-term competitive advantage. The incremental products that are now, mostly introduced into the market place over several months, are not seen as sufficient to place ICI Paints where they wish to be, either in terms of a market or technological capability.

Some managers did recognise, and explicitly state, that extending the firm's capabilities from familiar to unfamiliar technology is necessary for it's continued success, though problematical. These were, however, in the minority as most seemed content to focus on existing capabilities which remained confined to considering

novel chemical processes and techniques. However, one senior manager took on what was to amount to a 'personal crusade' to change the firm's perceptions towards a much wider range of new technological capabilities.

Harris' Revelational Vision.

With some humour, but also a certain degree of interest, many senior and junior managers talked about Harris' vision of a new IT literate ICI Paints. The anecdote, told in quasi-religious tones, was in terms of a 'revelation', occurring to Harris while on a management training course at Harvard Business School. That the vision was described in *spiritual* terms is both interesting and relevant, pointing to a concept that is both highly radical and 'against the grain', as well as personal and requiring a 'degree of faith', As Harris explains:-

"The idea is that every five years or so, senior managers should go to these schools to get a window on the world broader than just ICI. I have attended many, but this time it was 'road to Damascus' stuff. I had not appreciated the speed at which the IT Revolution was coming. The impact on business, industry and markets and in the 'ways of doing things' is going to be huge. I saw all this and my mind was opened to the way in which things could go, the way in which distribution channels were going to change and the way in which people could access information immediately" (C. Harris Interview).

According to Harris, the process of how this 'vision' came about, has a lot to do with how senior managers 'should' have their finger on the broader trends in society, creating and influencing the direction of their company. As he explains:-

"One of the important dynamics of business is 'reading the tea-leaves' in terms of the external environment and how it impacts on you. You have to think many years ahead in terms of where you are going. I think that the understanding of these changes and the changes in technology is what you need to look at for the long-term vision. From this you decide on your formal or informal strategy of where you are going".

To Harris, his notion of a future IT literate world is clear. He sees massive changes in everything from distribution, to sales, to advertising, and does not see ICI Paints yet aligning itself with this world. By 'seeing' the future, and increasingly formalising it into notions of mission, strategic intent and so on, he perceives the mechanisms in which it *can* become a clear strategy. He puts clear time frames upon this process of formalisation:-

"At the moment my 'complete' vision is a long way off, say 10 years, although obviously there will be many incremental changes along the way that we need to keep up with. Over the next couple of years or so, I want to form a shared-intent to do something about this with other senior people, creating a more 'strategic vision', if you like".

Disagreements over Strategy and Vision

Most of the other senior managers do not share Harris' enthusiasm for this version of events. McMahon, for example, comments:-

"Sending people away for indoctrination at Harvard or anywhere else, when they have spent their entire lives in one business is crazy. I can understand the desire to give them exposure to different ways of business but he went there after 20 years experience and after three months came back a complete convert to IT. It is almost like a converted smoker - one extreme to the other. Yes, internet shopping will grow but in five or ten years you will not see a disappearance of the B&Qs. We would be better off striking a deal with Mars, for example, and saying 'take this guy for a year' and we take one of their chaps" (I. McMahon Interview).

McMahon is no less visionary, rather his perception of future business is simply coloured differently, stemming, as it does, from the huge significance he places upon the shorter term strategic goals of a more product-oriented approach to branded-goods. Rather than the more theoretical approach offered by business schools he suggests that what is required is a broader 'hands on' experience with other branded goods firms. His claim that there is no depth to Harris's vision, as a reason for discounting it, is a telling one. To McMahon,:-

"Future Innovation and technology that is not 'grounded' in the 'real' world of numbers and costing and so on is not any good to us. It is not a marketable product but just pie-in-the-sky and more often than not, a waste of time and money. Innovation is for real not dreamers"

These strongly held differences of opinion of what amounts to vision, strategy and intent, creates a certain amount of tension amongst senior staff and Harris expressed deep reservations about his vision for ICI Paints and the difficulty in getting others to take it up. There was no formal training programme to encourage the extension of IT skills. People happily professed to being computer-illiterate and, at least at the start of my project, there was only one computer connected to the Internet, housed and isolated 'in quarantine' within its own walled-off booth.

Senior manager's concepts of 'vision and strategy', concerning different innovations and technologies, also differed greatly from each other. For Hulme, having a vision for innovation is:-

"Something plain, public and understandable. I don't think unless you understand the concept behind it, you've really got a strategy. So part of it is the communication. Making pronouncements that go into marketing brochures is not vision. They are more a mission statement, unless groups of people with a shared vision make it happen" (K. Hulme Interview. Senior Marketing Manager).

This reflects the view that a vision must be shared and, in a sense, 'owned', before it can become more formalised into strategy. Hulme suggests that a mission statement can have an effect on people's belief but that is a far cry from understanding, discussing and 'making it real'. Echoing Harris' comments concerning how visions and strategies are formed and are related, she continues:-

"Maybe vision is created more in the middle of a firm. The message comes down, reflects off the depths of the organisation, and then starts to make changes. It may not end up with what you'd originally planned, because people's own notions will change it. Vision and strategy often requires our interpretation by our experiences to make them real. They come down from the top but also require checking by the managers as juniors seek reassurance, to know that they are on the right tracks".

To Hulme, and other senior managers, part of their function is explicitly to interpret and change a firm's vision about where the firm is going, what products to pursue, its history and traditions.

Both Hume and Harris and other senior managers, in both commercial and R&D, suggested that they felt perfectly able to influence strategy locally (that is to say at the project level), but did not have an influence on major strategic decisions at more senior levels, such as the ICI Group. This was the job of the Chairman and other CEOs.

Opportunism

Continuing with this theme, many commercial managers talked confidently about the opportunity afforded by ICI Group and ICI Paints in its goals and vision. They did

not feel the need to constantly refer to the written word, indeed some of them were not even sure where the mission and vision statements were written down.

Several managers did remember several years ago, getting together and constructing a vision and mission statement. This was considered at the time to be the 'in vogue' thing to do, and there were posters printed and put up all around the building. This

was two to three years ago, however, and I was not able to find anybody who could accurately remember the exact wording of the poster, although the gist was something along the lines of, 'be the number one decorative coatings firm in the world'. Not much for several days work really' (M. Viner Interview).

Many R&D managers did not view ICI as 'opportunistic' or 'flexible' in its strategic aims. Taylor felt that having a vision, as opposed to a strategy, is more a case of having a selection of things to prioritise and re-prioritise in response to markets and opportunities as they come along. He commented that ICI does possess a degree of 'focus and direction' but this was often expressed in more abstract terms, rather than a formally articulated business plan or strategy. He went on to justify this by suggesting that to have a flexible vision was 'meaningless and empty':-

"A real vision is about being the best producer and differentiating on product quality and service. Differentiating on product is probably the most difficult vision to maintain as competitors will sooner or later catch up and even pass you" (D. Taylor Interview).

In addition to 'opportunism', employees, particularly managers, saw their job as guiding people and the firm in particular, and providing everyone with a sense of commercial orientation. Managers also recognised that many of their strategic aims contained unsolvable dilemmas, For example, the focus on the short-term can compromise, the long-term aims, and vice versa. Dealing with these dilemmas was seen as a main area of personal judgement.

Several areas of contention, other than the conceptual disagreement outlined above, could also be deciphered and were never far from the surface of discussion. There were the general concerns and conflicts such as, departmental disagreements, product

launches and leadership style as well as the more specific disagreements, such as the notion of branded goods and the creation of the innovation group. The next five sections shall outline these issues in more detail.

6.12.2 Organisational Innovation and Conflict

Inter-divisional tensions and conflict

Most organisations have inter-departmental tensions and this was no different within ICI. They appeared to exist particularly between the commercial and R&D functions. As one person put it 'it's almost like them and us or working-class and middle-class strife'.

In general both groups felt that they were not totally 'appreciated' by the other. This word often emerged in discussions, albeit in a good humoured way. There was said to be much covert political behaviour among managers and some suggested that their colleagues were out for themselves.

Many junior staff, albeit quietly, question the competence of their superiors, citing as evidence that the company does not communicate to them the long-term direction they were taking and that the company is forever reorganising, leaving them unsure where they stood as far as their careers were concerned.

New Product Release Tensions

Conflict is highly evident within the development of new products. The impetus to innovate had no regular starting point but often began with a directive or suggestion from market-research or marketing department about the possibility of a new product, focusing upon the 'desire' for it by a certain group of customers.

There is constant pressure on R&D to come up with the right product-mix and delivery schedules and a pressure on sales to develop suitable targets. Manufacturing

did not want to be seen as the ones failing the company. Thus, the pressure they experienced often meant that they would release new products to Sales and Marketing departments that personnel in R&D consider 'half-baked'. Similarly, it was suggested that products were often launched without listening to what the European market required:-

"We are constantly told that we should be looking to our broader markets. The whole point of best practices like the Stage-Gate Tool [a project selection tool, explained later] was to produce a coherent range of products, instead of just bits and pieces, here and there. With so many marketing people rushing about, all trying to be 'golden boys' and only thinking of their careers, it's difficult for us to do the right job, in some peoples eyes" (C. Joyce Interview).

A good example of this ad-hoc nature to product launches, was the non-drip paint products produced for Germany. These were produced in the older manufacturing building on site, on the only production line that could be adapted to accept the 'square' boxes in which the paint was delivered (it was released in Germany with a roller, hence the shape of the box).

This was a source of great frustration to production staff, as *only* in Germany was this product successful. It was produced in small batches that were not cost efficient, causing the staff a great deal of technical problems, as the boxes tended to jam the production-line requiring some staff simply to watch the production line all day:-

"Why can't the Germans have the paint the same as everyone else. I'll tell you why, because it looks good on the EU Sales Manager's sales figures, that's why. In fact it doesn't make any money, overall, at all" (P. Smith Interview. R&D Manager).

However, this ad-hoc nature to product launch was not criticised by all. Indeed, getting products out fast, and 'seeing what happens' is what some on the commercial side would like to see more of, despite the conflict:-

"When we tackle a new problem its usually ad-hoc. We learn as we go along and then we will get pointers about were we went wrong, what we have done well and what we haven't. From this we formulate procedures about how to produce it better or market it better and so on" (D. Algar Interview Senior Marketing Manager).

Algar suggests that in an 'ideal' world, there should not be a need for there to be an initial rush to acquire new knowledge by trail and error:-

"ICI Paints should be wise enough, and have the right systems in place, to ensure that the requisite knowledge is known in advance of the product launch, but this is not an ideal world" (D. Algar Interview).

He sees the problem of 'launch chaos' being the result of certain people being too accepting of the commercial situation because of the ways it has been for so long. The conflict and bad product launches are a result of failed co-ordination, rather than an avoidable part of a poor organisational learning process.

The 'Profit and Loss' performance goals for R&D was also a major source of conflict between departments and individuals. There is a significant pressure on this group to get new products out of the door quickly and sales people are equally as keen to see new products in the field. Consequently:-

"There is a relatively high incidence of products leaving us with design faults, such as PaintMate which leaked from its packaging or 'effect paints' that leave us without all the special tools" (D. Leggetter Interview).

Although in principle, there are formal procedures for R&D to release new products for launch, these are often compromised by the fierce performance criteria. Leggetter suggested that products were often not being tested to a suitably exhaustive range of conditions, due to time and cost constraints.

Leadership Style and the Support of Culture

The notion of 'innovation gate-keepers' was one often raised by the interviewees. These were said to be people, often not directly charged with overseeing innovation matters, but who nevertheless have a disproportionately large effect on the innovation process of the firm. The new CEO of the decorative business sees himself as a man capable of 'squeezing every ounce of profit out of this company'. He elaborates:-

"I have been parachuted in to fix it [ICI Paints]. You do not have six months to look at it and think about it. You get in - take a week to ten days to decide what you are going to do - then hit it hard. The fact that you do not have a lot of time means that you really have to go in aggressively and take the risk" (I. McMahon Interview).

This belief came with a rather abrasive managerial style that was not to everyone's liking, although some saw it as the 'kick up the pants' that ICI Paints needed. McMahan was also critical of the existing firm's business culture of ICI Paints:-

"There is a tendency for us to say 'we have some good years and some bad years' and you cannot do any better. I am a firm believer that if the culture is challenging and people are restless, they never just accept that. There has to be a trust between the individual and the organisation that if the risk doesn't come off they are not going to be pilloried. We see ourselves as very gentlemanly, highly ethical. There is nothing wrong with this but instilling a bit of fear would be more attractive from where I am sitting".

McMahan was seen as the most important 'gatekeeper' in fostering an innovative culture but by no means the only person. Two other individuals were cited as important people having an effect on innovation; Harris and Hulme. Indeed:-

"Kitty Hulme is probably the most significant person in terms of - nothing moves now unless she signs it off. This is the politics that comes in to the lobbying that goes on before the innovation meetings, in terms of broaching the subject with her, because you know that if she supports the idea, it is through. This is not right. It is not using the best practice, but it happens" (I. Kenyon Interview).

This echoes the political nature of innovation within ICI Paints and was seen as a constant source of frustration, but also accepted as a normal part of business culture. Harris was also seen as a 'champion' of innovation. Someone who you could go to with 'off the wall' ideas. Indeed, Harris was instrumental in the creation and set up of the Innovation Group.

6.12.3 The Innovation Group

The role of the Innovation Manager and the Innovation Group was, at its creation in 1996, broad and flexible in task and scope. The aim was to address what was seen as the lack of emphasis, and organisational difficulties, with the process of innovation, as well as to aid several current organisation-wide innovations that were not performing as expected. For example, 'On-Time-In-Full (OTIF), ICI Paint's version of 'Just-In-Time', had been in place for a year, but was still having major difficulties in its implementation and practice. Also, the group's general scope was to:-

"(...) foster a more innovative culture that could produce, not just one or two, but a stream of innovations to the market place, faster and better than we were doing" (C. Harris Interview).

The attitude of the firm towards innovation was in the 1990s, marked contrast to its attitude towards innovation in the mid to late 1980s.

“In this period the company was humming with new ideas and success. People were proud of our innovation record. Now it seems to be characterised by ideas such as ‘get someone else to do it’, ‘more trouble than its worth’, ‘risky for my career’ and this gets in the way of normal business” (C. Harris Interview).

The impetus for creating the innovative position also finds its genesis in the corporate re-structuring by Miller-Smith. His goal of ‘change’ was to be fostered by both acquisition and organic growth. The organic growth from ICI Paints was potentially to come from increased rates of new products.

The Innovation Group was headed by Ian Kenyon, who had held various sales and marketing positions within ICI Paints for the last decade. The Innovation Group drew from mostly junior staff in the R&D and Marketing Departments of the Decorative Business Division.

Kenyon was considered, by many, to be an ‘up and coming star’ of ICI. His enthusiasm and experience allied to his political and social skills were regularly cited as the reason why he was chosen for the job. Similarly, his ability to maintain an extensive network of ‘innovative contacts’, including myself, was cited as crucial to be able to perform the job satisfactorily. Initially, Kenyon suggests:-

“Although I had a broad remit, what the actual job entailed was unclear and took some time to formalise into what I thought I was supposed to be doing. I see this as a championing role primarily, not to be the only ones creating the ideas, but being more a focus point for other people. They can pass ideas to us and we will develop, expand and nurture them until we are ready to run with them”.

The attitude towards this group was highly mixed, ranging from ‘great, we can pass all our ideas to them and they can develop them’, to ‘what do they think *we’ve* been doing all this time’ and ‘I think the jury is still out on whether they make any difference’. Kenyon reported that initially, although warily, most managers were highly enthusiastic and supportive:-

“The senior managers supported it by creating the post. Other people seemed to support it by giving us their time and to an extent their ideas and experience. We have tried to introduce innovation campaigns which encourage people to forward their ideas with *quick* feedback. Ideally it is a pincer

movement where you have campaigns coming through from bottom-up, the CEO saying this is wonderful, and people saying 'here are my ideas' ” (I. Kenyon Interview).

This demonstrates that, as suggested previously, innovative ideas have often been seen as the preserve of the more junior staff members. The function of the more senior managers is to marshal them within a strategic and coherent direction. It also shows how seemingly ‘fragile’ innovative ideas can be, with Kenyon outlining the importance of quick and regular feedback, to let staff know that they are thinking in the right directions. However, a year after the position was created, ICI Paints appointed a new CEO and the positive mood quickly changed.

Soon after his arrival, and having had every manager ‘justify’ their roles and responsibilities within the Innovation Group, McMahon expressed his deep dissatisfaction with the group's role in ICI Paints and in particular with the Innovation Manager. From this time onwards the Innovation Manager expressed a growing sense that his position in the company was becoming more untenable and that ‘the writing was on the wall’ for him. This proved to be the case. As Kenyon explained:-

"At the end of the day, McMahon, does not walk the talk. He talks generally about the need for innovation, and how supportive of it he is going to be, how we need to be more risk averse - 'BOLLOCKS'. From his actions and words he didn't seem to mean a word of it" (I Kenyon Interview).

Without McMahon's support the job became effectively nullified. A reason given by Kenyon was that he was not senior enough to launch his own projects without the explicit go-ahead of McMahon, so what was the point of spending all his time and creative efforts when they were to be thwarted at a later stage.

Kenyon suggested, with some bitterness, that the purpose of the group was *not* just to launch products. Certainly, the group aimed to develop products to a certain stage, but then pass them on to other existing project managers. In this sense, McMahon would *never* see the benefit of this position. McMahon, however, has a different side of the conflict to tell:-

"I was astonished when I joined this business and found that I had an Innovation Manager. I have never been in a business where we had an Innovation Manager. Everything that I saw in my first two

months suggested that the Innovation Manager and the Group, including his superior, and everything that they had generated, was a complete waste of time".

Indeed, McMahon was very open about coming into the job with prejudice. He continues:-

"When I came in to this business, they had been working at all these things for a year. They had a great display to put on and were enthusiastic but what had it done for the business. It confirmed my own personal prejudices. The second the Innovation Manager was appointed the marketing people beavered away, came up with great ideas, half of which never went beyond the concept. Like it or not you can have all the creativity you like but you have to be able to convert it into something practical that the company is going to recognise as worth investing in" (I. McMahon Interview).

Similarly, he suggested that the very presence of an Innovation Group, probably has the effect of stifling innovative ideas, as people would have a tendency to say 'great someone else is taking care of innovation, we can get on with other things'. This was one of the very notions that the group had originally been set up to challenge. He also made it clear that he was very supportive of innovation but 'highly annoyed' that the firm thought that it should have a dedicated Innovation Manager when *everyone* should be innovating.

Although the general feeling of frustration felt by Kenyon continued for a year after McMahon joined, a time during which several projects were successfully started and completed by the group (such as the lightbulb campaign to reward people for novel ideas), Kenyon's role became so untenable that he left ICI Paints, in 1998, to pursue a marketing position in America.

Although ICI Paints immediately sought a replacement (only advertising internally), the job lay dormant for six months until, now under the control of the International Strategic Planning Office and Malcolm Viner, Stephan Coester was appointed to the position. It has a much reduced function. Although still called the Innovation Manager, and is now specifically tasked with attempting to find joint innovative synergies within ICI's European Paint companies.

The last area of conflict requiring discussion, a subject that constantly arose during interviews, was that of how best to handle the notion of brand management.

Premium Brand versus Own-Brand

ICI has at various times, flirted with producing paints under license for other companies. This is, at the moment, considered a complete anathema to everything that ICI Paints is trying to achieve in terms of market share and competitive advantage .

Indeed, who ICI Paints should see as their main competitors and where the main competitive 'battle' lies, is a regular source of disagreement. At present, the major players in the home decorative market are Dulux and the big DIY stores with their own cheaper store brands. The competitive issue is seen as 'one of attempting to promote brand loyalty for ICI's premium priced products' (Hulme Interview):-

"We have lost a close relationship with the customer, and the retailer is now best placed to develop a new one. There is a battle at the moment for the hearts and minds of the end-user. When you see B&Q launching their loyalty Clubcard, that is a nail in the coffin of the manufacturer. What Dulux does successfully in the UK still, just, is keep bringing in people through the door" (I. Kenyon Interview).

There is also a great deal of pride expressed in the brand and a feeling that, even if it did make commercial sense to make paint under someone else's name, it would be something done with a great deal of regret.

The competitive advantage of a 'premium' product and brand position is said to be worth to the market somewhere in the region of 20 pence per litre. This is down from the mid-eighties when ICI were obtaining a 50 pence per litre premium. Milking the premium brand is a source of great contention amongst the Senior Managers:-

"A typical mark-up of a successful business is around 35%. ICI, in the UK, is around 82%. What that says to any accountant would be you are milking this business too much. Unless you sustain a premium in the market you are not a premium brand. If I walked into B&Q, why would I buy Dulux as opposed to own label?" (D. Algar Interview. Senior Marketing Manager).

While using distributors such as Homebase and B&Q is seen as a 'weakness' to ICI Paints by nearly all of the sales and marketing force. It is also accepted as a 'necessary evil', as the move from high street shops to large out-of-town superstores is *the* biggest change in the industry in the last 20 years, and 'ICI had to be a part of it'. Indeed, the credit for persuading ICI Paints that this is the road down within

which all future strategy should be planned, is given to the ex-Group Chairman and ex-Paints Chairman, Philip Hanscome. At the time when ICI first became involved there were no more than one or two 'Big Sheds' in the entire country:-

"Philip Hanscombe. He had the vision. He said here is a new opportunity and the marketing skills to take the technology and give it life. He was at that time a marketing manager but he rose to be Chairman" (I. Kenyon Interview).

The 'big shed's [B&Q and Homebase] are considered by ICI's most important customer as well as their biggest competitor:-

"They are parasites, feeding off the brand name of ICI" (D. Algar Interview).

What to do about this near monopoly of ICI's big accounts is hotly debated. The arguments range from, acquiring a 'big shed', starting ICI's own high street shops, as they do in the USA; trying to by-pass them as distributor altogether and selling directly to the consumer by Internet. All of which is also tinged with a sense of realism that the DIY stores are far and away ICI Paints biggest customer. Thus, the broad distinction remains between those managers who want to 'keep them sweet' and those that want a more aggressive stance.

Several important issues arising out of the conflict within the innovation process are the importance of 'social skills' and 'networks of people', and the 'political nature' of the innovation process in ICI Paints. These are discussed in the next two chapters.

A Premium on Individual Initiative and Social Networks

In pursuing individual initiatives, departmental and project managers, as well as R&D personnel, tend to give a relatively low priority to co-ordinating their actions with each other. For example, the manager of the Market Research department, a department whose importance and stature to the firm seems to have grown in recent years, commented that:-

"How I set up, manage and run my department and pursue my individual and self-generated projects, has little effect on others. Well, actually it has a great deal of effect on the others, but I get them

involved after I have developed it to a point where I'm happy with it and not before" (I. Thompson Interview. Senior Market Research Manager).

As he suggests, he only initially involved his colleagues 'in so far as asking questions such as, would you be interested in this type of project'? There was little or no prior discussion as to how people might promote the project or products and where this product might fit in with existing products and how production was going to make and schedule the product?

This 'isolationism' was cited as a source of general frustration to the R&D staff, though not so much by the commercial staff. Indeed, it was often recorded by the commercial staff that Market Research was excellent and should, broadly speaking, be 'left alone to get on with what ever it is that they do'. Indeed, it was noted that success in a product's launch was often attributed to this departments far-sighted approaches and failure was often blamed on other departments, especially R&D.

While there seemed to be little interest in departmental integration at the initial conceptual level, co-ordination of individual initiatives often seemed to rely heavily on informal non-departmental social networks. Indeed the Innovation Manager was often described at being 'highly adept' at the use of his broad social-networking skills. The members of his group were personally chosen by him, due entirely to his social contact with them on previous projects. Many other people also noted the utility of networks as a way of getting innovation projects started. One commented:-

"People thrive on networking in the informal and unstructured sense as it often exists in ICI projects, with unclear rules and roles. They can dodge and weave away around rules and people, because this is hard to police and seems to go on all the time" (V. D'ath Interview. Junior Member of Innovation Group).

The social-networking side of innovation projects also has it downside with people often being described as being 'a little too good at networking and at starting rumours to get things moving'. This was said to have detrimental effect on projects and what people thought of the practitioner's involved.

People commented on the need for more formal-methods of innovating as they suggested that, although social-networking was very important, it did not necessarily

always make for the best innovation. Thus, you could be a good innovator and a poor networker. Allied closely to the notion of personal and social skill was the notion of political behaviour.

The Role of Political Behaviour

The period of this research, more or less, coincided with what several people called the 'increased politics of innovation'. Traditionally, innovation was the role of the various project and area managers. The creation of the Innovation Group served to blur this tradition and opened up the role of innovation as a 'political re-organisation of the map' and people's individual and departmental role within it (Algar Interview).

This is not necessarily to be thought of as a 'selfish' exercise. Although regularly described as a 'bit of a boys club' and 'not what you know but who you know' (Hullick Interview. Senior Human Resource Manager), the innovative culture of ICI was also considered 'non-egotistical' in the sense that it was just a way for you to 'get on' rather than maliciously harming other people's prospects.

Some staff did claim that they did not actively seek to participate in departmental and political behaviour and pursue 'grandiose games' (D. Algar Interview). This suggested that there were more than enough opportunities to further one's career within the company without having to resort to such political point-scoring. Nevertheless many people reported that the total reverse is the case and political 'one-up' behaviour was very much the 'norm'.

At a personal level, comparisons between individual characters were made in private, evaluating an individual's personality and past performance and skill at managing interpersonal relations. This involved making highly subjective judgements about an individual's strengths and weaknesses that could be seen to undermine the position of the person making the statement, as well as the person being talked about.

People were most often compared with one another in similar roles and on different projects. During many interviews, people 'jokingly' asked what others had said about them. Often personal comments were made about colleagues and then a series of questions were asked such as 'have you interviewed such and such yet' and then 'what have they said about me'? Regularly statements made in haste were qualified and a concerted effort to retract them followed.

Power and influence appears to broadly reflect the authority structure. Any deal-making or pursuit of personal interests seems to be subordinate to respect for the established 'pecking-order'. It was rare to voice a *highly* critical opinion of superordinates although, as commented earlier, it was more common from young, junior staff. When it was, it was usually over something specific that the individual felt very strongly about.

Similarly, there was said to be a great deal of political behaviour in the establishment of department or functional boundaries. Joyce suggested that the juxtaposition of the importance of certain departments with potentially overlapping scope for development and authority, leads to a natural 'jockeying for position' and that the politics within ICI Paints regularly has the effect of 'curtailing development of potentially good projects'.

In particular, Kenyon noted that the Market Research department is tasked with concentrating on the role it presently conducts, but that it could spread its operation to a more pro-active or exploratory one. This would, however, lead to the cannibalisation of other functional areas of the firm. For this reason, Thompson was under an un-written social command to keep his focus on his day-to-day tasks.

ICI did not seem, on the surface at least, to be a firm of cut-throat individuals, but neither did everyone choose to politely give way to everybody else with a conflicting opinion. There is, in fact, a good deal of political behaviour and one of the main manifestations is the reaffirmation of territorial claims between divisions. Similarly,

innovation was seen as a method of gaining credibility or personal 'kudos' for oneself, by being responsible or associated with successful projects. Because of the Innovation Group assuming responsibility for innovation, for many that possible method of 'self-kudos building' had been taken away.

This section has sought to show the influence of the social and political issues that arise within ICI Paints. Whilst many of these issues may be subconscious, their overall effect has been acknowledged as highly important by the senior managers.

Indeed, this was the main issue behind the strong focus for a more formal system of rules and procedures for the development of innovation (in particular the usage of the Stage-Gate analysis tool), as it was felt that the very ad-hoc nature of political and social forces upon the innovation process, was leading to too many incoherent and badly planned product launches.

6.12.4 Decision Making and Rules

It is clear from the fieldwork, that the organisation's managers wished to be seen in control of the commercial situation facing them and to demonstrate clear and coherent leadership over the strategic and innovation process. By giving a transparent description of the managerial system of decision-making concerning project selection, the senior managers espoused a belief that control exists hand in hand with the notion of 'empowerment' of the individual:-

"The word *empowerment* encapsulates nicely many of the changes we hoped to bring to our project and innovation decision-making process. This lies easily with our stated policy that, wherever possible, major decisions should be made by those to whom decisions relate. This goes as much to the project managers, as it does for our subsidiaries" (C. Harris Interview).

This demonstrates, again, the notion that once a belief has become part of the firm's 'mission' or 'strategic vision' (that is, a formalised shared-belief) it is adhered to. Perhaps the most detailed and important formal decision-making process is shown by the 'Stage-Gate project selection tool'.

The Stage-Gate Project Selection Tool

Based on the work of the A.D. Little Consultancy Group and introduced into ICI Paints by McKinsey and Co Management Consultancy, the tool aimed to give a quantifiable and transparent 'check-list' to better facilitate, project selection. The hope was that this would help the firm to form a more coherent portfolio of projects than it had at present, weed-out at an earlier stage the sub-standard projects that took up time and resources (and were usually only allowed to progress at all through political and social influence), and provide a clear and transparent 'guide' to any project manager wishing to develop an innovation idea, before presenting it to senior managers for selection or rejection.

The Stage-Gate tool operates by a system of 'gates' at which a series of analysing questions quantify and qualify many commercial and technical aspects of the project. The gates include, strategic screens, impact on position/industry structure, rewards levels, risk, innovation mix, total portfolio screen.

So for example, at Stage 1, the 'Strategic Screen Gate' seeks to test the proposed project against the overall strategic aims of the firm. At Stage 4, the 'Risk Gate' aims to assess the project's risk from both a commercial and technical perspective.

The details are not important to this thesis, but to give emphasis to the sort of questions and ideas the project teams had to focus upon. Consider the 'Technical Risk Assessment' component of Stage 4. Various questions such as 'do we have the process skills required'? or 'can we see clear sets of steps to reach the product'? are ranked with a probability of success from 0.1 (concept of product: not clear at all) to 1.0 (concept of product: very clear). Each answer is then multiplied by a factored number suggested by the tool, as a way of giving weight to the more important questions over other less important ones. The overall score for a particular project is then added up and measured against a system of ratings for different types of portfolio products and market types that judge the suitability and success for each

project suggested. Interestingly, the impetus for the use of an analysis tool did not come from the commercial side, but rather R&D:-

“Prior to its introduction we were in chaos. The drive for it largely came out of the technical area. In fact we had to overcome their inertia. Initially, I think it was good in helping us to manage projects; helping to ensure that the whole organisation knows what was going on here and letting us know what was or wasn't approved and why” (C. Joyce Interview).

The general success or at least ‘usefulness’, of the tool for project selection was commented upon by most people. Although most also suggested that:-

“It took a fairly long time to become bedded into ICI Paints. It really needed a lot of customising towards the ICI way of doing things” (R. Leggetter Interview).

This customisation was a major source of controversy. For example, as a senior R&D manager suggests:-

“We have a sort of informal process where, if any of us still feels uncomfortable about a project and it has already been approved by Stage-Gate, we say right we want to review it again in 12 months time. We cannot review them all but there is no formal process to do this within the tool” (C. Joyce Interview).

Indeed, there seemed to be a growing discontent with the Stage-Gate tool as more problems were seen to arise from it and the firm came to use and depend upon it to judge which projects were to be developed and launched. As explained:-

“A major weakness of the Stage-Gate process, that we are growing to discover, is that as you go through the filters we are still in the mindset of 12 months payback for each project. What tends to happen is that, by default, you will put through only smaller ideas. The ones with low risk. The ones that you know will sail through the gates” (I. Kenyon Interview).

Consequently, the projects that could provide ‘potentially’ very high-payback in terms of total revenue, in say, a five year period, got ‘squeezed’ out of selection because they were considered by the project managers to be too ‘high risk’, in the sense of project investment and resource over a long period. Similarly, as the Innovation Manager explained, other problems became apparent:-

“At Gate 3, the Senior Managers sit, commenting whether they like a colour or not. Completely spurious. All the market research has been done but they have a powerful share of the overall voice. If the project gets to Gate 3 and the commercial case has then been proven, then Gate 3 should be about the functions of production's - yes we can deliver it on this date - not the individual whims of the Seniors” (I. Kenyon Interview).

The commercial side also reported heavy degrees of 'personal' customisation of the tool:-

"Six months after a product has been launched we will now review the Stage-Gate and see how it performed The feeling is that this is a very worthwhile process and a lot of learning is taken from it in terms of process in terms of getting the launch pads right" (C. Harris Interview).

It seems that as the Stage-Gate tool becomes more ingrained in the cultural 'mind-set' of ICI, it is falling prey to the very issues that it was brought in to challenge. The system was said to be becoming 'more obsolete' as there were so many additions and customisations. It was now increasingly difficult to know what was expected of project managers. Similarly, it was reported that some people appeared to have a political and social 'knack' of getting projects accepted by senior managers even if, by the criteria laid out by the Stage-Gate tool, they should not have been.

6.13 Conclusions

This account constitutes my interpretation of how the staff at ICI Paints and ICI Group understand and practice the process of innovation. What emerges is a strong sense of continual tension and conflict as individuals interpret and pursue their own visions as to what the firm is trying to achieve and what is expected of them.

The account shows a company with a long, sometimes dynamic, sometimes stolid past, currently in the process of undergoing the biggest corporate change in its history. These changes have not affected ICI Paints as much as some of the other Business Units, but nevertheless are being felt at all levels of the Group. The greatest change has been in the realisation of the relative decline in certain historical capabilities exacerbated by technological advances, different systems of exploitation in the value chain, market growth by competitors as well as the changing emphasis of the organisations goals.

Innovation

From my fieldwork study, I suggest that the view within ICI Paints is that, as a mature industry, actual product innovation (differentiating the product from the competitors) appears to be on the decline. Where the competitive difference now lies is in the 'image and branding' of a product, which is under an increasing amount of commercial pressure from competitors' own-branded products. The lack of radically *new* innovations and the focus of the firm's product strategies of 'branding' has seen a rise in the importance of marketing disciplines, to a point where innovation is seen largely as a marketing and advertising exercise.

This changing internal focus has led to a re-establishing of a political order and personal 'kudos', which in turn, has led to a great deal of confusion concerning the perceived technological and strategic direction the company should be moving towards. The rather ad-hoc, incoherent and uncoordinated nature of product launches, led to a call for a formal system to judge which projects should be successfully pursued. This led to managerial practices, such as the Stage-Gate analysis tool. Although initially successful, this has become increasingly used as a 'political tool' with which people are able to interpret, hinder or facilitate outcomes in many ways other than the objective 'non-social' and 'political' methods of project selection that it was intended to facilitate.

The lack of overall strategic vision given by senior managers to their sub-ordinates has caused a great deal of angst amongst junior staff. Indeed, many of the senior managers are considered 'stuck in the old ways' of technologically-pushed innovation, rather than in touch with the new and faster 'market-oriented' view of product launches, touted by the Group's Chairman.

The problem of ICI Paints as a mature-industry, finding it difficult to innovate quickly and successfully, has led to other managerial initiatives. One direction

considered is to move away from traditional views of innovation as largely 'product-oriented' and to embrace the move towards an IT-based economy.

This vision is being hampered by senior staff's inability to form a consensus as to what this means to the firm. Another initiative was to create an Innovation Manager and Group. This notion immediately came up against the traditional mind-set of senior managers and the group found it difficult to break down the deeply ingrained conceptual and functional boundaries of individuals.

The cultural heritage was described as a system of traditional values and a sense of hierarchy being the natural order with a concern for 'ownership of ideas' and 'taking care of the details' of today and only a limited interest in the firm's long-term aims. The managers recognised that financial success (growth in market-share, assets-value and profitability) belongs to organisations that create or spot an opportunity and respond to it through the successful management of innovation of technology.

Practitioners regularly talk about the prevalence of 'political opportunism' and ad-hoc decision-making processes. Their accounts suggest both the process and content of their vision and strategies, shaped through discourse, practice and learning, are always open to revision within the boundaries of what the CEO suggests as 'ground rules and agreed prejudice'.

One reason for this seems to be that, no matter how many procedures and guidelines, or how well defined the role of individuals, there is still huge scope for multiple interpretations of possible futures, such as deciding whether a particular acquisition target is too big, too small, right or wrong, or whether a proposed technology is strategically advantageous or not. In presenting, arguing and testing particular views, ICI's managers take a sense of 'ownership' of parts of the vision and strategy and indeed derive a sense of identity from their part in shaping its process and content.

In this firm, it is the personal values and preferences of individuals more than the adherence to any formally agreed 'grand plan' that shapes the strategic direction of the company. ICI's managers share a strong sense of the continual pursuit of efficiency gains reinforced over the many decades of operation. Managers also believe in the potential for a greater sense of innovative capability, seeing no conflict between the positions of ownership, guidance and innovative behaviour. For them conservative and prudent financial management and creative use of technology can, and do, complement each other.

Beneath the feeling of ownership of the firm's cultural heritage that managers share, is an assumption that they have a large degree of control in managing the firm's relationship with its external environment. Perhaps, critically for the firm, the business environment seems sufficiently stable to allow ICI, its competitors, and other stakeholder groups, to take a reasonably measured approach in assessing their options for development, and the time to change their minds if necessary. Although with the onset of the IT 'revolution' some managers disagree with the traditional and careful approach. At the same time, despite being a mature firm, the external commercial environment is perceived, by some, to be sufficiently unstable to remind the firm that it must continually hunt for efficiency improvements, as well as look for novel and useful ways of delivering what the firm offers to end-users.

The next chapter outlines, and pursues in greater detail, several of the issues raised within this case study. Following Easterby-Smith's *et. al.*, (1991) grounded theory 'checklist' (section 5.7), the aim is to draw upon other research studies from a wide range of literature, re-evaluating the data, to develop thematic and conceptual patterns and identify coherent ideas and practices to be discussed and developed in later chapters.

7

Vision and Innovation Within ICI Paints

7.1 Introduction

Chapter Six illuminated the dynamic flow of innovation activity within ICI Paints. It demonstrated the marshalling of company resource, based around certain notions of managerial vision, and the importance of the political and social skills of the practitioner. The study also showed the attempt by practitioners to understand and interpret the uncertain and ambiguous vision expressions of senior managers, in terms of their existing practices, and the pervasive influence of 'cultural heritage'. In short, what became apparent was the diverse sense of 'commercial reality', as experienced by different practitioners.

Having familiarised myself with relevant research in Chapters Two, Three and Four, the next stage of Easterby-Smith's grounded-theory checklist (section 5.7), suggests an evaluation of the data in the light of previous research, identifying coherent concepts, linking and re-evaluating them against other similar notions and identifying conceptual 'patterns' from within the studied phenomena. As such, here, I draw from a wide-range of literature, from cognitive and social science, and more specifically, management and behavioural studies, to demonstrate the complementary nature of much of this research.

The purpose of the case study in Chapter Six was to form a personal interpretation of the process of vision and its effect upon the innovation practices within ICI Paints. This requires the researcher to produce explanations of the often 'hazy', thematic boundaries, as related by the practitioners, concerning the various issues analysed. These notions may cross over academic disciplines in the direction of say, general sociology, cognitive or economic accounts. Some 'cross-over' accounts of technical

change (for example, actor-network theory) have such theoretical ambitions. A balance here is struck in terms of a general understanding of the dynamics of a particular case, in this example, the study of specific cognitive and social elements of managerial vision and innovation, against a yield in terms of understanding more broad concepts of technological change.

Chapter Outline

This chapter begins by considering the notion of ‘cognitive complexity’ faced by practitioners, and outlines a method for discussing the ‘thoughts’ of individuals (section 7.2). As suggested in Chapter Four, cognitive explanations constitute theories of cognitive-representation and require conceptual models for describing mental processes; a conception of ‘schemata’ is suggested as being suited to the goals of this thesis. Broad notions of ICI’s cultural influence upon practitioner’s conceptual models of innovation are considered in section 7.3, with several heuristic biases that may affect such schemata described in section 7.4. The discussion then outlines the many different perceptions of culture within ICI Paints, possessed by practitioners (section 7.5), and the problems faced in translating ‘vision into practice’, outlined in section 7.6. Different levels of vision ‘content’ are discussed in section 7.7, focusing upon notions of personal kudos, technological specification, user-function and broader societal trends. These levels interact, providing a powerful conceptual mechanism upon which practitioners draw, and is described in section 7.8. Section 7.9 focuses upon how visions are shared, constituting a ‘resource’, facilitating the commitment and ‘bonding’ of other practitioners to a particular idea. How these cognitions are affected by the pervasive ‘cultural heritage’ of ICI, is discussed in section 7.10, outlining the importance of informal groups to the generation of innovation practice. Lastly, the effect of managerial schemata upon organisational change and the constitution of ‘legitimate’ notions of innovation practice is examined in section 7.11, with the chapter summarised in section 7.12.

7.2 The Complexity of Cognitive Representation

That institutional activities evolve and are influenced by an interaction between the business environment and the individual's cognitive processes, is well documented by a wide range of disciplines.¹⁹ Yet exactly what constitutes 'cognition' can vary enormously. The aim here, of forming representations of the thoughts of practitioners, is not to investigate *definite* notions of how mental abilities are embodied within the brain. Indeed, a common issue facing all cognitive explanation is that they are either, in some sense, reductionist to the level of chemical neuroscience, or they are forced to utilise a form of 'token' mental-representation in their description. Here, my goal is to suggest a grounded notion or 'token' form of representation, and outline how cognitive structure *might* relate various conceptual bias to issues of conceptual 'structure' in the social world.

Concerning how *practitioners* deal with variations of conceptual complexity, Arthur (1992; 5) suggests the notion of a problem 'complexity boundary'. Problems beyond the 'complexity boundary' are described as ones that cannot be accurately qualified using the existing concepts of the individual. He argues that for the practitioner, deductive-analytical procedures cannot be relied upon for answers to novel problems, yet practitioners are still able to make decisions in poorly understood situations. Thus, individuals must employ forms of *inductive* representations to enable them to learn from previous situations and apply 'learnt notions' across *similar* scenarios. To learn, practitioners require a specific 'sense' of reality, in which they can understand the implications of chosen actions, as well as possessing a general 'world' perspective in which they can identify potentially useful *future* action.

The researcher, analysing such notions, requires descriptions of decision-makers as building internal and 'testable' cognitive models that are representative of aspects of the world, in order to be able to understand how belief guides action (Arthur, 1992;156). Indeed, Holland *et. al.*, (1986; 12), similarly assert that:-

¹⁹ See Weick for a review (1980).

"...a cognitive system of a manager, explicitly constructs models of the problem space that are then mentally 'run' or manipulated to produce a 'future outlook' about the environment."

Additionally, Simon suggests that decision-makers construct *simplified* models of reality when dealing with complex problems, consisting of 'atomistic' notions of the world (1976; 79-96). This raises a major question for the researcher; can managerial practice and experience, in some fashion, be simplified to basic and, possibly, ambiguous concepts? If so, 'how does this process occur and why', and 'how do these simplified notions have an influence upon decision-making'?

Certainly, practitioners are subject to 'limited' perceptions, as they are unable to evaluate *all* the variables relevant to 'real-world' decisions (Simon, 1960, 190; Weick, 1990, 1995). Furthermore, as some sociologists suggest, when groups negotiate joint decisions, they also appear subject to the same perceptual biases (Janis and Mann, 1977; 129-33). How can the researcher 'make-sense' of the practitioner's reality, whilst accepting the notion of cognitive simplification?

It is argued that through an investigation of the implicit mental representations of ICI's practitioners, such questions can at least be better understood, drawing from synergistic approaches to the study of managerial vision and its effect upon innovation, reflected against relevant literature from social and cognitive sciences.

From the discussion in Chapter Four, I suggest that the most suitable representational form for beginning to analyse cognition is the *schemata*, because its broad conceptualisation of relational and causal mechanisms provides a theoretical framework in which the important issues of ambiguity, simplification, inductive-thinking and plural notions of reality, can be explicitly discussed.

7.2.1 Cognitive Schemata

The term 'schemata' is sometimes used in connection with 'cognitive maps'. In general, 'schemata' is a broader term, most apt here, because of its focus on hard to define and ambiguous concepts. A cognitive map is often identified as a particular type of schemata or a part of a broader schemata (Weick, 1979; 48-53).

Schemata are defined as representations of categorical attributes and the specified relationships between them. These constitute both 'common sense' social theories (Rumelhart and Ortony, 1977), as well as active cognitive structures which frame problems and suggest solutions (Neisser, 1976). Taylor describes them as broad thematic conceptions that people hold about their social world and suggests that previously developed schemata can be applied to new problems (1982; 72-3).

To Chittipeddi and Gioia, schemata are evoked by 'cues' in a new problem-solving environment, providing social frames of reference for problems that may eventually make it unnecessary for decision-makers to expend much conscious mental effort to diagnose each element of a new strategic problem (1983; 6). Attempts by managers to engage in complex problems will also introduce innate bias into their assumptions, forming the basis of an individual's schemata. Mason and Mitroff argue that such commonly-held cognitive assumptions constitute the basic elements of a practitioner's frame of 'world-reference' (1981). Problems of a strategic nature involve more organised notions of complexity. That is to say, problem variables can be considered as interdependent, in such a way that solutions to some problems create possible answers to others (1981; 3-21).

In this sense, it will not be enough to argue that practitioners within ICI Paints, 'simplify' past experience as sets of more generally applicable notions. Rather, *which* experiences, practices and assumptions contribute to *which* aspects of the mental-representation of a perceived phenomena, and how do these relate to practice?

ICI Group's business 'culture' was often explained by the interviewees as a sets of 'taken-for-granted' assumptions, similar to those described by Mason and Mitroff (1981). Indeed, from the case study, the influence of an 'ICI way of doing things' was regularly expressed as crucial to all facets of innovation. To gain an understanding of how these implicit assumptions influenced ICI's practitioners, I suggest to explore this notion is an apt place to begin.

7.3 ICI Group's Sense of Image

Almost uniformly, the interviewees suggested the belief that the technological heritage of ICI Group consisted of the firm 'traditionally seeking competitive advantage through the development of leadership positions in its core technological processes and large-scale manufacturing facilities'. Indeed, the Group's managerial expertise has typically focused on the few core-technology strategies important for maintaining a stable and conservatively run organisation. Consequently, this has resulted in a business culture in which terms such as; risk-adverse, fair-play, dependable, stolid, decent, professional, non-imaginative and technologically-incremental, were regularly utilised to describe the business ethos.

The broad conceptualisation of 'culture' was also described as something that is recently attempting to change, due to the realignment of the core-technologies and businesses, and the attempts of the Board to re-focus the business ethos towards a more market-orientated approach. Thus, it was generally acknowledged that the sub-units should be more willing to move into *any* technological areas required to increase, or preserve, their share of a defined market. As well as them being more 'market-sensitive' to requirements and not simply focus on the opportunities derived from technological developments, as was traditionally the case.

The formulation of 'technological horizons' on the part of corporate headquarters, has formally consisted of the creation of quantified targets, regarding appropriate policies, effecting the joint technological operations of the business units of ICI Group (such as the SHE 2000 policy; section 6.5.2), and the more informal 'visions' of Board members (section 6.5, 6.5.1, 6.5.3), recorded in publicity literature, press-articles, meetings and conferences, share-holder reports and the AGM presentations to all Group staff. Indeed, Prahalad and Bettis claim that the role for corporate managers is 'explicitly' to develop this type of culturally *dominant logic* amongst members (1986). That is to say, to formulate a set of socially-agreed interpretative schemes that help to focus attention and decision-making.

This is highly supportive of one of the central notions of selective perception (Simon 1960, 1980; Pisano, 1994; Prahalad and Bettis 1986). Here, schemata are shaped by two critical variables; the nature of the perceived problem, and the conceptual goals of the individual that are determined by the social-system in which the individual is placed. Thus, a starting point for understanding managerial cognition, focused on vision and innovation, may be to understand the nature of the practitioner's perception of a problem and the nature of cultural premises.

Indeed, Weick argues that these cultural premises are *the* powerful influence on practitioners, as they intervene early in the process of belief formation and colour all subsequent phases of the creation of a sense of business environment (1995). Certainly, such a notion of a stable and conservative technological cultural tradition, typically, was said to have a *substantial* influence on practitioners in directing choice, action and notions of innovation practice. Yet in their considerations of their *vision* for ICI, staff typically utilised common cognitive terms, such as, 'mental imagery', 'metaphor' and 'analogy' in relation to the more general cultural assumptions of their reality.

In essence, practitioners appeared to become more introspective and challenging (as opposed to being taken for granted) in their consideration of their assumptions of the organisational culture, the further removed they became from the Group's current entrenched beliefs. In this sense, one can suggest that to consider such ingrained cultural assumptions or ideologies, such as 'conservative' or 'non-risk taking', is not simply to consider them as specific cultural terminology *per se*, but rather as metaphors or analogies between past experience and practice, applied towards current or future action.

The next section describes several other more specific cognitive mechanisms that helped constitute a sense of shared 'structure' and may also constrain the perception of future innovation opportunity.

7.4 Cognitive Bias

Research within behavioural decision-theory suggests that various general cognitive biases affect strategic decision-making in a number of crucial ways (Barnes, 1984; Duhaime and Schwenk, 1985) and extensive lists of heuristics have been developed (Hogarth and Makridakis, 1981). Decision-makers are said to use these 'rules of thumb' to simplify complex problems into more generally applicable terms. Tversky and Kahneman argue that such heuristics provide efficient 'short-cuts' for the processing of environmental information (1974).

A comprehensive list of cognitive biases is provided by Mayer who describes 29 separate biases (1992). Those which seem most likely to affect managerial vision and decision-making are listed below in Table 2. I shall not give an exhaustive list from the case study, but instead give two examples to illustrate several points to be discussed later.

Biases	Effects
Availability	Judgements of probability of easily-recalled events distorted.
Selective perception	Expectations may bias observation of variables.
Illusory correlation	Encourages belief that unrelated variables are correlated.
Law of small numbers	Overestimation of the degree to which small samples are representative of populations.
Regression bias	Failure to allow for regression to the mean.
Wishful thinking	Probability of desired outcomes.
Illusion of control	Overestimation of personal control over outcomes.
Logical reconstruction	Logical reconstruction of events which cannot be accurately recalled.
Hindsight bias	Overestimation of predictability of past events.
Conservatism	Failure sufficiently to revise forecasts based on new information.

Table 2: Selected Heuristics and Biases

One heuristic that may affect the practitioner's sense of managerial vision in

particular is the *availability* heuristic (Barnes, 1984; Tversky and Kahneman, 1974). Decision-makers judge a future event as 'likely' if it is easy to recall past occurrences of 'similar' events. Indeed, the suggested existence of a 'product event-horizon', referred to by many interviewees, demonstrates out this notion. Here, a major product, service or process within ICI Paints, seemed to 'colour' the ideas of practitioners, such that it was said to be difficult for the innovators to 'see' beyond that particular event and consider new ones 'afresh'. *Brilliant Whites* was one such innovation 'event-horizon'. As Kenyon, the Innovations Manager explained:-

"Our market-share had been ticking along nicely and then 'bang', *Brilliant Whites* happened, and over night our market-share went through the roof. That was great, but at the end of the day there is only so many different types of white paint you can have. Over the next two years we launched them all, and with very little market-research to see what the consumer wanted them. It was just a case, of 'well Brilliant Whites has worked, so get lots of products out the door that are just like it'".

Likewise, regularly occurring events were easier for the interviewees to recall than infrequent ones and were judged by them to be more likely to influence future decisions. Members of the Innovation Group bemoaned what they called 'the rut of incremental thinking', into which ICI's practitioners, all too often, fell:-

"We know that we can produce different colours and different paint effects, similar to the last range, and no doubt exactly the same as the next range. I suppose this type of innovation is just lazy. I mean you don't need to think too much, it's just safe and easy for the product managers to do. That is what we do best, incremental after incremental" (V. D'ath. Junior Member of the Innovation Group).

In this sense, staff typically sought the regularity and stability of successful practice, in terms of what had occurred before; in essence the very physical embodiment of the 'safe' and 'non-risk taking' cultural ethos of the Group. Once a practice appeared successful and became 'accepted', it constituted a 'blue-print' for future courses of action.

This is not to say that such 'blue-prints' were consciously obvious to all, or even always went un-challenged. As McMahon noted, the Innovation Group actually had a *negative* affect upon the generation of new 'radical' innovation practices, by making other non-group members habitually *expect* the group to deal with *all* aspects of new innovation, as had been the practice in the crucial time between the creation of the Group and the time that McMahon joined.

The Group commonly defined a sense of radical innovation as one that changes the 'mind-set' of all members of ICI Paint's, but in excluding most members from the generation of new innovation practice, this conceptual goal was unlikely ever to occur. This was exactly the 'negative' process identified by McMahon during his initial 'job and role justification-meetings'.

Leaving *all* innovation to the Group had become 'settled' into the notion of the innovation culture of ICI Paints. Thus, this was perceived by practitioners to be the successful and 'legitimate' thing to do; it had become an *encultured* practice, because of the *frequency* and *availability* of 'successful' examples of such practice becoming unchallenged.

Other aspects of an innovation practice, besides frequency, appeared to increase the availability of certain types of events being recalled as 'legitimate'. Dramatic or vivid events also seemed easily recalled, even if they occurred infrequently, thus may have had disproportionate effect on future action.

For example, ICI Group Board members had regularly seen bad quarterly results, but coming just after a 'dramatic' event, such as a hostile potential take-over bid by Hanson Plc, appeared to have such a spectacular effect on Board members, that even after the safe conclusion, the event remained highly influential on their 'vision' of the future corporation (section 6.3). This directly led to a re-evaluation of the Group's entire business-mix and the subsequent demerger (and large divestment and purchasing programme), focused upon 'technological-fault-lines'.

Similarly, utilising the same general notion of this heuristic, I suggest that McMahon's perceived attitude towards innovation within ICI Paints, had such a dramatic effect on Kenyon's, and the Innovation Group's innovation assumptions, that Kenyon, from that moment onwards, felt his position untenable. However, one may argue that this also had to do with the level of the 'empowerment' of McMahon, to pragmatically 'force' his beliefs on others. I shall discuss this later in the chapter.

Langer suggests that decision-makers are subject to another important bias of the *illusion of personal control*, because of the way managers collect and store information (1983). She argues that managers constantly seek ways to re-affirm their 'level of direct control' over their environment, even if they are actually *re-active* rather than *pro-active* in their decision-making (1983; 24). Thus, practitioners form hypotheses about the effects of their commercial actions on various outcomes and typically seek-out information that supports their hypotheses, while ignoring disconfirming evidence.

For instance, Kenyon noted many subsequent examples of McMahon's negative attitude towards innovation as synonymous with the negative comments displayed during their first meeting. Kenyon interpreted these to *confirm* his belief that the CEO 'had it in for me' and was 'not interested in innovation at all'. Whereas McMahon suggested that, far from being against innovation *per se*, he was simply against the current 'isolating' practices of the Innovation Group. In essence, Kenyon can be seen as having already made his mind up and chose to interpret all subsequent encounters in broad terms of heuristically *reinforcing* his level of control (or lack of it) over events, rather than seeking to re-define it.

McMahon also demonstrates this notion with his singular advocacy of 'brand management' or 'cost-cutting' as the primary commercial and innovation strategy for ICI Paints. He admitted that he had a strong sense of prejudice about how he traditionally ran his businesses, and that this was how he intended to 'control' ICI Paints. As he described:-

"From my background, I come from a strong branded-culture of pre-cooked foods, I can say that from everything I see here, this company will greatly benefit from following a similar path".

Indeed, he was said by other senior managers to view *every* strategic policy or innovation in terms of how they related to his 'branded' view of the world. Thus, he was said to have rejected 'out of hand' many other possible choices, only accepting notions for further development that were 'similar' to his own. As Kenyon did, he can be seen as re-enforcing his own sense of *control* over his environment.

From these two examples, focused upon general and widely applicable cognitive devices, one may claim that such mechanisms, not only support the content of a particular belief of future action (such as the perceived outcome of a particular strategic action) but as also contributing to the creation, structure and transmission of that content to others.

Thus, by outlining the broad cultural themes as experienced and shared by its practitioners (section 7.3), and identifying common general cognitive mechanisms utilised in specific cases (as outlined above), one can *begin* to generate a basic notion of managerial schemata relating to innovation practice. This is of course a long way from describing what 'innovation' means to practitioners, lacking any description of the importance of specific context, how the sharing of visions takes place and how meaning is derived from practice. Yet such issues begin to constitute an exploratory account, with the broad aim of 'bringing together' social and cognitive descriptions, to form the *content* of managerial schemata.

The following section continues this discussion by outlining the notion of 'like-minded' communities, identified within the case study, as important for the construction of a sense of commercial reality.

7.5 Differences in Cultural Perception

From the description above, it may seem that most people within ICI Paints begin to consider innovation problems and the vision expressions of managers with, at least, broadly similar sets of shared and culturally-held assumptions of what ICI Paints does, how the sub-business is related to the corporation and what general strategic directions they are pursuing, with only specific conceptual disagreements (such as between McMahon and Kenyon) on issues arising in the course of their daily tasks. However, upon closer inspection, this was not necessarily the case. Drawing from the interviews, at all managerial levels of staff within ICI Paints, I suggest that the following broad conceptual 'map' can be drawn, outlining what practitioners

considered to be the important aims of the firm and the personal goals of the practitioner's functional roles.

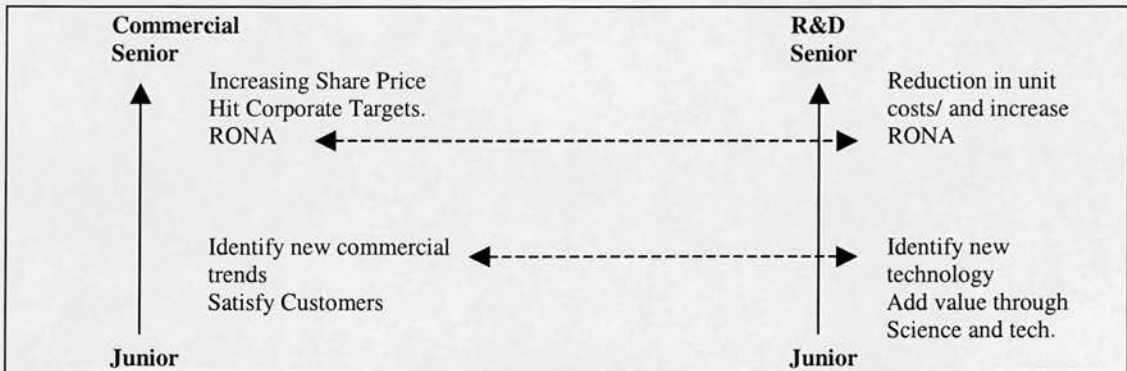


Chart 1: Functional Responsibilities

The chart suggests that practitioners possess certain 'individualistic' views about what the main goals or purposes of the firm are and of their role within it, distinct from the generally 'shared' view of the organisation's culture or ethos (section 7.3).

Senior manager's descriptions of their future visions, associated with their supporting evidence as to why this is the 'correct' way to proceed for the firm (given in terms of heuristically determined descriptions, similar to McMahon's advocacy of 'brand-management'), tended to derive from their immediate functional responsibility areas, giving impetus and importance to their own functional roles and their level of control over certain events within the firm.

Thus senior managers, within commercial functions, tended to consider both their responsibility within the firm and the operation of ICI Paints more generally, as providing shareholder-value and maintaining the corporate targets outlined by the Board, normally given to them in terms of achieving a certain return on net assets (RONA). The senior managers within R&D functions, also saw achieving targets as their main responsibility, but were expressed differently; typically in terms of the importance of achieving a reduction in unit-costs (allied to the associated technological and organisational processes), as well as with a similar, and yet more

functionally-based, interest in RONA.

Naturally enough, more junior practitioners were 'shielded', in some sense, from the commercial realities expressed to the senior managers by the Board, and were required to focus upon different tasks, with other associated goals, thus forming slightly different notions of individual and organisational 'purpose'.

The levels of individual 'purpose' were not necessarily mutually exclusive. Practitioners that held various conceptual notions as 'important', such as achieving RONA or identifying new technologies and market trends, had much in common with practitioners outside their own functional base.

Indeed, the 'like-minded', but functionally 'different' practitioners, were often said to have more of an influence on each other's notion of what constituted 'legitimate' innovation practice, than other practitioners within the same commercial function. For example, as one R&D manager commented:-

"Product development, around here, has traditionally been a 'pass the parcel affair'. We get a piece of paper with various specifications on it, handed to us, then we go away and talk to our boys on the benches [R&D workshops], develop it to the next stage and then pass it on. But actually what you do is you go and talk to certain people often over the road [on the commercial side], who you know 'thinks the same way as you', and get some more ideas about how the product should go" (Leggetter, R&D Manager).

The influence of other 'like-minded' practitioners may be seen both in a formal sense of being involved in the same project, and informally, in terms of being 'exposed' to the ideas of practitioner's with 'similar', but subtly different, concepts of innovation. Indeed, Fleck has also noted the importance of informal groups to the development of innovation (Fleck, 2000).

This process was common practice throughout ICI Paints and was not confined simply to 'R&D asking various commercial practitioners for advice'. Indeed, the notion went far deeper than this, constituting not only the generation of a sense of 'appropriate' innovation practice, but also aiding the generation of the 'future' notions of ICI's commercial and technological practice.

Thus, from this description, one can suggest that in addition to the general sense of cultural assumptions, practitioners are influenced by various cognitive mechanisms, that not only reinforce and help transmit their sense of reality, but also establish its content, as well as being influenced by the conceptually *similar* (or like-minded) schemata of functionally different practitioners.

7.6 Translating Cognition Into Behaviour

The description so far, suggests practitioners as 'bounded' individuals, with choice and behaviour influenced by simplified cognitive assumptions, based upon their implicit theories of the commercial world and the various commonly-held notions of cultural behaviour (also see Argyis and Schon, 1978; Simon, 1991).

However, this picture does not serve to characterise behaviour in specific situations. It is necessary to further specify how incomplete cognitions are expressed in terms of actual practice. For instance, a wide-ranging management practice such as 'lean production' or 'process engineering', or indeed, ICI's version of Just-in-Time, OTIF, does not fully specify the particular behaviours and practices that are to be taken up by others. Instead, they offer some general guiding principles that are open to individual interpretation.

As these practices diffuse throughout the firm they are represented differently by practitioners and depends largely on the social contexts in which they are placed (Zbaracki, 1998). This is especially well exemplified by the example of the Stage-Gate Product Portfolio analysis tool. Despite the seemingly objective formalisation of proposed future action and strategy, the general social and political milieu of ICI Paints resulted in a series of diffuse interpretations throughout (section 6.12.4). In this sense, this is an example of social-structure impinging on internal beliefs.

Although the visions of senior managers were said to be highly influential upon practitioner's judgements, the portfolio tool did not reflect these expressions in terms

of formal practice. Such expressions may have had an 'influence' on the innovation projects, but as there was no formal process for their operationalisation, whether they were actually 'taken up', in some sense, is dependent on other cultural processes. Consequently, left to personal interpretation, the Stage-Gate tool became as much politicised during its 'enculturation' as the more subjective practices (such as 'personal lobbying') that it sought to replace.

Conceptually, there were at least two basic influencing mechanisms that helped to 'flesh out' these broad managerial templates and translate them into actual practice. One was said to be the existing set of practised routines, bound up within the firm's cultural heritage. Such notions served as 'default' behaviour to people's existing notions (also see Strickberger, 1991). Some actions and rules were clearly specified by the managerial template while other sets of behaviours were simply carried over from past 'similar' practice. Thus, new practices were repeatedly understood in terms of past practices; the Internet was initially compared to ICI's existing internal communication system, Lotus Notes, rather than as a 'new' opportunity to sell or communicate to consumers.

Secondly, the template (and possibly past practices) served as a starting point for a process of experiential learning by practitioners. For example, many staff saw Stage-Gate, not as 'set in stone', but *explicitly* as something to be learned from and adapted into the business culture of ICI Paints, as the informal additions to the Stage-Gate tool by R&D managers Leggetter and Joyce demonstrated (section 6.12.4).

These two processes, the imposition of sets of historical 'default' routines and experiential search for new solutions, may be combined within the managerial schemata utilised when practitioners 'choose' a particular decision, within the context of their explicit representation of a commercial reality as well as focused on their notions of a potential future activity. Ambiguity may arise from the fact that the mapping of broad representations of these managerial practices, to specific sets of strategies or actions, is not a 'one-to-one' process. This 'mis-match' may

consequently be resolved by the use of existing practices as ‘defaults’ for elements not specified by the template. Thus, not surprisingly, without explicit practice to guide ICI’s staff in the operationalisation of practices (such as OTIF or StageGate) or the more vague vision expressions of managers, they may soon fall back on known ‘political lobbying’ to get projects accepted.

The R&D community ‘rose as one’ to demand a portfolio product-selection tool from senior managers, to aid them in their product development. In the same way, they added an informal re-evaluation of projects, twelve months after their launch. This was not done unilaterally however; R&D practitioners having already discussed these various ideas within their functional and conceptually bounded communities. In this sense, a particular group of practitioners (in a manner to be investigated), can be seen to have rallied around a particular ‘vision’ to guide causal action. The next section discusses this notion of a ‘vision as a commitment’ in more detail.

7.7 Four Levels of Vision Commitment

Interviewees, of all ranks of seniority, expressed the *content* of their visions of ICI Paint's innovation future, in terms of four conceptual levels; personal kudos, innovation specification, innovation function, and society.

Level 1: Kudos Building

This level of vision was expressed in terms of how practitioners saw themselves within a possible future commercial environment, or how they saw themselves gaining ‘credibility’ amongst their peers, through being associated with a series of successful innovation practices.

The notion of ‘legitimate’ action and its effect on an individuals schemata, is an important one for this thesis. So far, I have discussed the ‘bounded’ nature of practitioners cognitions as something that is constituted by the various limitations of innate mechanisms and the broader constructs of a cultural ‘ethos’. Here, I argue that

they also are bounded by what particular social or informal 'sub-communities' they consider to be 'legitimate' practice and belief.

Practitioners constantly sought authorisation to act, behave, suggest ideas, or challenge the 'socially acceptable' practices of the firm, and appeared to lose interest in (or at least did not assign much importance to) specific notions, if there was a perceived difficulty in getting authorisation to progress from senior managers.

Subordinates typically separated actions into those that they considered *unlikely* to gain authorisation; those considered certain to gain authorisation, and those that required authorisation but were thought to be capable of being circumvented by social or political means, such as those seen within the StageGate example.

The more direct control practitioners had over a project, the more they were concerned with its anticipated success. In this sense, one was said to have 'ownership' over an idea or project, in that individuals gained degrees of personal credibility from their peers, in being associated with successful (or unsuccessful) practice. When individuals had little control, or when authorisation was seen as unpredictable and unreliable, the individual did not assign the project much importance in being able to increase their sense of personal 'kudos'. In essence, to spend time developing an innovation to a reasonably advanced 'theoretical' level, and to then be rejected, was considered too much of a personal 'risk', as it was considered a failed endeavour.

Similarly, senior managers, such as Hulme and Harris, were characterised as people who were likely to pass or block projects, thus affecting the sub-ordinate's behaviour towards them. The time taken to obtain authorisation and the quality of feedback on innovation ideas was also described as a problem and was something identified by the Innovation Group to 'work on' in an effort to encourage more innovation ideas.

The difficulties in obtaining quick, suitable and conceptually rich feedback, may

impair individual learning processes, for example, about 'how responsiveness to changes in customer tastes affects the customer's perception of quality', or 'the importance of a new technology to existing practice'. Indeed, it may also help define 'what exactly is acceptable practice' and 'what actions are likely to boost the personal credibility of practitioners'. If the feedback is slow and un-informed (such as the personal whims of senior managers, mentioned as disastrous to innovation within ICI Paints, by Kenyon), then this may have a disrupting effect on notions of what acceptable innovation entails. If authorisation was swift and predictable, individuals were said to have felt 'conceptually liberated' and allowed to think beyond the initial goal of getting projects authorised, and as such, this authorisation may have given a sense of 'legitimisation' to their interpretation of similar future innovation practices.

Due to the regular 'un-predictiveness' of senior managers, however, practitioners within ICI Paints often perceived innovation as *risky* to their own career aspirations, and as I have suggested, careers were said to become 'tainted' by being associated with failed projects. However, success (and therefore, kudos) could also be achieved by the same 'risk' process. Indeed, it may be argued here, that a good deal of resentment was levelled at the Innovation Group by other practitioners, for just this reason. That is to say, by transferring (or accepting) responsibility of innovation to themselves, people external to the Innovation Group were denied possible opportunities to gain credibility for themselves through being associated with successful projects.

Level 2: Innovation Specification

Vision statements of senior managers often directly entailed pronouncements about the potential specification of future products, processes or services. These were often explicit, containing notions of how potential project outlines for artefacts, systems or processes were to be developed. For example, the 1999 Environmental Policy of ICI Paints (SHE Report; Section 6.5.2), mentioned:-

'We will strive to develop new products and containers that have minimal impact on the environment whilst maintaining our quality performance standards'.

This relates both to the explicit and physical areas in which to innovate and the conceptual basis requiring the innovation, and to the pragmatic performance of the firm. Similarly, outlined within the Annual Report, the 1999 Strategic Vision Statement of the Group states:-

'The roll-out of new and improved products, which are designed to have less impact on the environment, will be a key feature'.

Such specifications were often taken-up directly in the strategic processes of the senior managers, who sets the goals and priorities for strategy and action, in the local setting of each individual sub-unit, department or project group. For example, great importance was placed on environmentally 'friendly' projects. This was commonly seen in the reduction of environmentally harmful ingredients, products regularly produced and launched by ICI Paints, as well as the more 'blue-sky' projects of senior research manager, Dr P. Taylor, and his small 'novel technology' group.

When such expressions were taken-up by the sub-units, departments or project groups, they appeared to be taken as 'requirements' for a specific set of ideas and behaviour. In such cases, the beliefs expressed are taken as a form of demand. That is to say, expressions of senior managers and Board members, about the future, initially stated as 'will be', were often re-interpreted as 'should be', by the practitioners involved.

Indeed, most interviewees expressed that a typical day-to-day characteristic of innovation practice, was to constantly observe the behaviour and beliefs of more senior people and to continually re-check their understanding with similarly 'minded' practitioners, as well as with those further up the managerial hierarchy. Thus, ICI's practitioners were consistently engaged in an on-going negotiation of 'meaning and interpretation' to develop conceptual 'alignments'.

Level 3: Function

At a third level, vision statements appeared less specific, often expressed as the possible functions that potential technology may fulfil. These pronouncements claimed something about the general direction of the technological field and about the broader opportunities that the field may offer. An example of this was shown by Vice-President, Margetts' expressions concerning general environmental issues and their impact upon technological development within the ICI Group (section 6.5.1).

A 'promise', was expressed as a sustainable commercial advantage, whilst more functional direction was given within his supporting notion of the 'pillars' of sustainability. Here, Margetts talked about the broad functional areas in which to innovate, such as 'social improvement' and 'economic growth'. These are less specific than product specifications and were more geared towards the needs of ICI Group, than to the more broader societal trends, outlined in the next sub-section. They are analogous to existing thematic technology programmes, such as the technology groups, set up to provide technologically-based managerial skill throughout the Group (section 6.2).

These expressions were more diffuse than other vision levels and the functions were interpreted in various ways. They are also less easily proved 'true or false', (or quantifiable) than other visions. That is to say, a vision about a particular trend, or specification can be identified as *existing* (by market-research) or can be *actualised* in a physical artefact (by R&D), yet a 'function' is more vague. Consequently, they amounted to more an 'aspiration' or a particular 'ideology' for ICI to strive towards.

Level 4: Trends

The case study also gave evidence for a fourth level. These were statements, or utterances, about a particular technology, geared towards certain trends in society. Again, these were broad and diffuse and tended to be expressed in the form of

potentially heterogeneous scenarios. For example, such statements might be expressed as 'the Internet will become very important in our business' or 'environmental issues will be extremely important to our industry'. These require a degree of prior contextual knowledge to fully appreciate their relevance to ICI, and required a great deal of individual interpretation to 'make-sense' of. Hence, one may know what the Internet is, but different groups within ICI Paints, possessed substantially different views of its potential development.

The diffuse nature of these statements often amounted to 'hunches', enabling managers to 'align' others with their more specific concepts and constituted to 'aid' in justifying their own ideas. This level proved highly influential in the overall social dynamics of organisational change, particularly in periods of fast technological development. Yet in other periods, its influence appeared to be reduced to little more than a background 'noise'. For example, although IT has been a feature of the business landscape for decades, its growing importance has only recently been realised.

ICI Group and its sub-units had several methods of communication and articulating superordinate visions. These were, board meetings, ceremonies, mission statements and published reports. Where groups and individuals charged with creating innovation appeared to lack a coherent approach to perceived problems, they were often more willing to focus their attention on acknowledging the problem of finding 'common-cause' with issues in the other vision levels, One to Three. Thus, once a trend was accepted as important to ICI Paints, practitioners were more receptive, and indeed actively searched for guidance from senior managers and considered how they could fulfil or identify themselves with other issues raised within different levels.

The content of Level Four was also prevalent in considerations of the internal organisational 'trends', concerning strategy and innovation. For example, criticism of various existing commercial strategies typically focused on a need for changing

several key behavioural issues, such as 'spending sufficient time on major strategic decisions' and 'spending too much time managing rather than directing'. These often became the key behavioural trends that people aspired to, whether they benefited the firm or not and was a point also recognised by Pettigrew (1985; 402).

The content of these four levels created a conceptual basis around which practitioners formed a sense of 'like-mindedness' with others. For example, it was expressed by all interviewees that Harris and Kenyon and the Innovation Group shared, more or less, the same vision on innovation, for example, the societal trends that foster the usage and development of the Internet.

For a senior manager (such as Harris' Internet 'revelation'), to possess a vision is one thing. When these visions became shared, the possible opportunities to which they alluded to, became a more regular and important contributing factor to decision-making and opportunity-seeking behaviour. Thus, once a vision becomes a more 'accepted' and a shared notion of what, say, IT developments means to ICI Paints, it then may become a more important (or personally advantageous) topic for the Innovation Group to develop and base future ideas upon. The next section considers how these levels are related and the influence they have upon decision-making.

7.8 The Connection and Influence of Levels

That strategically orientated decisions arise from shared cognitions is well documented (Burgelman, 1983; Chaffee, 1985; Prahalad and Bettis, 1986; Johnson, 1987). Such research suggests that through cyclical social negotiation, visions may become more coherent, specific and situated in the contexts in which they are used. From the description so far, one can also suggest that shared cognitions create a sense of commitment between individuals of a similar 'minded' view and give rise to joint explanations of the perceived causations between belief and action.

The content of the four vision levels were not mutually exclusive and quickly became intertwined, yet the purpose of outlining the different levels is to emphasise that ICI's practitioners, initially, were drawn towards (or entered) the process of considering future innovation at any one of these levels. Level Two refers to the specification of a process or product, which in turn, is embedded in Level Three, the potential function that it hopes to fulfil. Future trends in technology, markets or society in general (Level Four), though are more difficult to quantify, gave a degree of 'credibility' to the other levels concerned with functions and specifications.

Although specific issues within each level were also embedded within (or influenced by) general notions of the cultural assumptions of ICI Paints, the levels were also interconnected at a more basic and personnel level of achieving 'success' or 'kudos' for that practitioner (as Level One suggests). That is to say, what was often most important and influential to the practitioner, is reflected by such a question as, 'how will I personally benefit if I become involved with the proposed innovation'?

To give an example of how these levels are embedded within the practitioners 'personal' situation, consider senior research scientist, Dr. Phillip Taylor. He is a member of various specific scientific and technological research bodies, as well as the more general research community of ICI Paints. He is also a member of the science and technology society at large. Taylor has beliefs in possible future technological opportunity and defends his own personal ideas, in terms of current strategy and is capable of 'acting' on any one of these levels. Thus, an utterance from him might 'register' within one, or all, of the specific levels outlined above.

While the more specific Level Two, indicates that the individual espousing a belief has a degree of expertise and that the statement expressed by them has 'authority' (for example, Margetts's vision of future technology strategy), articulations at Level Three and Four may be utilised by the practitioner to give a degree of 'legitimation' for the potential functional and societal propositions they suggest. In this sense, to outline potential specifications without considering the societal trends that it relates

to, would seem to others to be an 'unfounded' vision.

Changes in organisational innovation or strategic direction, as expressed in articles and speeches of senior managers in ICI, were often used to indicate a shift in balance between the importance of the specific vision levels to the firm. A common theme of the vision statements from the Group Chairman, as well as other senior managers who also tended to express broad and wide-sweeping statements, was the 'habit' of attempting to personalise the vision, either by referring to themselves or 'offering' the observer a chance to 'become' part of its reality. Thus, to appeal to Level One, was to motivate people and align their schemata to that of the visionary by 'offering' the possibility of inferring personal credibility. The next section considers how managerial vision may be translated into managerial practice.

7.9 Vision to Action

As I have suggested, practitioners often formed informal groups, based around various levels of vision. Typically, staff 'lobbied' to become part of a particular project, once it had become generally discussed by others, as they considered that project advantageous for their 'kudos' or they felt that they may contribute expertise to one of the conceptual areas suggested. For example, it was considered a personal success (initially anyhow) to be associated with the Innovation Group at its inception, as this was a project that had the 'blessing' of senior managers. The vision associated with the project was to have young, creative personnel from a variety of disciplines, working on a host of innovation projects. The people within the group were said to be able to contribute to this view and the propagation of such notions were used by Kenyon and Harris to attract suitable staff.

Indeed, vision statements and the expressed beliefs about events, technologies or future scenarios, were considered by managers as a *resource* in themselves. To express a vision was also to use them as a mechanism to begin to build resources around certain beliefs, in order to facilitate their conversion into practice. Indeed, Such expressions were used by practitioners in a number of similar ways;

- They were used to legitimise a particular view; to justify existing strategy or innovation projects; give support to negotiation concerning a proposed decision or give credibility to ideas and functional roles, within specific departments.
- They were used as a method of justifying a call on specific funds when other quantifiable methods could not be used; to focus the attention of other individuals and attract people to (or for selecting people for) a particular project.
- The use of vision expressions by senior managers also effected the decision-making processes in terms of 'rationalisations', not only as a method of persuasion, but also, as a way of reducing the perceived personal uncertainty that individuals faced when committing a sense of personal kudos to the organisation's political and social milieu (such as Kenyon committing himself to Harris' IT 'revelation').

In the next section, I elaborate upon the importance of the utilisation of 'vision', as a form of conceptual justification and persuasion, in influencing managerial decision-making concerning innovation. In so doing, I suggest the importance to this thesis of the specific context and content of 'practice' with which individuals perceive, act, and configure particular visions of innovation.

7.9.1 The Commitment of Resource to Uncertainty

When making decisions concerning resource allocation, innovation and strategic policy, it was accepted that it may not always be possible to 'calculate' the future course of events with any reasonable degree of accuracy. Nevertheless, important decisions were still confidently made that referred to 'vague' future events and possible technological opportunity. Indeed, one of the reasons given for the purchase of Quest Plc and National Starch, by the ICI Group, was explicitly this uncharted *potential* for cross-business technological synergies. As Taylor suggests:-

"The possibility of product synergies may be obvious, but what this actually means, in terms of policies, is all guess work. You do not have access to hardly anything you need to make hard and fast decisions, and quantify all the possibilities before making the purchase" (Dr. P. Taylor, Senior Research Scientist).

Different decisions may be considered, at best, 'optimal', in different situations, and senior managers expressed an acute awareness of the effect that often relatively minor decisions can have on the organisation. A clearly defined and coherent vision may appeal to practitioners on many conceptual levels (section 7.7) and help to reduce perceived uncertainty. In this way, visions may provide 'grounding assumptions' relating new and unknown situations to existing practices of the firm, helping to keep practitioners thinking and acting in similar directions. Weick terms this process, *organising*, describing it as 'the organisational reduction of complexity' helping to create unambiguous situations and helping managers 'make-sense' of their world (1979;39). Indeed, as he suggests:-

'It is precisely in the face of massive uncertainty that beliefs concerning a notion of a future of some sort are necessary to evoke action' (1987;226).

Consider how a senior commercial manager of ICI Paints explains the process of formulating potential future technology strategy:-

"It is the job of managing to estimate what we must do, where we must go, and where we must be, in 10 years time, or in 5 years time. What changes do we expect in technology and market and society at large? This is not science, a lot of it is guess work, hunches, but informed by your skill and experience. Our task is then to see if the technology, the organisation and the strategies we have are sufficient, and which future directions are the most promising for us, in terms of fulfilling the future requirements of the firms and which needs further development work" (C. Harris, Senior Marketing Manager).

Here, uncertainty is accepted as part of the manager's job. By envisioning uncertainty in terms of a given time-frame, the task (or vision) becomes less uncertain and more familiar to existing practice. Harris explains the process as 'guesswork' informed by skill and experience. In this sense, they are also 'bounded' and enabled by the 'developing' cognitive mechanisms of the individual, mitigated by the cultural assumptions of the firm.

The Context of Visions

In discussing how managers 'use' visions, it may seem as if they were isolated statements, used by practitioners working on their own. Here, the context in which visions are placed, can be addressed by considering their 'performance' of the

individual's they influence. Instead of asking what managers *do* with visions, the question is now 'what do these expressions of vision *do* to other practitioners' and 'how do they change their conceptions of a commercial reality'?

Utterances that 'do' things or create things, have been called 'performatives' by Austin (1962). He introduced the term, within his study of statements which, when expressed, were in fact an *action* in themselves. When one communicates a vision, as I have suggested, one does not just give a factual description of a perceived reality that is, in some manner, 'out there'. One alters the social and cognitive reality of the listener in subtle ways. Indeed, a vision statement seemed to have the effect upon practitioners of reinforcing or destroying, or in some other way, altering the 'connection' between past experience and action, and the notions of future practice. In this sense, visions are also a type of 'speech act' (Searle, 1969). Vision expressions of ICI's senior managers are not just expressions of something that does not exist (yet), they are expected to *do* something specific to other practitioners; they are advising, showing, directing, influencing and confirming forces; a notion similar to the concept of 'script' (Akrich 1992). Latour also uses the concept of script to capture the explicit or implicit messages and guidelines, 'built into' artefacts (1992). This kind of analysis is especially utilised by actor-network accounts, with a comparable notion of 'sociotechnical scenarios' (Callon, 1986).

Requirements for Innovation

From the case study, it seems that managerial visions do not appear so powerful or pervasive that they necessarily and directly generate sets of specific requirements to guide technological development alone. They are, after all, often explained as no more than ambiguous 'hunches', initially rather vague, and often open to negotiation and change. As I suggest, what is needed for their operationalisation is that the vision is taken up in a more formal sense, by groups of empowered individuals and typically 'processed' within existing project, strategic or planning arenas. From the discussion, how visions become actualised in practice can be described as follows:-

-Vision statements contain some form of description (or prescription) of particular issues that can be understood within a broader meanings of an innovator's awareness of a 'commercial reality'. This includes roles for the individual and technology, and are either intended to allow people to align themselves with them, or specifically constructed to provide support for the existing strategic plans of groups.

-When a particular vision becomes accepted by others, it becomes an influencing issue of varying importance and is added to other competing managerial and commercial issues.

-A particular vision is considered important, subject to dominant cognitive heuristics, and other influences upon the individual's mental apparatus (I shall discuss this in more detail in the next chapter).

-As an issue of importance to managers, a particular vision focuses attention and may demand action. This includes attempts to quantify particular specifications and the construction of relevant changes to existing routines, practices, products or processes.

-The cognitive processes and social interactions determining the particular direction that the innovation may take, have a dynamic of their own, often seemingly independent of the visions brought forward by practitioners, to create more grounded notions of reality. Thus, generally speaking, a first step of vision-building does not automatically lead to the third. For example, a particular vision of environmental safety may not lead to a specific product developmental strategy, as there is much subjective interpretation and conceptual reconfiguration in-between.

However, this sequence:-'emerging vision- increasing alignment of individual schemata - growing strategic importance through negotiation - requirements identified - strategic policy and implementation, is as much contingent on the many specific influences of the social context of the firm in which innovation practices are

performed, especially, if the first step is one that is 'forced' into strategic consideration.

For example, the conflict between McMahon's perspective of innovation and that of the Innovation Group, amounted to more than simply different views. It was not simply the differences but also McMahon's level of managerial 'empowerment' inferred by his management position, that appeared to have such a disruptive affect on the Group. As a junior member suggested:-

"I don't agree with what he [McMahon] has in mind, but he is the boss and I don't have much choice but to follow what he is thinking" (V. D'ath Interview).

In this sense, various innovation practices, that were opposed to McMahon's notion of what constituted 'acceptable practice', were perceived as 'risky' to career aspirations. Similarly, certain managerial visions appeared more easily accepted by practitioners, provided they were viewed as similar by those who sought to follow them. Indeed, Harris found a ready ally in Kenyon, who, although not recognising the importance of the Internet to ICI Paints *per se*, had worked previously on several similar IT-based projects that had an effect on ICI practices, at many levels of the value-chain. In this way, the rather convoluted route of 'vision to action' may become more quickly and rigidly-fixed in the social rules of the firm (or in particular, the informal-groups), as I shall explain in more detail, in the next section.

7.10 The Emergence of a Shared Cultural Schemata

In this section, I revisit and develop several important issues that have been introduced in this chapter. In the account given here, drawing from the case study, the content of each vision-level effected how they became 'encultured' within the organisation's practice. In the interpretations of events, a schemata is constructed, modified and reshuffled, becoming socially communicated in its sharing and actualisation in practice. These interpretations were not uniform throughout the firm; they were plural, dependent on the 'style' of innovators and the 'community of practice', that was said to have a large influence upon 'legitimate' decision-making.

7.10.1 A Plural Perception of an Innovation Culture

Understanding, or in some sense, 'making coherent' the many competing notions of what innovation entails and the different possible approaches that could be taken, was an important issue of governance regularly discussed amongst ICI's managers. It has often been noted that segmented departments differ, in their degrees of attention, to the strategic issues or policies of the firm, and their various interpretations of them (Sproull, 1981, Mintzberg, 1987). Indeed, the different functional or project areas of ICI (or informal groups), maintained 'slightly' different notions of what seemed important, as well as possessing different systems of reward (both formal and informal). Although all departments (and informal sub-communities) possessed broadly similar cultural assumptions, as well as beliefs, of what constituted a 'strategic problem' or 'hostile environment', each group applied them in different ways to specific practice.

Each vision implicitly included some notion of an organisational 'map' in which the supposed differences in departments, divisions or functions were related in terms of a perceived similarity to existing practice. These were focused on current issues (such as contributing to existing projects), possibly in terms of market geography (such as 'non-drip' roller paint for Germany), or by other subjective classification schemes.

The prevalence of an 'over-the-wall' attitude to innovation projects within ICI Paints was clear, and the relatively rigid organisational 'maps' that were inherent within this belief, was something that the Innovation Group attempted to dispel. Distortions between individual schemata often arose due to political or social distractions within (and external to) the organisation, such as disruptive conflicts, personal disagreements or 'inappropriate' organisational structure. The most obvious was the attitude to innovation attributed to McMahon, but also includes other examples, such as the lack of technological synergy in ICI's European Paint businesses that Stephan Coester (the 'new' Innovation Manager) was tasked to solve.

There were several fundamental notions of the various functions of ICI Paints which

were familiar to all practitioners, such as production or sales departments. Similarly, there were some functional or departmental areas whose 'cultural vocabulary', or political arrangements related to innovation, were considered a 'mystery' to most other staff. One such example, was the Strategy and Planning Office, managed by Viner and Hulme. Many managers expressed a lack of knowledge as to what they did and how they went about it. The same was said about the Market Research Department. One junior practitioner commenting, 'what ever it is they do, I don't know, I just hope that they keep on doing it'. In this sense, people still constructed 'workable' notions of, and ascribed an importance to their functional role within the innovation process, but these notions were vague and based on incomplete 'hearsay'; in essence, 'filling in the gaps' in their organisational functional map of the firm.

7.10.2 The Learning of 'Style'

While certain authors, interested in cognition, concentrate on the modes of representation of information during 'thinking' (Richardson, 1977), Kirby and Moore focus upon the organisation and structure of information during expressions of 'belief' (1988), a notion similar to the concept of managerial vision described here.

They suggest two broad alternative modes of cognitive representation, 'visualising' (thinking in a pictorial mode) or 'verbalising' (thinking in a semantic/verbal mode). Both were, of course, heavily utilised by managers throughout the case study, yet I suggest that initially, the more broad and exploratory pronouncements take the form of 'visualising', such as Miller-Smith's company-wide expressions, typically using such terms as *flowers*, *blinkers* or *leeching*, while later, as the visions became more 'socialised' and developed, in terms of being related to current strategies and practices, the expressions often took the form of semantic 'metaphors', such as taking part in a *war or managing* a football team.

It is possible for individuals to act in a successful way and yet also behave inconsistently to the organisation's habitual approaches to problem-perceiving and solving (Streufert and Nogami, 1989; 97). Hayes and Allinson cite a number of

studies that suggest individuals can combine aspects of cognitive styles to provide successful and alternative cognitive heuristics for dealing with particularly complex problems or novel situations (1994;54).

Kirton and DeCiantis also suggest notions of cognitive 'style' as having a crucial and variable influence on group and organisational culture, as 'exaggerating the intra-group differences', and as a potential source of creative conflict (1989;84). Several social science authors also suggest that organisations have preferred 'styles' of learning for the creation and management of new knowledge; a notion similar to that of cognitive 'style' (Nevis *et. al.*, 1995; Pedler *et. al.*, 1997).

Indeed, the process of learning which 'cultural' issues successfully influence the practitioner, has been described as two 'knowledge creation and management' modes; a knowledge-intuition mode, characterised by creative and expansive thought, and a knowledge-implementation mode, characterised by the rational and stabilising thought, similar to the stolid and conservative cultural assumptions of the ICI Group and its sub-units (Glynn, 1996; Marcus, 1988; Rogers, 1983).

This relationship has important implications for the understanding of the management of learning 'cultures' and the consequences for the *processing* of managerial visions, and its affect upon innovation. It alludes to the possibility of practitioner's being 'aided' in the learning of successful search strategies and innovative behaviour, suggesting that certain 'styles' deal more effectively with organisational conflict, often pre-supposed by technological change.

7.11 Organisational Change

From a cognitive perspective, a practitioner's *sense-making* mechanisms (including the search for new opportunity) trigger changes in the schemata with which practitioners represent the world (Louis, 1980; Louis and Sutton, 1991). Indeed, it has also been claimed that the model of 'reality' *must* change before organisational

renewal can occur (Barr *et. al.*, 1992). Similarly, any inconsistency between a current 'reality' and a vision of the future, may constitute a stimulus for a retrospective explanation (Weick, 1995).

Indeed, the corporate change of the existing business and technological mix of ICI Group, naturally created changes in senior manager's cognitions, concerning their perception of the nature of ICI's technological capabilities and future competitive advantage. The comprehension of what major decisions may mean to the firm, took place within a continuous process of problem redefinition, opportunistic behaviour, and crisis management (also see Mason and Mitroff, 1980). The process of corporate portfolio change, outlined within the case-study, could not be described as 'smooth', 'well-planned' or even 'obvious', to the decision-makers involved from the beginning (section 6.3). Rather, it was a process of conflictual change characterised by a constant re-evaluation of what each individual operative change meant to the business and technological-mix of the firm, reflected against a general vision of moving towards a more 'market-focused' speciality chemical sector.

Although not the aim here, it may eventually prove possible to distinguish between the processes of cognitive change that result in a refinement (or incremental change) of an individual's schemata, and processes that shift them to a *new* representation with fundamentally different premises. In the example of the major ICI Group demerger, the threat of a hostile take-over by Hanson Plc. was perceived as being enough of a crisis to warrant a massive change in organisational structure (section 6.3). One may argue that this was based on a dramatic change in the re-interpretation of ICI Group as a 'stable' and 'enduring' organisation, reflected against a belief of how such a group would endure in a particular envisioned business environment. Indeed, such a dramatic re-conceptualisation of the 'vision' of ICI's future was described by then Chairman, Henderson, as having a 'flash of instant vision' that undermined his assumptions about the competitive re-focusing of the ICI Group.

Similarly:-

"It became immediately apparent from the conclusions drawn, that ICI was facing a critical moment in its history. A sea change had been taking place in the world chemical markets and ICI was not properly equipped to respond to it" (Kennedy, 1993;12).

Occasional and small invalidations seem unlikely to generate such dramatic 'cognitive shifts'. Indeed, Thagard argues that when people already have a theory of 'how the world works' and are exposed to evidence that opposes that theory, they tend to persevere in their beliefs well beyond the point at which logical considerations may sustain them (1996). This may constitute a cognitive basis of organisational stability and provide a propensity for practice to endure. Indeed, even with the presence of the consistent invalidation of existing routines, individuals may not adopt substantially new schemes if they do not have access to alternative and rich representations (Kuhn, 1962). In this sense, a vision may constitute a cognitive 'bridge' between established, and new, notions of a reality.

Perhaps the pervasive role of such mechanisms, as 'drivers' of cognitive change, have something to do with deficiencies in human inference and problem-solving. The essence of analogy, for example, is the transfer of knowledge structure from one situation to another through a process of non-direct mapping, finding a correspondence between aspects of one body of information and aspects of another (Gick and Holyoak, 1983). Thus, the mis-matching of ICI's broad managerial practices (section 7.6), may *necessarily* require such an adaptive learning process to 'make-sense' of, and operationalise, them.

Indeed, it could be argued that it is difficult to suggest how the transfer of ideas can be expressed without the use of some form of metaphor or analogy, yet the point here is not simply that such cognitive mechanisms are utilised in the sharing of vision, but rather that a cognitive context is inexorably *intertwined* with the social context *and* content of the shared 'message'.

7.12 Conclusions

Given a cognitive alignment, there are several characteristic ways in which to interpret organisational and technological change (Penrose, 1959; Langlois 1997; Pettigrew 1973). Yet when examined in detail, many important questions often go unanswered (Langlois, 1996). For example, 'in what ways can innovators be said to *perceive* meaningful opportunity', and 'how do practitioners deal with uncertain and ambiguous environmental data'?

Much of the sociologically-based literature within this chapter, has aimed to prove compatibility with many cognitive explanations of 'vision' and helped to illuminate its role in stimulating innovation. Cognitive schemata are explained as internal representational systems that individuals create and utilise to interpret their social environment and provide structure and order to their social world. Different individuals with 'similar' notions of reality are better enabled to communicate and share learned experiences. In this sense, organisational ideologies can be viewed as socially agreed upon schemata.

Various aspects of ICI's cultural assumptions illustrated the importance of experiential learning, based upon a culturally 'agreed' set of conceptual categories and prior beliefs. The importance of a dominant logic, and its effect upon the sets of visions of practitioners, suggests that each practitioner does not begin to answer questions such as 'what and how' to innovate *tabula rasa*, but rather possesses existing and complex interrelated cognitive structures that direct the range of possibilities and 'allow' search processes in certain directions and not others. Thus, the dominant logic of ICI Group, consisting of cognitively simplified terms, such as; conservatism, short-termism, politically expedient and non-risk-taking, operates as culturally held *metaphors* that relate specific innovation projects or events. Far from being abstract or vague terms, the 'logic', appears to consistently legitimise and moderate a personal sense of what a vision means to the innovator, reinforced by existing practice.

The construction of ICI practitioner's sense of a commercial reality was influenced by several vision levels of content. They are the individual, artefacts, the firm and broader social trends. These created, strengthened or weakened the conceptual linkages between people and functional departments, by constituting a resource to be utilised in the development of new technology.

As visions began to be shared, they formed a focal point around which informal communities of 'like-minded' practitioners coalesced. These communities were often structurally bound by formal organisational structures, such as marketing or R&D functions, but mostly constituted more 'conceptually-bounded' groups, cross-functional in nature, and served to provide the practitioner with a sense of what was culturally important and legitimate to consider, pursue and develop.

ICI's heritage of practice served as 'default' behaviour to existing schemata, and was often applied to novel situations that lacked clearly defined 'dispositions to act' (Strickberger, 1991). Some actions may be clearly specified by general managerial 'templates', while remaining sets are simply be carried over from past practice.

The notion of what was considered as 'legitimate' or 'authorised' behaviour and its effect on schemata was shown to be an important issue for attempting to understand notions of vision and innovation. Individuals constantly sought authorisation from their immediate superiors and their 'like-minded' informal communities on how to act, behave, suggest ideas or challenge the social boundaries of the firm. The more direct control practitioners had over particular projects, the more they were concerned with its anticipated success and the credibility that this may infer. In this sense, they had degrees of personal 'ownership' over innovations.

Sub-ordinates were constantly required to observe the perceived beliefs of other, more senior, managers, and to continually re-check and test their interpreted understanding. Hence, sub-ordinates were typically engaged in a dynamic and on-going negotiation of meaning, attempting to develop synergistic 'alignments' of their

assumptions, largely influenced by 'conceptually-similar' and informal communities.

The general contention derived here is that conceptions of future innovation possibility does not exist in a social vacuum of their own choosing. They are moderated within a particular social-context and by the cognitive mechanisms and processes of practitioners. In being reinforced and influenced by shared organisational assumptions and current practices, they become institutionalised.

The next chapter, focuses on the effect of organisational culture and its influence upon the practitioner's decision-making capabilities. Such an investigation further illuminates the importance of the 'like-minded' and informal communities upon individual's experiential learning of culturally 'acceptable' notions. The chapter also continues to draw heavily from synergistic social and cognitive research, and begins to outline an explanatory situated cognition account in which research issues can be further investigated.

8

Organisational Culture

8.1 Introduction

The literature review in Chapter Two argued that the research on organisational culture often lacked a cognitive understanding of the perception of future innovation opportunity. Indeed, an increasing number of publications pertain to these issues as having a major influence on an organisation's innovation performance, yet much of this research seems confused by different considerations applied to the term 'culture'. The aim of this chapter is to address several important notions raised within the last chapter, that were characteristic of ICI's business 'culture', and discuss their effect upon the visions of ICI's practitioners.

Having identified several coherent notions through Step One and Step Three, the next step in Easterby-Smith's grounded theory checklist (section 5.7), suggests attempting to further categorise the concepts identified from the 'raw-data' of transcripts. This involves linking, drafting and re-evaluating accounts of the emerging themes, considering new ideas, and adapting older themes. As such, although consistently attempting to identify new topics of relevance and drawing upon a wide range of literature, the analytical focus is now more heavily placed upon describing, in depth, several of the major topics, identified within Chapter Seven.

Chapter Outline

Section 8.2 considers several basic cultural assumptions within the study of ICI Paints. These suggest that the 'commercial reality' of practitioners is ultimately and inexorably connected to their perception of their business ethos, that, far from being dispassionately observed, they are actively engaged in shaping. Section 8.3 considers

further, various theoretical implications of a 'cultural' reality, suggesting notions of conceptual plurality and shared-meaning, as crucial to the account developed within this thesis.

Section 8.4 describes three general perspectives in the study of organisational culture; holistic, variable and cognitive. The discussion demonstrates that although the present analysis can be said to fall within a general cognitive perspective, the research issues posed here, seek answers that may require analyses that lie outside this broad approach. With the last section in mind, section 8.5 outlines the influence of ICI's culture upon innovation 'choice', suggesting that visions are typically framed by technological and commercial assumptions concerning what is considered 'legitimate' practice. This legitimisation is mitigated by shared views, often established within the temporary and informal communities of 'like-minded' practitioners, outlined as crucial innovation within ICI Paints in the last chapter.

Section 8.6 discusses how practitioners set about constructing new and important considerations, suggesting that a necessary part of their 'enculturation' entails the learning of legitimate practice and knowledge of the 'empowerment' of certain practitioners to 'force' issues into their day-to-day considerations. Section 8.7 continues this theme, outlining particular examples of vision expressions and how their eventual structural influence upon practitioners is shared throughout the firm.

Drawing from Chapter Four and Chapter Seven, section 8.8 begins to describe, in more depth, the treatment of several critical issues raised here, within a SitCog account. In particular, areas of interest include the sharing of a collective sense of cognition, the influence of communities of 'like-minded' practitioners, the identification of anomalous data, and the importance of experiential learning *in situ*. Section 8.9 provides the chapter summary.

8.2 Cultural Assumptions

Several cultural assumptions appeared entrenched within the descriptions of innovation and vision, provided by ICI's practitioners, yet often went largely 'unquestioned' by them. In section 7.3, I provided a list of common terminology that was repeatedly utilised to describe ICI's general business ethos. However, during the many interviews conducted, it also became apparent that several other underlying 'behavioural' assumptions existed and were widely-held throughout the firm.

Firstly, managers *control* the process of innovation, as well as ICI's relationship with their competitive environment, and yet remain, in some fashion, 'removed' and untouched from that process. Second, the role and content of existing assumptions were similarly dependent on previously held organisational practices, as well as on the limitations of the practitioner to distinguish relevant and valuable information from other 'less critical' data within the commercial environment. Third, and similar to the first, innovation could be managed by practitioners, just as they managed other organisational processes. Together, the lexical terms and behavioural procedures, constituted what I shall refer to as ICI's business or cultural assumptions. So, for example, an assumption that was regularly expressed within the interviews was that 'ICI do not make paint for anybody else' and that 'the strategic focus was placed upon brand-management- their own!'

An additional policy may have been to make paint under somebody else's brand-label, yet this idea seemed anathema to the entrenched assumptions of the firm. Indeed, not one interviewee could remember anybody even suggesting such an idea, as to do so would immediately be considered 'illegitimate' by their peers. As such, I suggest that this demonstrates the influence of both the managerial *control* of ICI's strategies and the embodiment of the 'stolid', and 'conservative' policies of the past.

Implicit in the discussion here is a notion that all of these assumptions *can* be successfully challenged. That is to say, far from being 'removed' from the culture in

which they are embedded, practitioners are actively engaged in its construction, and play a critical role in the identification of 'anomalous' data that leads to the creation of new vision and innovation. Similarly, although these phenomena can be pragmatically managed, they require more self-reflexive forms of managerial practice, than exists at present.

Indeed, although many authors suggest that an organisation's culture is largely a construction of the social processes of the firm (Mintzberg, 1978; Child and Smith, 1990), the degree to which they consider the environment as 'material and independent', or view it as a product of managerial or cognitive 'imagination', or as a characteristic of innate 'perceptual mechanisms', differs enormously (Simon, 1980; Penrose 1959, Langlois, 1996). Similarly, although various authors focus on the construction of a 'collective view' of the environment, many do not necessarily consider that process specifically in terms of vision, innovation or technological development (Berger and Luckmann, 1966; Weick, 1979). This neglect may offer room for accounts that serves to enrich the understanding of innovation and vision, in the context of cultural and organisational studies. The next section considers several approaches to 'how do practitioners 'make-sense' of their business environment'?

8.3 Different Approaches to Understanding Cultural Reality

At a basic level, it has often been recognised that organisations differ culturally, in many complex and subtle ways (Weick, 1979; Knights and Murray, 1992). ICI's culture is often stereotyped as being very conservative, risk averse and 'steady', whereas the image of, say, 3M, is typically explained as adventurous and risk-taking, and is capable of producing a stream of successful and innovative products. This image may arise from people's biases, their experiences over-time in dealing with these organisations, generalisations (or simplifications) of industry comparisons and attempts at conscious image management by the organisations themselves by use of promotional strategies, advertising or marketing.

Such stereotypical images may demonstrate the variety of ways that organisations are perceived externally but clearly they cannot constitute the basis for making empirical judgements about which factors give rise to certain practices.

8.3.1 The Plurality of Cultural Study

The plural nature of organisational culture is acknowledged by many writers. Harrison's (1972) work, describing 'cultural ideologies', is probably the most widely quoted. For example, Handy (1975) uses his framework, considering it in relation to the context of power relations amongst individuals.

Indeed, 'power' has been described as a key force in the construction of interpersonal relationships (Knights and Morgan, 1990) and the culture from which innovators draw meaning and identity (Knights and Murray, 1992). Similarly, Chapter Six suggested innovation practice within ICI Paints as being largely influenced by political process, where it was commonplace for those with greater 'legal' power to dominate the beliefs of others (section 6.12.2). This may constitute formal authority, alliances and informal networks, control over decision processes, as well as other informal sources, such as 'boundary management' (Morgan, 1986). Knights and Morgan (1990) also suggest practitioners construct internal social and political relations through practice, from which everyone derives meanings and identity.

Practitioners within ICI devoted a great deal of time to discussions that sought to enhance their personal status (or kudos and identity) within the firm and routinely attempted to identify potential opportunities and personal *threats* to aid this process, in the vision expressions of others. Indeed, many staff wondered why managers always seemed to be in meetings; meetings that rarely produced an output that was broadcast to others (section 6.12.3). These meetings were often arranged at irregular times and many people were critical of the quality of the communication arising from them. It is unlikely that they met to discuss innovation strategy since, by their own admission, this was something they should have been discussing but typically were not. Indeed, Kenyon summed up the feelings of many, concerning these meetings:-

“Finger pointing is what happens at these meetings, not real critical analysis of our successes and failures. These meetings aren’t helpful but pretty fraught times for all concerned, but you don’t want to be taken out of the loop; it’s office politics writ large and there to make the people feel important.”

Knights and Murray further suggests that while practitioners obviously consider, for example, the needs of the market-place and the capabilities of the firms technology’s in their discussion of innovation, such ‘externalities’ and ‘negotiated internalities’ are often constructed by the power and practices of key personnel (1992: 225). Nevertheless, according to ICI’s assumptions, practitioners typically saw these *structures* as ‘real’ and ‘handed down to them from past practices’ and consequently, were beyond their control. Internal decisions and preferred options were also mediated by subjective interpretations of ‘power’, and not as an *a priori* response to environmental change. Drawing from the description of cognitive simplification (section 7.2), practitioners appeared to reduce the ambiguity of such externalities by applying their previous cognitive structures and derived meanings to them. In essence, the fact that certain events or practices were ‘taken for granted’, implied that such notions were repeatedly used with little reflection upon their performance.

Fincham *et. al.*, concluded that these structures are interpreted according to the distribution of knowledge and the aspirations of particular groups (1994: 300). Indeed, drawing from Chapter Seven, the most important groups in which these interpretations took place were said to be, not the more rigidly defined functional groups but, the informal communities of ‘like-minded’ practitioners (section 7.5).

Similarly, there was a conflict between various departments over the control of the innovation process (section 6.12.2, 6.12.3). One side claimed that customer’s needs were best met by the existing technological arrangements that placed marketing and ‘brand-management’ at the centre of the argument. While others claimed that a fundamental change in innovation strategy was essential, in order to better meet those same needs. This political conflict can be viewed as an attempt to legitimise functional and career interests by embedding them within innovation projects. (Knights and Morgan, 1992: 218).

8.3.2 Cultural Paradigms and Revolutions

The Philosophy of Science also contributes to the notion of a 'common' or shared sense of reality. Kuhn describes the history of science as long periods of 'normal science' punctuated by 'revolutionary' shared thinking (1970). These revolutions replace a community's notion of reality, or 'paradigms' of the world, with another more flexible and richer version, offering a more encompassing account of 'how the world works'. Kuhn's ideas offer a view largely similar to that of Ludwig Fleck, in his outline of 'thought collectives' (Fleck, 1979).

Kuhn's ideas have heavily influenced managerial research, which often refers to the 'paradigm' of an organisation as joint 'mindsets' or sets of 'cultural blinkers', preventing the organisation from seeing the world as it 'really' is. This suggests that ICI's assumptions (section 7.3) may act as a 'cognitive filter' that, in some fashion, refines unsuitable ideas and notions from within the commercial environment.

Burrell and Morgan (1979) and Morgan (1980), also within a Kuhnian perspective, claim that a good deal of social theory can be analysed in terms of 'world-views', suggesting that specific organisational accounts typically depend on two things. Firstly, the degree to which a society (or group) can be regarded as 'material' and 'objective', or as the subjective experiences of the individuals concerned. Secondly, that one must consider the construction of 'reality', in terms of a sociological continuum of 'regulation' to 'radical change'. That is to say, individuals may regard structural concepts, such as 'free-market' or 'adventurous', as worth preserving, or they may regard them as ideologies that constrain them in their day-to-day practices.

Many authors have similarly introduced similar terms to 'paradigm' and 'world-view', in various contexts, such as exemplar, pattern or regime. Where authors assume Kuhn's 'shared examples', they similarly refer to different aspects of a 'search space'. For example, Nelson and Winter's (1977) 'regime', emphasises certain technologists' beliefs, while Georghiou *et. al.*, (1986) utilises the same term for specific design configurations. Dosi (1982) uses the term 'paradigm', mirroring

Kuhn's multiple meanings, whilst referring to practitioners exemplars and heuristics, guided by the 'invisible hand' of engineer's 'blinkered imagination'. However, there is little notion of action, in turn, guiding the cognitive processes of the practitioner's or, in particular, their 'imagination', a fundamental notion within a SitCog perspective. The next section examines several general perspectives for considering 'organisational culture'.

8.4 Analytical Perspective on Organisational Culture

Sackmann suggests three broad approaches can be differentiated from within cultural research; holistic, variable and cognitive perspectives (1991). Although they possess differences, all focus upon the establishment of the components of culture, their relationship to its complex dimensions, addressing theoretical and methodological assumptions, based on shared 'sense-making' mechanisms (Sackmann, 1991).

The Holistic Perspective

Within this broad perspective, culture is viewed as consistent 'ways of thinking and responding', acquired and communicated, mainly in terms of individual representations. Research consists of the unique attainments and experiences of groups, often embodied in artefacts. This approach is well established within managerial literature and best summed up by Tunstall:-

'Corporate culture may be described as a general constellation of beliefs, customs, value systems, behavioural norms, and ways of doing business, that are unique to each corporation, that set a pattern for corporate activities and action and describes the implicit and emergent patterns of behaviour and emotions characterising life in the organisation' (Tunstall, 1983; 5, in Sackmann, 1991; 7).

The perspective signifies an in-depth and long-term ethnographical study, drawing from various sources of information, and typically results in a rich setting-specific description that makes it difficult to characterise 'conjecture' from 'empirical' evidence. Culture is something that organisations *possess*. In this sense, organisations *are* cultures that need to be understood from a theoretically 'holistic' standpoint.

The Variable Perceptive

This approach concentrates on the 'expressions' of culture, in the form of the verbal and physical behaviour of individuals, allied with associated underlying meanings. Culture is described as manifestations of behavioural 'norms'. The research focuses on the observable behaviour of practitioners, mainly inferred from restructured self-reports. Culture is something that organisations 'have' and is regarded as an additional variable that may be regulated by managers, once it is made apparent.

Special issues of interest constitute the collective activities of communities, such as rites, rituals, and ceremonies, as well as the collective verbal behaviours of practitioners specifically, speeches, jargon and stories. Here, physical artefacts are considered the main evident product of cultures.

The Cognitive Perspective

A cognitive perspective typically places the focus of research upon the practitioner's beliefs, concepts and values, that are considered central to the complex and varied phenomenon of 'culture' (Sackmann 1991; 22). Within anthropology, and sociology in particular, where a cognitive approach has been utilised, the characteristics of culture are often described as 'organised knowledge'. Hence, the focus is placed upon the issues that 'lone innovators' have in 'mind'; but perhaps less so, their cognitive mechanisms for perceiving and interpreting the ideas and theories of others that are utilised by them to collectively 'make sense' of their world.

Researchers within this perspective, have variously referred to culture as sets of understandings or meanings, or as a publicly 'accepted' understanding. They are also referred to as values, norms and expectations, utilised by individuals, and as assumptions commonly held by members of specific sub-groups (Allen 1984, Sapienza 1985, Schein 1983).

Here, 'culture' is typically accepted as a construction of practices and routines, that focus managerial perception and decision-making, providing notions of 'what is important', and 'how to go about it'. This perspective is best captured by Schein, drawing on the influences of social psychologists and anthropologists as:-

'The pattern of basic assumptions that a given group has invented, discovered, or developed, learning to cope with its problems of external adaptation and internal integration, that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to these problems' (1984; 3).

8.4.1 A Summary of the Construction of Individual Reality and Organisational Culture

In essence, there is no clear agreement between perspectives as to what 'culture' or 'reality' means and what its characteristics are. Yet from these non-mutually exclusive descriptions, it appears that all three approaches can broadly be defined as consisting of a complex and homogeneous social milieu, centred around (or at least heavily influenced by) the 'doing, thinking and sharing' of key and empowered individuals or specific communities.

Indeed, the three perspectives show that although separate strands do exist, while this thesis can be said to broadly lie within a cognitive approach, the similarities between accounts may necessarily mean that this research can be said to contribute elements to all three.

The major interest in this thesis is the 'sense-making' mechanisms of individuals and groups that are utilised within vision and innovation, and are, in most cases, said to be incorporated within the organisational 'norms' or rules for believing and understanding what is acceptable behaviour, as well as perceiving and interpreting what is anomalous or interesting data. Behavioural 'norms' can be thought of as 'taken-for-granted' expressions, accepted within a particular culture or sub-community, explicitly positioned in the observable practices of a firm, while the negotiated meanings between practitioners are often located, tacitly, below a visible level of interaction. Typically, the first level is addressed by the approaches

suggested, but the second (even from within the cognitive approach) is often considered of secondary importance or simply neglected altogether. As I have argued, creating an understanding of a sense of 'reality', as witnessed by ICI's practitioners, must also constitute an inquiry into the 'underlying' cognitive processes of 'sense-making' (Weick, 1979; Schank and Abelson, 1977).

From within a broad cognitive exposition, attempts have been made to describe organisational culture from within Information-Processing systems (Galbraith, 1982; Daft and Weick, 1984), sets of shared cognitions (Brown, 1978) and self-organising system approaches (Schank and Abelson, 1977). Yet these accounts typically describe culture as mere theoretical abstraction capable of independent action and ignoring the fact that it is the practitioners 'situated' within organisations that perceive, interpret and decide to act (Langlois, 1996; Silverman, 1971).

Typically, Information-Processing accounts have to be substantially amended to include notions of 'people'. For example, key individuals may act and decide on the basis of certain shared meanings that are negotiated amongst other practitioners (Berger and Luckman, 1966; Louis 1980; Pfeffer, 1981). Similarly, individuals belong to the organisation and share information to create a basis for action (Bartunek, 1984; Weick, 1979, 1990). In so doing, they also share the 'underlying assumptions' about interpreting data that enable the co-ordination of actions and innovative behaviour. These deep or underlying notions have proved difficult for Information-Processing research to take into account.

The novel situations that ICI practitioners encountered, often appeared to 'implore' the practitioner to acquire new information and new interpretations, which required a re-evaluation of existing practice. That is to say, practitioners, as part of their cognitive disposition, and as part of their day-to-day practice, 'searched out' new patterns or anomalous data. The process of learning the encultured processes or 'rules' of the firm is an important factor here, and explanations need to be based upon a shared 'people centred' perspective to include, for example, the emotional

commitments of practitioners seeking 'attainment', explanations lacking in Information-Processing perspectives. With this discussion in mind, the next section describes the influence of ICI's cultural 'ethos and its affect upon innovation practices, as well as an individualistic description of motivated and shared practice.

8.5 ICI's Individualistic Business Culture

ICI's members appeared to take for granted the importance of individual success through personal initiatives and political skill, in an often competitive and territorial commercial environment. The staff also possessed a sense of cultural order or 'way of doing things', provided by the organisational history (section 6.3), its products and processes and through their complex hierarchical systems of managerial 'empowerment' (section 6.4). When staff discussed innovation and culture in terms of its 'ownership', it was for them a natural and emergent framework, rarely introspectively questioned (section 6.4 and 6.12.1). For example, consider the notion of personal 'failure' (section 6.11). As the R&D Director suggested:-

"Failure sticks (...). We hate loose ends and everything has to be neat and tidy. There is a tremendous urge for self-flagellation." (C. Joyce Interview).

This was a common sentiment amongst staff and a source of great annoyance to many tasked with innovation, who suggested that the risk to one's 'personal kudos' was a major hindrance to much of their day-to-day innovation activity. Yet such comments were rarely de-constructed any further. To be associated with a successful project was also to infer credibility on the future opinions and career aspirations of the innovator. In this sense, one's functional identity was personally 'bound' to the projects worked upon.

This 'order' perceived by practitioners was additionally reinforced by the taken for granted day-to-day practices of ICI. For example, the relative ease with which staff were moved around projects and tasks reinforced the notion of competition at both the individual and organisation level. Indeed, section 6.12.1 and 6.12.2 describe the sense of personal opportunism that existed because of it:-

"It [being moved within tasks] can be frustrating as you can have many different bosses with their own peculiar ways, but it does mean that your job is never the same and gives you lots of chances to see what is going on, who is good at what and what sort of things it would be good for you to get involved with" (V. D'ath. Junior member of the Innovation Group).

The perception of a cultural order was also reinforced by the organisational emphasis put upon continuous improvement in efficiency and cost-cutting measures. This was also reflected in the traditionally cautious recruitment of senior managers (although this was changing to reflect the more 'market-focused' approach), continuous training programs (such as the Harvard Business School course attended by Harris), and regular performance evaluation of individuals and functioning divisions.

Individualistic and informal practices were possibly stimulated by the existence of a lack of formal career advancement structure. For example, the political whispering campaigns surrounding new product releases or the premium placed upon the Innovation Manager's social networking skills as the basis for building organisational credibility, were suggested as highly influential in 'getting ahead' (section 6.12.2). The individualistic sense of competition could also be seen in more 'formal' practices, such as the Stage-Gate project selection tool (section 6.12.3). Here, an essentially quantitative method was increasingly 'subverted' by practitioner's who were skilled in using political and social networks to circumvent the structured framework of the tool, to suit their own personal aspirations.

These personal 'ways of doing' appeared to be the by-product of a 'nobody else is going to look after your career' approach to ICI's working culture, suggested by the Innovation Manager (section 6.11) as a major dominant cultural influence affecting career aspirations. The possibility that other less individualistic career-oriented cultural influences could be generated did not occur to practitioners, This appears to contradict the major assumption of managerial 'control', that any cultural 'type' can be fostered within the firm (section 8.2).

This is not to say that ICI Paints could be perceived of *only* in terms of individualistic practices. It was accepted that decision-making processes, as well as the strategic or innovation issues of the firm, involved much shared teamwork and

negotiation. Indeed, it was considered a normal part of a practitioner's daily life to be constantly looking towards senior manager's vision expressions as a way of 'aligning' their own personal beliefs to others, forming a sense of identity and to act in 'legitimate' ways.

8.5.1 The Day to Day Influence of 'Power'

As the case study demonstrates, 'existing practice guides future practice...without logical determination' (Bijker, 1995; 252). Bijker was speaking on the social-shaping of technological systems, but the point applies equally to the innovation and cultural processes described here. Such guidance appears to derive from a mixture of dealing with the necessity of day-to-day practice and the often tacit influence of ICI's pervasive cultural assumptions.

The 'taken for granted' processing of shared decision-making concerning innovation, was felt by most staff to be reducing in importance, because of the particular leadership style of their present CEO, McMahan, and other key personnel, such as Senior Marketing Manager, Hulme. Thus, an individual's empowered interpretation of what a particular vision expression entails, had a demonstrative effect on other practitioners simply by the fact of their 'legal' position within the firm.

This had an especially important influence on the Innovation Group and the Innovation Manager's sense of personal identity and their role within the firm (section 6.12.2). The disagreement between McMahan and the Innovation Group over what innovation practice meant to the firm and the fundamental role of the Group within ICI Paints, was not merely a theoretical one. The problem for Kenyon was that McMahan had a leadership style that was neither consensual nor conciliatory *and* he was also empowered to 'force' Kenyon and the Group to adhere to his view (in fact Kenyon could not and decided to leave the firm). The formal managerial structures, responsibility hierarchies and working procedures were subsequently considered to maintain the new cost-conscious, 'brand management' regime for the foreseeable future.

Despite the intervention of key and empowered individuals there was still a sense of continuity between the existing and pervasive heritage of ICI and the more transient everyday practices that appeared 'superfluous' of any one individual. Engaging in new experiences was often seen as disruptive and 'risky' to the individual's position within the firm (both informal and formal), but was still viewed as serving to enrich the general culture of ICI. Indeed, this rather paradoxical belief was expressed as:-

"We fail, we learn, it may not be much good to the guy who gets shafted because of it, but that's the way of it" (D. Algar. Senior Marketing Manager).

Organisational change did not mean ignoring the existing 'ways of doing' however. Although the engagement in new innovations, such as OTIF or Lotus Notes, introduced major new political/social elements into the business culture of ICI Paints, which effected most people in some manner or other, they did not seem to undermine the managerial commitment to the 'ownership' of projects and ideas. Indeed, these innovations appeared to assimilate existing structural knowledge in context specific ways, with both the content and process of knowledge assimilation, becoming themselves eventually unquestioned.

The clearest example of this can be seen in the slow but inexorable 'enculturation' and 'politicisation' of the Stage-Gate Tool; a practice originally intended to 'by-pass' much of the informal political and social processes associated with ICI's 'way of doing', considered by many to be detrimental to performance. Towards the end of my data gathering period, certain managers were considering new project selection tools precisely because of this process of 'creeping enculturation':-

"One of my jobs has been to really look at the Stage-gate tool and see how we can improve it and adapt it. But actually we've been doing this informally since the day we were first shown the tool from McKinsey's [Management Consultants]. I have already suggested that we formalise many of the suggestions but actually, to be honest, I think there will always be too many people who can lobby around it. It has had its day" (I. Kenyon Innovation Manager).

In summary, over time, many rules of behaviour within ICI Paints have become sub-conscious and 'taken for granted' (or, at least, not formally questioned), forming part of the organisation's cultural 'ways of doing'. Thus, in this sense, one can say that organisations are 'rule governed', although this does not assume that 'rules' are

fixed, unchangeable or deterministic. They are more like influential guides to action. The next section, considers how these interpretations are generated and shared.

8.6 The Interpretation of New Ways of 'Doing Things'

As I have suggested in Chapter Four, many authors have claimed that, within organisations, the shared reality of individuals is essentially a social construct (e.g. Berger and Luckman, 1966). That is to say, the organisational context and social interaction of individuals provide a framework for the creation of shared meaning. Thus, individuals can act upon what they perceive and believe to be 'real', whether or not their beliefs are objectively 'true' (Silverman, 1971). From the discussions in Chapter Two, Three and Four, it has also been argued that such a claim can be seen as compatible with the tenets of a broad cognitive approach to interpreted meanings of vision and innovation.

It is claimed here, that innovators interpret ambiguous situations in terms of pre-existing cognitive frames of reference (or managerial schemata) (Langer 1988). Practitioners, that possess a shared construct derived from the social negotiations within ICI, interpret new or ambiguous data in terms of what they *expect*, and is personally advantageous, to perceive. Their expectations are mitigated by the organisational norms, values and procedures, in essence, constituting an enriched and more context specific cultural assumption (section 7.3).

Attempts to understand ambiguity or uncertainty, presupposed by 'new' problems, often proved to be inadequate to the task. As practitioners considered what they 'expected' to see, the organisational context of shared meanings also helped to focus what was 'expected' of them. One may also suggest that the successful emergence of new practices, to deal with novel situations, were, by their very nature, *against* existing organisational 'norms' and were therefore likely to cause political conflict. Indeed, this was found to be the case time and again:-

"Sometimes you feel as, even though it is your job, it would be best just to carry on in the same way

as before. Every new problem or new product I've been involved with, causes trouble throughout, in one way or another. People automatically think that you are trying to tread on their toes and stealing their thunder, even when that's not the case at all" (V' D'ath. Junior Member. Innovation Group).

In many instances of 'externally forced change', the insights of past experiences were often seen as a hindrance to existing practice. Consider the example of the reticent approach of many practitioners towards the 'impending' IT revolution and its possible effect upon ICI's business culture:-

"Why would we want to get involved with this? We have always made paint and always will make paint. To start thinking about selling on the Internet, when our skills and competencies lie in our good name and suppliers and distributors around the world is mad. It's like cutting off your nose to spite your face" (R. Leggetter, R&D Manager).

Such reticence was also shown again in the almost 'fanatical' rejection of the notion of making paints under other brand names, and the 'war-like' metaphors used to describe the commercial *battle* against other 'big-shed' own-brand paints (section 6.11.2.).

Indeed, these strongly held opinions may well have served to dominate and 'filter' new exogenous data, compelling individuals to seemingly distort or ignore what was not subsumed into their regular cultural expectations. Indeed, the propensity of individuals to utilise existing schemata in ambiguous or novel situations is well documented (Argyris and Schon, 1978; Barr *et. al.*, 1992). Such notions are highly influential when applied to repeated instances of new information being rejected as outdated (section 7.4), or in suggesting why failing strategies endure, affecting practitioners ability to make 'sense' of change (Barr *et. al.*, 1982).

Similarly, the received view within ICI Paints is that as a mature industry, the actual rate of product innovation (differentiating the product from the competitors), was on an industry-wide decline. Where the competitive difference now lay was said to be in the 'image and branding' of a product, which was under an increasing amount of commercial pressure from other 'new' competitor's (that is distributors, not chemical firms) own-branded products. Indeed as the Director of R&D, Joyce, suggested:-

"We have reached the point now where consumers by and large are relatively satisfied with paint in terms of what it does for them. I think we have almost reached the point where actually innovating in

the product itself, other than to maintain the image of our paint is passé, almost” (C. Joyce Interview).

Such notions not only emerge from the confirmation of practice and assumptions but also appear to constitute a ‘self-fulfilling’ prophecy, of sorts. Consequently, expectations and corroborating experiences for particular visions or strategic decisions from the firm's past, tended to support the ‘received’ or existing view for selecting new and relevant incoming information. Existing managerial practices and insights, often reaffirmed in the past, constrained individual's capability to perceive certain data as ‘new’. Thus, the causal assumptions of schemata tend to favour a continuance of past practices, as both less personally ‘risky’ and more culturally ‘legitimate’.

8.7 ICI: A Collective Innovative Organisation

As outlined in Chapters One, Two and Three, whether the particular innovation is a major strategic reconfiguration, a significant product/process design or a new project launch, innovation can be seen as a collective activity, occurring over a relatively lengthy period of time, within a continually revised set of descriptive or interpretative frameworks. As a result, the attention of this chapter, now turns to a series of questions about the shared cognitions within ICI Paints, and how they evolve into pervasive cultural influences.

As I have argued, existing ‘ways of doing things’ constituted a powerful schemata that helped guide decision-making and constrained practitioners ability to perceive anomalous data and its salient interpretation. Yet, as the ICI case study demonstrated, as organisational change and innovative efforts occur, their development can be hindered, redirected or even be stopped by unpredictable events, such as Hanson’s take-over bid (section 6.3) or the vision ‘revelations’ of senior and ‘empowered’ managers, such as Henderson’s ‘sea-change’ of opinion concerning the direction that ICI Group must take (section 6.3) or Harris’ ‘IT road to Damascus’ (section 6.12.1).

For example, the Board members and senior managers of ICI Group struggled for a relatively long-time before deciding that they should exit their historic home industry

of Bulk Chemicals, and in so doing, chose to pursue policies that Hanson Plc. might possibly have followed anyway. During this time, a great deal of qualitative and ambiguous information included both signals that change was highly desirable, and signals that their current chemical sector may still remain profitable to them.

Perceiving the scope of the problem and making concrete decisions proved to be an extremely difficult task that could not have been accomplished either by strictly qualitative assumptions or by utilising existing business practices. Indeed, Chairman Henderson seemed to realise this when he brought in the external management consultants, S.G. Warburg, to aid with the major technological decisions that led to the eventual demerger of ICI's core businesses. Indeed, a number of 'dramatic' cultural changes, such as the large scale reduction of staff in the early eighties, and the re-alignment of technological mixes and businesses of the late nineties, have also been characterised by a senior management team working in close connection with external consultants to generate major change. As the Vice-Chairman of I.T. at Millbank, suggests:-

"It is true that at times of crisis, we tend to seek advice and reassurance, in the sense of giving the Board confidence in our eventual decisions, call it what you will, from outside our culture. We talk about ourselves and our culture as being strong and dependable, but sometimes that works against you and stops us from considering other obvious decisions" (Dr. R. Sykes, Vice-Chairman IT).

The interpretation of information needed to define a 'new' sense of a shared reality, is here, considered essentially as a social task, in that the sharing takes place in the social 'space' of ICI, as well as with other stakeholders. That is to say, the structure of both the organisation and industry in which it is placed are a powerfully influential context that helped shift and re-focus the cues for interpreting data. This collective influence, including suppliers, competitors as well as on occasion, management consultants, was shown to be highly important for ICI's innovation practices. For such organisational change, be it a dramatic sectorial change, or new product launches, it was necessary for a critical number of members or groups to embrace the new direction, or a new vision, and plan for the impact of that change. Thus, although the importance of 'key' individuals to initiate such practice is clear, technological change can still very much be seen as a shared activity.

8.7.1 Corporate Change and Existing Practice

Several characteristics, consistent with particular sets of 'core values' (section 7.3), often re-emerged to dominate manager's decision-processes, even after an acceptance that these values may have already proved to be unsuitable.

Senior managers did not completely dismiss their traditional managerial hierarchical structures with the shift to new industrial sectors. The demerged firms were still guided by the conservative financial policies of the past. However, different senior managers brought different specific practices to the task, either by being supportive or critical of particular changes, thus directing decisions into new avenues.

The often conflicting interplay of older values and new visions were often said to hinder change efforts, with the ensuing conflict contributing a high personal cost to participants. An example of this was the departure of Kenyon, yet many other personnel, such as Senior Marketing Manager, Harris, (who also subsequently left ICI Paints) a junior member of the Innovation Group, such as D'ath, and several R&D Managers, for example, C. Taylor, Leggetter and R. Smith, all expressed a belief that a constant willingness to 'go against the grain' of accepted practice jeopardised their future position within the firm.

This issue of personal 'kudos' was acknowledged by practitioners as important to their considerations when aligning their opinions with managerial visions. Indeed, emotional costs involved are often said to make the innovation process more difficult within firms (Whetton, 1980; Barr *et. al.*, 1992).

8.7.2 Seeing Beyond Existing Technology

Von Hippel (1988) and Henderson and Clerk (1990) argue that it is especially difficult for members of a given culture to 'perceive' beyond the existing interpretative paradigm of the technology currently *in situ*. However, new technology and practices may still provide an *allure* to mature organisations, as they often seem

to promise new ways to exceed the stolid limitations of existing routines. Indeed, the focus on brand-management, led by McMahon, as a direct method of challenging the 'threat' of the big DIY Stores own-branded products, was a case in point.

A great deal of conflict arose due to the suggested paradoxical nature of ICI's relationship with the 'big sheds' (section 6.12.2). They were seen as both competitor and consumer. The use of point-of-sale computer aided technology, such as the paint-mixing 'Language of Colour' system or direct marketing and selling by Internet (section 6.12.1) can be considered as methods of *preserving* existing product ranges (and strategies), in the face of strong market-place challenges, rather than moving into new product-orientated technological changes.

Yet the perception of technological novelty, additional to existing product ranges, often provided little grounds for practitioners to actively assess new technological capabilities. Similarly, far from actually exceeding the limitations of current practice, once adopted, a new technology is often used within old practices or subsumed into the old 'ways of doing' (Goldhar and Jelinek, 1983).

To attempt to formulate coherent strategic plans for particular innovation projects while many senior managers interpret its effect upon current practice differently, finding little or no common ground, has been called a recipe for failure (Utterback, 1982). If mature-industry firms, such as ICI Paints, are to foster an innovative environment, then the importance of the construction of company-wide and consistent support for innovation efforts has been cited as crucial (Jelinek and Litterer, 1994). The creation of new and shared interpretations of a possible future may lie at the heart of the task; the *sine qua non* of successful innovation:-

"So part of it [vision as an antecedent to innovation] is the communication. Making pronouncements that go into marketing brochures is not vision, they are more a mission statement unless, that is, groups of people with a shared vision make it happen" (K. Hulme. Senior Marketing Manager).

Indeed, the received view of ICI's staff was that a failure to address the many contradictory assumptions, or other critical criteria that distorted the characteristics

and consequences of technological change, has often focused managerial attention away from other more 'appropriate' decisions and strategies, thus proving costly to the firm (section 6.12.3, 6.12.1).

8.7.3 Managerial Commitment to Innovation

Senior level support proved essential to emphasise (or at least not hinder) the importance of particular themes or visional directions at the lower levels of staff, who actually produced the technologically-based innovations (section 6.11.2):-

"Vision and strategy often requires our interpretation by our experiences to make them real. They come down from the top but also require checking by the managers as juniors seek reassurance, to know that they are on the right tracks" (C. Harris. Senior Marketing Manager).

However, the reception of these visions was not a passive process of simple transmission, as sub-ordinate practitioners challenged, expanded, altered and generally developed the visions, in the process of them becoming operationalised. Indeed, the ICI case study showed that the vision transmission process amongst practitioners of all ranks, was co-operative, cyclical and interpretative, with specific 'levels' (section 7.7), largely constructed within sub-communities of 'like-minded' practitioners of 'legitimised' content (section 7.10). The case study also illuminated the belief that the information or data that first initiates innovation is, in some sense, 'out there', often hidden and enigmatic to members and not publicly available, yet awaiting discovery (section 6.12.1). Indeed, it was suggested that:-

"One of the important dynamics of business is 'reading the tea leaves', in terms of external environments and how it impacts you. You have to think many years ahead in terms of where you are going. The further out you look the more you are trying to guess changes in behaviour" (C. Harris).

8.7.4 A Summary of Cultural Belief and Commitment

So far, drawing from the discussion of cognitive approaches to the construction of meaning in Chapter Four, insights into the construction of cultural belief (sections 7.3, 8.3, 8.4) and the commitment to innovation of senior managers (section 7.4), can be summarised by three elements. Firstly, successful innovation depends upon the readiness of individuals, not necessarily tasked with innovation, to support, pursue,

foster or in some manner, influence other practitioners.

Consider the example of the senior manager, Chris Harris. Here, a senior executive not only supported the notion of innovation as something requiring 'special attention' and resource from the firm, but also 'pushed' his growing and 'empowered' recognition of a potential impending commercial disaster for ICI Paints, brought about through a lack of IT capabilities possessed by senior and junior management. He unlike, say, Henderson, the Groups ex-Chairman, was not senior enough to 'skip' quickly through the vision-action cycle (section 7.9.), completely forcing his visions to become operationalised and largely enacted 'unchanged'. Rather he entered directly into the cycle, persuading others, altering opinions and assumptions of what was important to ICI Paints in terms of innovation practice.

The junior staff of ICI Paints were also not empowered to champion projects (section 3.4.1) in the face of the beliefs of other, often 'inappropriate', strategies or to challenge the lack of support toward technologically innovative projects (section 6.12.1, 6.12.3). Instead, practitioners were tasked by the CEO and other 'like-minded' senior managers with focusing innovation efforts on brand-management and cost-cutting exercises. Thus, Harris, for example, can be seen as going against the cultural-wide belief that a willingness to share in managerial decisions and to support juniors to 'insist upon being heard', is an essential element in innovation.

For junior practitioners to challenge this cultural orthodoxy, and align themselves with the visions of, say, Harris, when his visions were considered by most to be largely unspecified and unclear and against the more 'forced' and 'empowered' notions of McMahon and Hulme, was to put one's personal kudos at considerable 'risk', as Kenyon demonstrated by his subsequent departure (section 6.12.2).

Secondly, technology and to some extent industrial trends, were often said to be cyclical (or reciprocal) in nature, with the 'innovators' being the individuals who could imagine beyond local changes to perceive major structural change, and also

perceive technological possibilities in many other (or different) areas of the commercial environment. That is to say, to produce incremental change was not considered by ICI's practitioners to be 'true' innovation, and therefore little credibility could be inferred upon them (section 7.4). Indeed, D'ath and Kenyon's comments concerning the 'Brilliant-Whites' project (section 7.4) summed up the feelings of many, describing the typical 'mind-set' of practitioners in following the same innovation notions, time and again, suggesting the prevalence of innovation 'event-horizon' as a powerful type of *cognitive* trajectory.

Third and lastly, innovation is a dynamic group effort. Initially, innovators (such as Kenyon) were skilled at enlisting others and using various mental 'skills' to make sense of the anomalous data and persuade others to share the same (or at least similar) 'visions' (section 6.12.2). As suggested in section 7.7, this 'persuasion' was directed towards other practitioners within ICI in a number of specific ways. For example, by 'promising' that, if people aligned themselves with a particular view, they could earn degrees of personal kudos (Level One; section 7.7). Indeed, the vision statements expressed by Miller-Smith (section 6.5) or Margetts (section 6.5.1) or the comments of Harris and Hume (section 6.12, 6.12.1), inevitably contained certain 'hidden' or implicit messages, intended to appeal to groups (or informal communities) of practitioners, focused on specific aspects of technology.

8.8: A Situated Perspective of Organisational Culture

So far, in this chapter I have discussed several approaches to the study of organisational culture (section 8.4) and suggested that this thesis lies mostly within general cognitive accounts. However, from the discussion above, outlining the general culture assumptions of ICI and the more specific contextual influence of the informal 'like-minded' communities as having a major affect upon innovation and vision, the present account differs from many cognitive perspectives as they typically rely on individualistic notions of 'lone' innovators.

In the remainder of this chapter, drawing from the case study and research within the SitCog approach, I suggest a more focused cognitive description of various issues raised and illuminate some as requiring further investigation. The aim is not to provide a discursive description of ICI's innovation culture or describe 'how the world may work' viewed from this approach, but rather the aim is to derive and elaborate an analytical account for providing a deeper understanding of the situation in ICI Paints, from which future analysis can develop. This will address both the cognitive issues raised within Chapter Four and the suggested neglect of approaches to technological development outlined in Chapter Two.

8.8.1 Theoretical Background

SitCog has been positioned as an alternative to Information-Processing approaches of understanding cognition and seeks to address some of the suggested oversights of such a computational account. In particular, it challenges the reliance on stored descriptions of rules and information and the focus on conscious reasoning and thought, as well as the clear neglect of a cultural or 'material' context of description.

The meanings of terms such as 'situated cognition,' 'situated action', or 'situativity' enjoy no consensus amongst researchers. The terms are, however, typically used to indicate a display of related ideas and perspectives, constituting something similar to the notion of 'socio-cultural constructivism' or Kuhn's 'paradigm'. One can at least identify two main areas of research associated with SitCog perspectives.

Anthropologists, such as Lave (1988, 1991), are interested in the cultural construction of meaning. They mix 'critical theory' within anthropology, with the socio-culturalism of Vygotsky (Rogoff and Lave, 1984). Thus, Vygotskyian inspired socio-historical approaches take as their core concern, the processes whereby a culture reproduces itself across generational boundaries. This notion then becomes embedded within the 'critical' stages of realisation, within a given society.

The second area of research, and the main interest for this analysis, is the description of cognition within the larger physical and social context of interactions, culturally constructed 'tools' and derived conceptual meanings. Here, SitCog refers to a 'person plus' unit of analysis, with individual *knowing* and social *action* intertwined and inseparable. Thus, 'the physical context is reunited with the social, within the thought process' (Light and Butterworth, 1992; 1).

Bredo depicts this notion of a SitCog approach to culture as 'shifting the focus from individual *in* the environment to individual *and* environment' (1994; 29). For this reason, I suggest that SitCog presents an alternative cognitive perspective to many approaches suggested as lying within traditional cognitive accounts (section 8.4).

Although two separate strands of research exist, there is much that is similar. Suchman (1993; 72) echoes this complimentary notion and portrays Lave's research on cognition in 'everyday environments' as specifically challenging any insulated view of cognition that ignores contextual factors (section 4.10). Thus, in both areas of research, *social* and *individual* are not simply different levels of study, rather they are inexorably connected. Bredo describes this close relationship:-

'[Writing, conversing, or thinking] are the result of dialogue...in which person and environment modify each other so as to create an integral performance. Seen in this way, a successful person acts with the environment, shaping it to modify themselves, in turn, and then to shape the environment, and so on, until some end is achieved' (1994; 29).

The next section considers several complementary perspectives to 'collective' thinking suggesting that, although much can be learnt from them, a SitCog perspective posits a more 'theoretically rich' basis from which to consider the causal relationship between vision and innovation.

8.8.2 Individual, Group and Collective Cognition

Several authors have tried to make sense of the influences on decision-making in 'conceptual groups', by suggesting that the *main* influence lies in either the cognitive processes of social structure or in the cognition of individuals. For example,

Durkheim (1976), within his study of religious organisations, introduced the term 'social group' as 'a mysterious, super-organic group mind' (Douglas, 1987; 14).

Douglas' notion of 'thought worlds' also describes the shared experiences of practitioners (1987; 16). Here, the expectations of a collective, reinforce the sense that an organisation is constrained less by its geographical or 'legal' definition of events or phenomena, and more by the social and cognitive network of stakeholders, such as relationships with customers, competitors and suppliers.

In particular, the work of Ludwig Fleck provides a useful introduction to the notion of 'like-minded' groups, as I have described them within ICI Paints (section 8.3). Fleck suggests the term 'thought collective', in outlining the shared practices and expectations of a society of practitioners. As he describes:-

'The insistent clamour of public opinion...the gathering of collective experience...laboratory practice, continuous co-operation and mutual interaction among the members achieved the collective experience...in communal anonymity' (1979; 77-78).

By suggesting the 'anonymous' aspects of the 'thought-collective', Fleck appears to be referring to the hidden or 'deep-structure' of cognition, suggested as crucial to this thesis. Individuals within a 'thought collective' share particular cognitive 'styles' of thinking. A thought style is described as 'the special carrier for the historical development of any field of thought, as well as for the given stock of knowledge and level of culture' (Fleck L., 1979; 39). Thus, for practitioners the 'thought style' is a readiness for directed perception, with corresponding mental and objective assimilations of what has been perceived, and thus, is similar to the notion of cognitive 'style' outlined in sections 7.10 and 7.12 (Fleck L., 1979; 159).

Fleck (1979; 179) accepts that the notion of 'thought collective' is cognitively problematical, as it suggests a view of a collective 'mind' that is somehow 'material'. However, I suggest that if practitioners can attach *value* and *meaning* to the statistical data of, for example, the Stage-Gate selection tool, a practice supposedly 'objective' in nature (section 6.12.3), then why not within a 'thought collective', which serves to

increase the understanding of where the conceptual boundary lies for the practitioner, between that which is *thought* and that which is taken to *exist* within a culture. Thinking, believing, or indeed the processes of vision described in ICI Paints, are accorded a certain degree of 'power' to create objects, actions and practices, construed as originating in 'thinking'; but 'only if they are within a given style-permeated *thinking* of a collective' (Fleck L., 1979; 181).

The causality of social and cognitive notions within descriptions of culture continues to be debated. For example, questions remain about the inter-relatedness of a given cognitive style as a 'dominant outlook' (section 7.12), giving the often informal and temporary character of 'thought collectives' (section 7.10), or as an active expression of the 'thought collective' itself (Fleck L., 1979; 158).

Although highly influential in the work of, say, Kuhn, Fleck's work lacks procedural notions for describing *how* practitioners may become enculturated to the style of a thought collective, or how it is that certain notions become 'legitimate' and how practitioners may become motivated to consider certain actions and not others. Similarly, in suggesting the 'mind' as material, he begins to explain why it is that certain notions endure, yet does not describe how it is that expectations (of technology) 'appeal' to certain types of collectives, or how these collectives coalesce; in essence there is no account of the plural and active nature of 'sub-cultures'. From the discussion of Fleck's work however, I suggest that it remains, here, unsuitable to ask whether individual or group cognition is the more meaningful model for examining notions of innovation practice and shared reality, as to describe them separately is to deny what actually makes a thought 'collective'.

As I suggest in Chapter Seven, the prevalence of plural and often competing notions of ICI's assumptions, and the coalescence of, often temporary, communities around the various levels of vision expressions (section 7.5 and 7.7), played a significant role in creating notions of legitimate innovation practice, as well as 'blinding' them to alternative choices. The next section considers these issues in more detail.

8.8.3 Communities of 'Like-Minded' Practitioners

The conceptual roots of a SitCog account lies within mainstream cognitive science research on concept learning, as well as with more sociological approaches to the construction of 'meaning', as suggested by Fleck and Durkheim. The difference is that now the analytical focus has shifted more to the community's 'legitimate' sense-making mechanisms and their use of shared assumptions, rules and facts. In this view, the construction of meaning is now tied to specific organisational contexts and purposes, 'negotiated' within a given collective. Practitioners develop *shared* ways of responding to features in particular contexts, that Gee (1997) calls discourses:-

'Discourses are socio-historical co-ordinations of people, objects (props), ways of talking, acting, interacting, thinking, and valuing that allow for the display and recognition of socially significant identities...' (1997; 255-256).

Discourses are not just held by individual participants, but also reside in the practices in which the group engages, the cultural tools (such as jargon and habits) they use, and the contextual settings. Indeed, social scientists, Berger and Luckmann, also usefully capture this 'centrality of shared interaction' and communication between practitioners, in the shaping of their notions of reality:-

'The reality of everyday life further presents itself as an intersubjective world, a world that I share with others. I cannot exist in everyday life without continually interacting and communicating with others. I know that I live with them in a common world. Most importantly, I know that there is an ongoing correspondence between my meaning and their meaning in this world, that we share a common sense about its reality' (1966: 37).

Although ICI's cultural ethos is shown to constrain choice by helping to 'blind' practitioners to some innovation opportunities while illuminating others, the construction of reality and the subjective nature of the data perceived by them, means that aspects of ICI's history is still open to re-interpretation without necessarily upsetting the entire institutional order as a result (Berger and Luckmann, 1966: 87).

8.8.4 Kenyon's Interpretation of Innovation

The Innovation Manager, Kenyon, can now be considered as actively 'looking' for ways to reinterpret ICI's history, as he explored his own interpretations of innovation

and vision expression and the realities of his fellow practitioners. There are several important aspects to Kenyon's account of 'how' he went about interpreting the visions of senior managers and 'how' he decided to structure his notions of innovation practice around them for this account.

The first is that he utilised his extensive political and social networking skills (section 6.12.2) to engage his colleagues in constructing innovation 'choice', rather than deciding particular directions alone. He sorted out the opinions of others, soliciting their visions of the future, as well as observing the visions of his seniors, to *share* the choice-making processes with them as they expected him to do. In this sense, as I have suggested, the process of 'vision to action' is cyclical, iterative and generative (section 7.9). He took it for granted that while the development of innovation 'choice' open to the Innovation Group is formally his, pragmatically, those choices are inter-subjectively shared with other group members, as well as with other senior personnel, as individuals become personally associated with the projects worked upon. Kenyon described this iterative cycle of establishing shared-meaning and personal identity, thus:-

"One of my roles as I see it, is that I have to try and force my senior colleagues to recognise that the task I have been given to do is far too big. Unless I get some consensus and closer direction we are going to be stumbling around all over the place for a long time. I'm not just saying 'hey guys tell me what to do'. I'm saying here are the objectives you've given me. Here are a number of different ways of going about it. I see this as a championing role primarily, not to be the only ones creating the ideas, but being more a focus point for other people".

The second aspect of Kenyon's account suggests that he struggled for a meaningful and legitimate way forward, after his initial ill-fated meeting with McMahon (section 6.12.2). This meeting seemed to call in to question his ability to construct innovation practice, through his continual probing and 'sense-making' on his part, and through talking with practitioners about what they 'see' and what they 'do'.

Kenyon's initial job was to 'test' for the socially acceptable and unacceptable boundaries of innovation. He was sensing where the conceptual constraints and barriers lay, that make action difficult, and looked for self-imposed restrictions on the legitimate opinions that his colleagues considered and exercised when confronted

with problems (also see Weick, 1979; 150). In essence, he was building into proposals his anticipation of peer reaction to innovation suggestions, and was guided by unspoken rules of 'right and wrong' ways to behave internally, and compete externally.

Kenyon and his immediate group of 'like-minded' practitioners, (in this case, the Innovation Group) appeared thrown into both social and mental conflict by the entrenched attitudes of an 'empowered' senior manager, as they attempted to reconcile their beliefs of what constituted legitimate innovation practice, how they constructed their social networks (knowing full well that innovation, in the sense that they perceived it, was now considered 'culturally illegitimate' to other practitioners), and their own career aspirations within the firm.

Kenyon, and the Group, initially, learned about where the boundaries of acceptable innovation practice lay (before McMahon joined ICI), when they became used to senior managers coming back to them and saying, for example, 'we don't like this for the following reasons'. Kenyon found probing the boundaries of accepted innovation strategies this way very effective in flushing out subliminal assumptions and beliefs, without the loss of any sense of 'kudos' to himself. He internalised these boundaries, making them part of his own subjective notions of what innovation practice entailed to ICI Paints and to himself. In this sense, his disagreement with McMahon produced a *fundamental* heuristic that undermined his 'self-image', and his basic assumptions as to the 'purpose' of innovation.

The third aspect of Kenyon's account suggests that, through the process of deciding what to do and how to do it, Kenyon constructed schemata to aid him in making-sense of the 'legitimate' boundaries of the firm. In the words of Garfinkel (1967), Kenyon was 'accomplishing a subjective reality by creating new interpretations and expressions of possible future realities' for himself and the Innovation Group, through applying *meaning* to his fellow practitioner's preferences, and his own tacit knowledge and experience. He sought to share his 'amended' heuristics with

colleagues, as a way of making ICI's 'rules or habits of mind' for innovation practice more explicit, in the belief that this would reduce the ambiguity of practice, and thereby make decision-making, problem definition and 'choice' more efficient.

From the discussion of Kenyon's notion of innovation practice, a SitCog can be said to treat organisational culture as a powerful *mediator* of cultural learning and practice within ICI Paints. To a large extent, the various different communities within ICI, defined what was *possible* and what was *real* to the practitioners embedded within them. This is not to say that, as some theories of technological change suggest (such as Actor-Network Theory), the relationship between technology and the practitioner is ideological or materialist, or indeed, denies altogether the *distinction* between 'social' and 'physical'. In such a view, technology is considered only as 'stabilised' networks of non-human and human actors. The functions that a technology display, derive no meaning outside the persistence of the alliances between 'actors', and has no objective meaning whatsoever (Constant, 2000, in Ziman, 2000).

Thus, when Kenyon became Innovations Manager, he did not begin to internalise notions of technology 'naively', or simply, in terms of 'short-term' and immediate requirements. Certain conceptual structures within his notions of reality were provided by his pre-scientific assumptions (or in this case, *pre-technological*, section 4.3) as to what was feasible and desirable in the 'long-term', as well as by his existing knowledge of ICI's technological and social heritage. In Campbell's words he produced 'a fit of both phenomena and noumena'. That is to say, a fit between one's perceptions of, or beliefs about, the otherwise unknowable world (phenomena) and the 'world-as-it-is' (noumena, or the-thing-itself) (Campbell, 1974).

8.8.5 Communities of Practice and Cultural Research

Ethnographic research typically defines these 'like-minded' groups, henceforth 'communities of practice', as people bound by certain relationships who share a common *practice* (Brown and Duguid, 1991; Lave and Wenger, 1990). From the

discussion in this chapter, and in Chapter Seven, I suggest that such a notion can also be extended to include commonly-held notions of 'vision'. More precisely, these collectives comprised informal (and largely temporary) groups, coalescing around particular contents of vision expression (section 7.7). Thus, 'community' here refers to the informality and personal basis of decision-making and suggests that community boundaries do not correspond directly to the geographic business-unit or to functional boundaries, but rather to practice or 'person-based' networks.

In suggesting that such a community can also emerge, based around a vision of the function or specification of technology (Levels Two and Three; section 7.7), one may also argue for an additional connotation of 'community' as the inclusion of community-based artefacts, such as equipment, policies and jargon, that possesses little independent influence to the organisation outside their context-specific interpretation and enactment by community members (Wenger, 1990; Weick, 1979).

From the case study, the term 'practice' may also be said to denote that practitioners identify with their functional role in personal ways (Level One; section 7.7), often similar to a professional's sense of 'calling'; a perspective supported by the study's depiction of the role of R&D and commercial staffs activities (section 7.5) (also see Leonard-Barton, 1995; Schon, 1987). Hence, from the discussion here, practice denotes 'knowledge-in-action' (Schon, 1987), or 'knowing' (Barton, 1995), also implying that practice is as much about *learning* the cultural context of practice as it is about *doing* the practice itself. I shall return to this point in Chapter Nine, in terms of considering 'learning in action' as a cognitive apprenticeship of ICI's staff.

Thus, communities of practice differ from traditional notions of purely function or geographically-based groups (Brown and Duguid, 1991), by focusing upon 'co-joining' concepts, such as network leadership, individual-community dynamics, and more purely 'conceptual' issues, such as the perception of the future technology. Just as group-studies have sought to address the lack of grounded research on social factors in organisations and challenge much technology-driven research that seeks to

split production tasks from natural work groups (Trist, 1981), the notion of communities of practice, as outlined here, can be said to address many research 'deficiencies' related to learning and competence.

8.8.6 The New Disorder of Innovation Practice Within Practice

As the case study showed, politics and 'power' is endemic to everyday practice, whether through individuals and groups 'vying' with each other for control of resources, or as an unavoidable consequence of the distributed expertise and decision-making processes associated with innovation (also see Fleck, 1993). In addition, individuals and sub-groups (both formal and informal) had a differentiated understanding of innovation practice, and differing visions of how the firm should compete in the future. These differentiated views were not aided by the 'confusing' practices of ICI Group's Board.

The Board sought to ensure a successful implementation of their re-structuring programme by keeping the whole change process under tight financial control, through a seemingly ordered unfolding of its strategic implementations (section 6.2, 6.4). They believed that the more centralised control, based on existing forms of managerial hierarchy, the less disruption to business-units through the re-structuring phase, there would generally be. It is a vision of corporate leaders assuming that they enjoy total control, moving *dumb* pieces around, or out of, the company.

According to the interviewees, it was due to this tight control of information and finance that the senior managers possessed different views about what these corporate changes were meant to achieve, as well as how various changes were to be affected by them. ICI Paints appeared to now view its role as moving towards the centre ground and 'responsible' for leading the Group's new 'market-led' performance, as opposed to ICI Paint's traditional technologically-driven role on the periphery. Internally, this led to a political redefining of the role of R&D. Now they were considered by many to be *subsidiary* to that of the marketing functions, giving support to other areas of the firm to identify possible technological opportunities,

rather than R&D suggesting and pursuing new technological avenues themselves, as they have previously done.

Both Marketing and R&D functions lived within a differentiated understanding of ICI's practices, and of what ICI's innovation strategy should consist of. This differentiation has existed for many years ('them' and 'us'; section 6.10), pre-dating the issues surrounding the re-organisation, yet current corporate changes have accentuated them.

Further, as I have suggested, cumulative experience amongst communities, may also lead to differentiated understandings and expectations. The process of learning the legitimate notions of ICI Paints was further complicated as communities of practice typically found great difficulty in selecting 'cues' from competing interpretations (section 6.12.2). However, practitioners regularly applied conceptual patterns to their relationships with suppliers customers, competitors, and other stakeholders. For example, headed by senior marketing manager, Thompson, the Market Research Department constructed market segments by applying their 'conceptual' patterns on the premise that groups of people share certain characteristics, or hold similar views concerning topics such as, non-drip paint, D.I.Y, out of town shopping, and so on (section 6.12.1). Further related practices are then learnt on the strength of these conceptual 'resemblances' (Berger and Luckmann, 1966).

Thus, the practice of innovation is ordered not only by shared meaning, recipes and routines, but also by the *patterns* that practitioners themselves generate. Within a SitCog account, notion of cognitive *apprenticeship* may offer a potentially useful metaphor for the way people learn 'what is' and 'what is not', legitimate, within their specific communities of practice. As Lave and Wenger suggest:-

'Apprenticeship models of learning are not themselves a pedagogical strategy or a learning technique. It is an analytic viewpoint on learning, a way of understanding learning. Learning through apprenticeship occurs no matter which conceptual form provides the context for learning, or whether there is any intentional educational form at all' (1991; 40).

I shall develop this experiential view of learning further, within the next chapter.

8.8.7 Managerial and Culturally-Held Schemata

As I have suggested in Chapter Seven, ICI's practitioners utilised their cognitive schemata as sense-making mechanisms to attribute contextual meanings to actions and events. Clancey argues that managerial reflections, like other thoughts, are mostly immediate constructions, drawing upon established mental schemata:-

'Every act of deliberation occurs as an immediate behaviour. Every act of speaking, or any idea at all, is produced by the cognitive architecture as a matter of course, as a new neurological co-ordination' (1993; 111-112).

This is not to say that, within the discussion of a SitCog account of innovation practice, there is no place for cognitive 'rules' *per se*. Indeed, Clancey (1997) later illustrates how facts, rules, and mental representation can be said to play an important role within situated frameworks. These 'facts or rules' are initially described by 'experts' (or in this case, senior managers of ICI), as shown by McMahon's strong advocacy of specific strategic practices and performance evaluations. Thus, through the perceived 'empowerment' of certain individuals (whether informally or formally considered), the various vision expressions of senior managers are interpreted as rule-like *speech acts* to be acted upon (section 7.7).

In essence, one can now describe Harris' 'Road to Damascus' revelation, his subsequent vision expressions (section 6.12.1) and his entering into the 'vision to action' cycle (section 7.9), not simply in terms of trying to persuade others of the validity of his vision, but also as him trying to engender a sense of 'expertise' within his beliefs. In so doing, he gives 'power' to his visions and subsequently alters people's notions of his vision expression from 'should be' to 'will be' and hence, force them into the day-to-day consideration of communities. In so doing, his visions can be said to almost constitute a *physical* artefact for the building of directed resource, aiding the sharing of his visions from an individual to communities of practice and then on to the more widely held innovation policies of the firm.

In this translation, visions were taken-up by others and became embedded within communities, taking on a structural 'life of its own', and possibly be interpreted independently from the originators intended meaning. From this description, a more static structural component of schemata can be described as:-

'Sets of commonly held cognitions that are held with some emotional investment and integrated into a logical system or cognitive map that contains cognitions about description, operations, descriptions and causes. They are habitually used and influence perception, thinking, feeling and acting' (Sackmann 1991; 34).

Sackmann's evocation of the 'emotional investment' to schemata, resonates with the findings from the case study. Indeed, the personal commitment to innovation, in terms of career aspirations, kudos, and credibility, were suggested, time and again, as crucial to innovation choices and the interpretation of vision and practice.

Similarly, that groups change and individual schemata evolve is also important for this description. Structural characteristics may alter, depending on the groups gradual evolution. Hence, any description of schemata must be complemented by a developing and dynamic account of cognitive change. That is to say, one must address the formation, change and perpetuation of the learning of the cultural 'norms' of ICI's practitioners:-

'Cognitions become commonly held in processes of social interactions. They can be introduced into the organisation based on outside experiences, they can emerge from growing experiences, they can be invented and/or negotiated. In repeated applications they become attached with emotions and assigned with degrees of importance, also commonly held. This cultural knowledge is passed to new members' (Sackmann 1991; 36).

What makes schemata specifically 'cultural' is the notion of sharing and the type of learnt personal attachment that is associated with them, which are passed on to new people through practice, often out-living their originators. Practitioners tended to more heavily utilise successful ones, providing specific sanctioning or 'legitimised' behaviour and generating the sense of cultural 'ownership', suggested as a pervasive notion within ICI's practitioners (sections 7.4 and 7.7).

Drawing from literature in cognitive and social psychology, such a description would

necessarily seem to benefit from degrees of integration of the cognitive aspects of culture with sociological and anthropological themes, suggested as a major tenet of the SitCog account here.

8.9 Conclusions

Chapter Two presented the notion of innovation as consisting of a complex milieu of social and cognition 'influences', within which practitioners are continually seeking to control their competitive environment, in accordance with various short and long term goals of the firm. From the discussion in Chapter Six, Seven and Eight, the description of ICI Paints suggests that purposeful action is constrained by individual cognitive and social limitations on the practitioner's ability to organise and process 'anomalous' information, as well as limitations of various informal communities to negotiate 'acceptable' meanings ascribed to managerial vision and provide 'legitimate' notion of innovation practice. Hence, choices about possible innovations are *bounded* by individuals comprehension of their commercial reality and their ability to contest and negotiate a coherent and joint understanding of innovation opportunity.

This chapter has sought to explore, in more depth, the cognitive and social construction of the commercial reality of practitioners, suggesting that a SitCog framework, in which a synthesis of several cultural approaches are subsumed, provides a usefully theoretical source of material in which descriptions of 'cultural practice' emerge, that in turn, suggests several possible 'fruitful' future avenues of research.

The perception of the commercial reality of ICI's practitioners is not static. The organisation (and communities of practice) alter their perceptions, both incrementally over time, and through 'shocking' new experiences and day-to-day practice. The emphasis is placed upon the inclusivity of notions within managerial reality and actual organisational practice, reinforcing the sense that innovation practice reflects

shared notions or 'theories' of how work *should* be organised or which types of behaviour are considered 'acceptable' to the community.

ICI practitioner's sense of personal 'ownership' of projects and responsibilities, and the firm's ongoing innovation practices are inclusive; one reinforcing the other. There is a dynamic and developmental aspect to this inclusiveness, based on practitioners differentiated perceptions of what constitutes ownership, what constitutes existing cultural assumptions, and their personal perceptions of innovative opportunity.

The sense of personal ownership and assumptions, such as, as a mature firm, ICI's 'usual stream of vertically-integrated innovation is coming to an end' (section 6.3), has implications for how practitioners worked together and came to regard what was considered 'legitimate' behaviour. Indeed, collective agreements of how practitioners learned and dealt with anomalous information, are heavily reflected in the influential and pervasive assumptions of ICI's business culture.

Knowledge about the historical successes and failures of ICI, were communicated and 'learned' by practitioners, who also brought with them their own cultural varieties of practice. This process of *enculturation* may have had an inertia (or time-lag) built in, and was based on historical and personal experiences, often becoming dissociated from their original meaning as events fade in relevancy, as a natural and innate consequence of practitioners cognitive simplification of phenomena (section 7.2).

The plurality of commonly held cognitions, implies the existence of several groupings of sub-cultures, or here, communities of practice, not restricted in a formal sense of belonging to one particular function or geographical location. What makes a 'grouping' was that the individuals hold similar and specific schemata, here, focused upon particular conceptions of future innovation, in common. The conceptual boundaries were flexible and dynamic, and membership of a particular community may be just one of several held by practitioners.

The process of conceptual learning was suggested a crucial factor in the 'enculturation' of practitioners, and it is suggested that explanations within a SitCog account, should be based upon a shared 'people-centred' perspective. As the discussion suggests, one must consider how a firm's historical experience and learning processes can be captured in its procedures and practices (March, 1990; Jelinek, 1979).

Just as different communities may possess distinctive notions of reality, Chapter Six and Seven have suggested that various 'communities' within ICI, possessed distinctive notions of future activity. The very heterogeneity of individuals and collective experiences were not infinitely variable, rather such variety tended to coalesce as discernible features of a limited number of realities. Practice amongst members, reflected distinctive structural arrangements, assumptions and ideas of 'how the world works' and 'how to behave within it'.

The role of learning and enculturation, within notions of a situated environment, that shape the reality of practitioners, shall be discussed further in Chapter Nine. The concept of 'ownership' is also examined in more depth, suggesting that a core schemata, the 'self-concept', provides explanations of the expressed importance of self- motivation, kudos, and credibility, focused upon conducting 'legitimate' practice, suggested as important characteristics of a SitCog account of ICI's innovation practices. These are suggested as learnt in a form of 'cognitive apprenticeship' within communities of practice.

9

Legitimate Innovation Practice

9.1 Introduction

Chapter Seven outlined the processes of vision within ICI Paints, suggesting its use as a 'resource' to draw finance, or personnel, towards particular innovation projects and strategies, as a way of legitimising a particular view of technology, reducing perceived uncertainty and 'promising' a degree of credibility for people who follow them. The chapter also suggested that visions provided a conceptual focal point for 'like-minded' practitioners to generate joint perceptions of commercial reality.

Chapter Eight investigated certain aspects of the business ethos and ingrained cultural assumptions of ICI and suggested its influence upon the legitimisation of innovation and vision practice. Following on from these discussions, this chapter considers the notion of legitimate practice, in more depth; in particular considering 'how practitioners come to know what is considered legitimate', and 'how this process motivates the individual to innovate in certain directions'?

The purpose of this chapter is to continue the development of the account of innovation by close adherence to the grounded theory checklist (section 5.7), further developing and 'enriching' several of the major conceptual issues previously raised. In particular, the processes of experiential learning and concept change are discussed, concentrating upon the role of communities of practice in establishing legitimate notions of innovation practice and vision expression. This chapter also explores the construction of practitioner's 'self-image' that provides both a 'core' schemata for relating visions to a personal 'need for attainment' and provides the motivation to act in ways 'acceptable' to particular communities of practice and functional groups.

Chapter Outline

Section 9.2 outlines, in more depth, the importance of the sense-making mechanisms within which ICI's practitioners altered and adapted 'meanings' of events and phenomena, derived from 'real' experience and practice. It is suggested here that such a conceptual focus of a SitCog account is consistent with certain social science approaches that also consider 'how' and 'what' is to be shaped. To give a sense of 'legitimacy', to practice, is said to involve a complex form of social learning, and is described within section 9.3. In outlining problems of situationist approaches to motivated behaviour, the account developed here draws heavily from self-motivation theories of activity. Drawing from the case study, this section also suggests the 'self-concept' as a most important schemata to ICI's practitioners, underlying a great deal of the firm's innovation practice and constituting the 'building block' of social-identity and expectation.

Section 9.4 continues with this last theme, propounding the importance of personal 'kudos' and informal peer reviews within ICI Paints. Section 9.5 argues for a description of learning *in situ*, as central to the current explanations of technological change, the main characteristics of which are illustrated in section 9.6. Described as a form of cognitive apprenticeship, the 'enculturation' of ICI's practitioners mainly occurred within communities of practice, providing notions of what is to be considered both credible and legitimate, both in terms of satisfying the 'self-concept' and cultural assumptions of the firm. Section 9.7 expands this description to consider how the broad assumptions of ICI inferred meaning to individuals, suggesting that the learning of accepted practice is a process in which the practitioner is not passive but is instead 'bounded' by an interpretation of their commercial reality. Section 9.8 describes several of the more general aspects of the SitCog perspective of innovation within ICI, focusing on the construction of organisational competence and performance, with a chapter summary in section 9.9.

9.2 Enacting Reality

The literature review in Chapter Two suggested several approaches to the analysis of technological development that typically assumed 'reality' to be, in some sense, witnessed as 'true' and reflective of issues 'out there' in the commercial environment. However, the discussion in Chapter Seven and Eight argued that 'reality' is constructed and mitigated by practitioner's 'bounded' interpretation of their visions and their past experiences. Thus, for ICI's practitioners, a given sense of commercial 'reality', cannot necessarily be considered 'out there' or 'true', waiting to be discovered by them. Although not denying that technological 'terrains' did exist (section 9.2.1), whatever was 'out there' was largely perceived by the sense-making mechanisms that enabled them to understand what was 'out there' in the first place. Thus, environmental 'anomalies' cannot automatically be considered self-evident.

For example, as I have suggested in section 6.3 and 8.7, Henderson, and the ICI Board, received conflicting information concerning their proposed plans for the corporate demerger. A great deal of this information concerned the trends within the chemical industry and the difficulties of managing a wide range of technological capabilities; a problem faced by many of ICI's big chemical competitors. The choice to change from BC to SC was certainly not self-evident or 'predetermined' from an industry point of view, but a result of much subjective deliberation (section 6.3).

The cognitive perspective begun, in Chapters Seven and Eight, differs from other descriptions (section 2.2) by explicitly placing an analytical focus upon the interpretative mechanisms of practitioners as a basis for understanding action. Though ICI's practitioners interpret and alter their technological responses to their external environments differently, these processes can all be described as elaborations of a single fundamental mental activity. This basic humanistic process consists of striving to enhance performance through experience-based adaptations to their cognitive schemata. Such adaptive or recursive behaviour (Constant, 2000), has

also been described as 'learning by doing' or 'learning by using'.²⁰

The previous chapter cited the importance for ICI's practitioners of continuously learning new conceptual 'norms' of the firm, often first expressed in terms of managerial vision. That is to say, vision expressions helped practitioners identify the social and cognitive mechanisms that may help them mediate the successful transformation of their existing schematic notions into new and potentially more 'applicable' ones (section 8.9, 8.9.1).

Whilst historical analyses have often examined how interpretative combinations of individuals' behaviour and certain events create alternative technological paths (Rosenberg, 1982; David 1985; Arthur, 1988), other researchers have specifically focused upon the ways in which the learning mechanisms of practitioners create the institutional environments that shape a technology's emergence (Barley, 1986; Weick, 1990). Indeed, certain economic historians have also outlined the importance of learning in the development of new industries and technologies (Rosenberg, 1976), in creating formal R&D programmes as institutionalised learning mechanisms (Mowery and Rosenberg (1979), and its affect upon productivity (Arrow, 1962) and industrial structures (Dosi, 1988). Within all these descriptions 'learning' also refers to the enhancement of tacit forms of competence, encompassing not only organisational routines that arise as a result of conscious managerial effort, but also the informal and emergent iterations, identified as crucial to innovation within ICI.

9.2.1 Threats and Opportunity as Selection Criteria

That practitioners *can* become consciously aware of the scope for enacting their competitive environment has been argued, for example, by Smircich and Stubbart (1985). However, in replacing the objective and independent 'reality' of the practitioner with a consciously enacted one, Smircich and Stubbart appear to deny the possibility that *any* objectified agent can shape choice. They suggest that:-

²⁰ See Fleck (2000), for a discussion of these two types of learning.

'There are no threats or opportunities out there in an environment, just material and symbolic records of action. But an innovator, determined to find meaning, makes relationships by bringing connections and patterns to the action' (1985; 726).

Certainly, as I have argued within this thesis, to conceive of a cognitive and social environment may change one's understanding of the malleable nature and source of commercial threats and opportunities. However, ICI's practitioners actively attempted to *objectify* and *legitimise* their notions by attaching 'fixed' meanings and values to actual practice, events and situations; a reality that then became interpreted as *real* and immutable. In essence, they attempted to conform to the stolid, conservative, and unquestioned cultural assumptions of the firm (section 8.2). As Market Research Manager, Thompson, suggests:-

"How we look at social trends is pretty much up to us, but our job is to dig into them and really understand how they may affect us in terms of sales, strategy, whatever. Then the tough job is making the salesman or strategists see that *this* is the way the world really is going to be and that we better do something about it now, when we have done that, we can get on with other things" (I. Thompson. Market Research Manager).

More formal examples of this process, such as the Stage-Gate tool, that sought to 'objectify' practice and make action and belief, in some sense, 'taken for granted', took personal judgements of project developers and assigned numerical values to their future technological and commercial projections. These figures were then utilised as subsequent justification for future action as if they were 'fact'. In essence, the quantified figures were considered 'real' and unquestionable.

Within the current competitive environment of ICI Paints there was a great deal of scope for interpreting exogenous events, or anomalies, in different ways. The many interpretations of the 'threat' posed by B&Q, based on actions such as, a demand for a unit-price cut as a condition for remaining ICI's main distributor/customer, or B&Q acting as direct competitors, attempting to challenge ICI's key markets in decorative paints by favourably promoting their own-branded in-store products, are all outcomes of ICI's senior managers (and sub-ordinates) forming a sense of what the 'crucial' aspects of their current commercial reality entails to them and the firm. That is to say, it is a product of their 'inter-subjectivity'.

Yet the 'objectified' existence of such 'facts' may still present a real threat to ICI's future success *however* ICI's practitioners choose to deal with them, or indeed, whether they choose to observe these anomalies at all. In essence, a threat may exist irrespective of its comprehension.

Berger and Luckmann (1966) argue that 'symbolic records of action' become real and 'objectified' through, for example, the creation of legitimised or institutionalised commitments; commitments that ICI's senior managers sought to engender by either expressing vision statements (section 7.9, 7.9.1) or through the introduction of managerial practices, such as OTIF or StageGate. In this sense, the threats and opportunities that were thought to face ICI Paints may well not be 'out there' in the commercial environment but neither then can 'customers' or 'competitors' simply be said to be 'a projection of human imagination', as Morgan and Smircich describe within their radical subjectivist approach to social science analysis (1980; 492).

Similarly, artefacts, by implication of their design, face different levels of environmental selection; that is, for example, bridges fall down and paint cracks. Learning, in the sense of obtaining valuable and reliable knowledge about such design issues, may not only come from the subjective interpretations of practitioners or consumers, but also from the technical limitations of the artefacts themselves. Indeed, as a senior R&D manager acknowledges, this physical constraint places important limitations upon the bounded extent of the 'visioning' of ICI's practitioners:-

"We could sit here for an hour and think of all the really great stuff we could ever make. Knowing what we do right now, we could plan products that could satisfy every trend you could ever think of. But in truth we couldn't actually make half of them. We may not actually know that before we start though so we keep our casting forward [visions of technology] fairly grounded. We cannot afford to chase too many rainbows as we may never get there and would still have to spend a lot of money to find that out" (D.Taylor. R&D Manager).

In this sense, when ICI's managers construct their 'reality' concerning which innovation developments are best to persevere with, they do so utilising their 'pre-scientific' and 'pre-technological' knowledge, based on their historical experiences of technological practice (section 4.3) that provides a sense of 'objectified' limitation

on what choices are available to them. Additionally, as Vicki D'ath suggested, to incrementally innovate based upon existing product ranges, was considered a 'safe option' for practitioners (section 7.4). That is to say, incremental innovation was part of the 'non-risk taking' cultural assumptions that served as a 'default' to new action.

9.2.2 Opportunity Related to Current Practice

The process of seeking 'legitimation' for actions (and visions) did not necessarily mean that radically alternative technological solutions were never suggested at all. Rather, to do so was to possibly engender a greater sense of personal risk to one's kudos within ICI (also see Barr *et.al*, 1992). As a senior R&D manager claimed:-

"You know full well that if you go to certain people with some ideas, they just simply won't get it. I don't mean that they are stupid, it's just that it may be outside their normal field of view. Some seniors [managers] just aren't interested in how we make stuff - doesn't make them look good in the balance sheets I suppose. Try as you might, going to them with anything other than a nice clear, well marketed idea is a waste of my time and lessens you in their eyes" (R. Leggetter. R&D Manager).

Contrary to certain perspectives of technological change, such as social systems approaches, the ICI case study suggests that there was not any altruistic sense displayed by ICI's practitioners, towards 'bettering' a systemic or organisational approach towards technological change and development. Rather, a fundamental belief of ICI's innovators involved to better one's own personal standing within the firm (section 7.7, 8.5.1, 8.7.1, 8.8.4). What this entailed was not immediately obvious to practitioners, but was something itself that required interpretation and negotiation; in essence it had to be *learnt*.

These issues lie at the very heart of the cognitive description of practitioner's understanding of legitimate innovation activity and vision expression, described here. The next section, drawing from the case study, considers this notion in more detail, and discusses how ICI's practitioners constructed the important notion of 'self' and its effects upon innovation practice.

9.3 Social Learning

One of the problems for a social constructivist, or a more general situationist perspective, is to account for the role of individual differences; why do practitioners not all respond in the same way when placed in the same situation? In an effort to address this some researchers have turned to 'self' theories to explain these individualistic aspects of organisational behaviour. For example, social-identity theory (Stryker, 1986; Tajfel and Turner, 1985), self-presentation theory (Beach and Mitchell, 1990), and self-efficacy theory (Bandura, 1986) are all fundamentally concepts of 'self motivation' but none, as yet, have been successfully integrated into technological change.

Most current theories of self-motivation assume that individuals are 'rational maximiser(s) of personal utility' (Shamir, 1990; 39). Hence, such calculative models typically assume that learning 'correct' behaviour is a result of profligate processes. Thus, practitioners learn to behave in ways that 'maximise' positive outcomes and 'minimise' negative ones.

Indeed, the view of 'learning through practice', within a SitCog account, argues that individuals go through unique sets of learning experiences which result in situational variables exerting different self-motivational forces. Indeed, SitCog researchers, Brown, Collins and Dugid (1989), suggest that the activity in which knowledge is developed and deployed is an *ineliminable* part of what is learnt.

Historically, one of the major stumbling blocks to relating notions of the 'self-concept' to practitioner behaviour has been the view of the self-concept as a stable, generalised, or average view of the individual. More recent research in social psychology (Greenwald and Pratkanis, 1984; Schlenker, 1980) attempts to resolve this problem by conceptualising it as a multifaceted phenomenon composed of a set of images, schematas or prototypes (Markus and Wurf, 1987). Indeed, there is a similar movement in sociology, where 'self' is defined in terms of multiple identities

(Schlenker, 1985; Stryker, 1980); these identities include personal characteristics and experiences as well as social status (or empowerment), all contributing a motivational force to encourage practitioners to act in particular ways.

Both streams of research indicate that some representations of the commercial environment (envisioned or current) are more important than others to practitioners (Schlenker, 1980, 1984). Some are representations of 'what the self is perceived to be' versus 'what the self would like to be' (Markus and Wurf, 1987); some are core-conceptions (Gergen, 1984) or provide a salient identity (Stryker, 1980, 1986), while other notions of the 'self' are more peripheral, dynamic (Markus and Wurf, 1987) or relatively stable over-time (Sullivan, 1989). All of these descriptions of self-motivation are based on the assumption that 'human beings have a fundamental need to maintain or enhance one's standing within peer communities (Snyder and Williams, 1982; 258); a view supported by the ICI case study (section 7.7, 8.8.4, 8.7.4). The next section relates this theoretical discussion of the self-concept to evidence generated from the case study.

9.3.1. Situated Learning and the Self-Concept Within ICI Paints

Kihlstrom and Cantor (1984) propose that the fundamental concept of the 'self' is deeply embedded in a hierarchical system of socially learnt concepts. They regard 'self-concepts' as the prototype (or basic schemata), abstracted from individual observation, that refer aspects of the environment that may serve to improve notions of the 'self'. Along with Harre (1983), Gergen (1984) emphasises the socially constructed nature of the 'self' and prefers metaphors such as 'dialogue', 'dance' or 'drama' in describing the relationship between the 'knower' and the 'known', to the machine metaphor of 'thinking' in separate stages heavily utilised in many cognitive descriptions (such as Information-Processing approaches).

To ICI's practitioners, the notion of the self-concept can be thought of as a mental construct that develops as a result of past experience or the immersion in the practices of a community. This is utilised by practitioners in subsequent cognitive-

processing of self-relevant information to generate and improve one's sense of credibility or kudos.

The importance of establishing a sense of 'self', one's 'role' within ICI Paints and of learning the legitimate notions of innovation practice, was a central theme identified from within the case study. For example, the prevalence of ICI's individualistic culture (section 8.5), the highly personalised nature of new product 'tensions' (section 6.12.2), the career opportunism afforded by innovation practice (section 6.12.1), the perception of the power of key personnel, such as Hulme or McMahan, to force vision into action (section 6.12.2), the overall lack of a formalised career structure and the 'stickiness' of failure (section 6.11) and the relating of the practitioner's organisational role and technological vision to their personal sense of 'image' (section 7.3, 7.5 and 9.2), are all evidence of the importance of the 'self-concept' to innovation practice within ICI.

For ICI's senior managers to *motivate* sub-ordinates to act and behave in certain ways by the use of vision expressions (sections 7.7, 7.8), that practitioners then re-interpret in terms of enhancing their self-concept, should not be considered a 'warm and friendly' term for making people 'happy' in their work. Rather, it is a way for 'preparing' or at least appealing to a most basic and fundamental schemata of practitioners, enabling them to assimilate and process relevant information in a more synergistic manner, in accordance with the future aspirations of the firm.

One of the most dramatic examples of how the self-concept played an important role in ICI's innovation process was the affect of McMahan's seemingly 'negative' vision expressions, concerning future innovation upon the Innovation Manager, Kenyon, and his Innovation Group. Section 8.5 outlined the effect that McMahan's comments had on Kenyon, in particular, the 'power' of McMahan to force a particular vision of future innovation into the foreground of practice with little negotiation or adaptation from sub-ordinates. However, rather than simply becoming an additional political and social concern for Kenyon to consider, the 'stand-off' appeared to him to be

insurmountable (section 8.8.4). The contention here is that this ‘problem’ challenged the core-concept that contributed to Kenyon's sense of ‘self’. Thus, rather than undermining a single idea or opinion, this negation of innovation undermined Kenyon’s self-concept, not only in his own eyes, but also in the eyes of his community of practice, to such an extent that he felt his role had become untenable.

The self-perceptions of traits, competencies and values of ICI’s practitioners appeared to exist as knowledge structures which served to monitor and control the importance of current experience, vision expressions (section 7.7), and practice and helped to seek out advantages and disadvantages for the individual. Schlenker (1985) refers to these self-perceptions as ‘identities’ and defines an identity as a schemata of an individual that describes, interrelates, and explains relevant features, characteristics, and experiences of successful practice to that person.

As Figure 7 depicts, the self-concept is suggested as a crucial element in the construction of ICI practitioner's sense of a commercial reality. It can be understood here as a series of self-referential questions that relate the ‘identity’ of the individual to current vision expressions and practice.

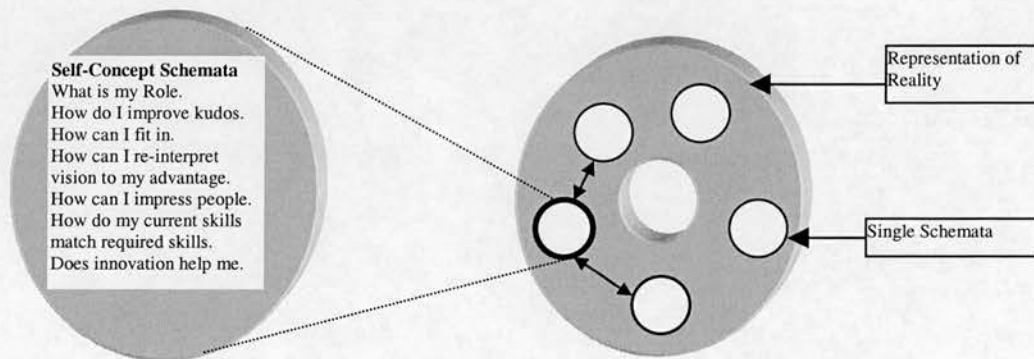


Figure 7: The Importance of the Self-Concept

The circle on the right, symbolises the practitioners representation of reality, always in a constant state of flux. The inner circles represents a single schemata. The thicker-lined inner circle represents the fact that some schemata become ‘fixed’ and taken-for-granted in repeated usage; in this case, the self-concept. The thinner-lined

inner circles suggest other schemata, say, representing notions of 'power', or specific technological knowledge, still open to degrees of introspection and change.

The thick-lined inner circle is expanded to reveal, in the large circle on the left, its content. In this case, I suggest that the self-concept can be represented as a series of self-referential questions that relates a proposed notion to ways for that individual to improve their own kudos or credibility. The thick-lined self-concept is connected to several other schemata to demonstrate that the self-concept also affects other schemata. For example, the self-referential questions, outlined within the self-concept, also refer to notions of empowerment, as well as the vision expressions of various 'key' personnel, such as Hulme and McMahon, suggesting ways to behave to increase personal credibility (section 7.7, 8.5.1).

Motivation To Act

Drawing from section 8.8.4, the self-concept provided a motivation for Kenyon to act by setting an internal standard that then became a basis for future activity to lead to achieving notions of his 'ideal' self. For example, Kenyon tended to use fixed standards of self-justification as he initially attempted to reinforce a perception of competency. Later, as he was said to have achieved higher levels of competency by his peers, key personnel such as Harris, Hulme and later, McMahon, were seen as crucial by him to 'impress'. This is because his schemata relating to, say, empowerment, can be said to contain notions of these people as 'important' to the innovation process; a notion learnt through past practice. Thus, part of achieving a successful degree of competence was to have obtained feedback from these individuals. This need for constantly achieving higher levels of competency, expressed as verbal or written 'peer feedback' within specific communities, is similar to what McClelland (1961) refers to as a practitioner's 'need for achievement'.

To McClelland, the motivating force for individuals who are inner-driven and motivated by their self-concept is task feedback (but not necessarily 're-reinforcing')

feedback). It is, however, important to these individuals that their efforts, as witnessed by others, are vital in achieving their perceived outcome. This process is also akin to Deci's (1975) idea of 'intrinsic motivation' as representing practitioner's attempts to seek out and overcome challenges, and Katz and Kahn's (1978) idea of 'internalised motivation as self-expression' derived from role performance.

Also, the self-concept can be seen to give motivation to act when the notion of 'self' was derived from adopting the roles and expectations of reference groups; that is to say, 'communities of practice'. Here, practitioners attempted to meet the future expectations of others by behaving in ways that elicited a particular social feedback, consistent with their self-perceptions. In this sense, the Innovation Group required *positive* feedback from senior managers (and Kenyon) and re-interpreted their behaviour accordingly if this was not forthcoming, shown in D'ath's comments in section 7.9.1. When positive task feedback was obtained, individuals communicated these results to other members of their immediate reference communities as exemplars of 'legitimate' action. Indeed, from McMahon's comments, it is clear that he considered there to be a 'joint mind-set' within the Group, suggesting that notions of legitimate action had become 'fixed' and taken-for-granted (section 6.12.2).

Individuals also behaved in ways which aimed to satisfy the legitimate 'rules' of other reference group members, first to gain acceptance and then to gain social status through negative/positive feedback. As such, individuals continually strove to earn the acceptance and status of reference group members.

Indeed, when he first started his job as Innovation Manager, Kenyon's 'pleading' with senior managers to help him outline his responsibilities can now be seen in a new light (section 6.12.2, 8.8.4). Here, Kenyon can be viewed as establishing the 'social boundaries', under which his role could infer kudos to himself, as well as establishing how he could obtain 'feedback' from managers, to develop successful notions further. As a new role within the firm, such boundaries were 'unknown', both to Kenyon and the other managers. In this reciprocal way, Kenyon can be

considered as learning and constructing a new content of his 'self concept', related to his new role and identity within the firm (section 7.5). This need for social acceptance is similar to McClelland's (1961) need for 'affiliation and power'.

Most of the practitioners interviewed, to varying degrees, displayed both these internal and external notions of self-concept motivation. Yet in Kenyon's case, the inability to realise the former may have contributed to his perceived loss of status and personal kudos within the Innovation Group, in particular, and the firm at large. In associating himself with his individualised approach to innovation he was not able to later disassociate himself from its 'illegitimacy' when McMahon expressed his 'empowered' vision for future innovation activity as an alternative to his views.

9.3.2 Summary of the Self-Concept and Identity

ICI's practitioners established a sense of a social identity through involvement with both functional groups (section 7.5), the more informal communities of practice (sections 7.8, 8.8.5). The reference groups, in particular, provided at least three major functions with respect to the practitioner's self-concept; they helped determine the profile of traits, competencies, and values for a particular notion of legitimate action, they established and communicated the relative value and status of successful action and credibility, and they provided a basis for interpreting feedback regarding the level of required competence and values related to the vision expressions of managers.

Notions of the 'self' were also related to practitioner's 'legal' or functional role (and the relative 'empowerment' of certain senior managers). For example, the role of the specific members of the Innovation Group were associated with creativity and broad-minded thinking (traits). Marketing members were said to have analytical ability and appreciation of the history of previous ICI products (competencies), and senior commercial managers were said to be 'non-risk-taking' and 'conservative' (values). Practitioners who were identified with particular functional groups typically

demonstrated the notions associated with that identity.

The determination of relevant sets of attributes that comprised 'identity' were not necessarily fixed but could be changed as a result of the interaction between the individual and other members of relevant reference groups. That is to say, practitioners were capable of belonging to more than one community of practice. The Innovation Group is the most obvious of these. It was not a functionally or geographically-based group, as members still remained within their respective 'legal' departments. Indeed, which members were in the group depended on which projects were being worked on at the time. Members were either drawn into it or bid to become members of the group (section 7.9).

Another community of practice was Kenyon's 'academic community', to which I was one member. Indeed, he was involved with several academic projects, and we all supplied ideas, papers and presentations. In essence we all coalesced around Kenyon's vision of legitimate innovation practice, involving the creation of many broad networked groups containing diverse interests on innovation practice, 'feeding' him new ideas and reviewing current practices.

The importance of these communities for understanding what was considered 'legitimate' activity was referred to time and again, yet due to their ephemeral nature, they may be considered difficult to identify. Indeed, it is not the aim of this research to constitute a 'mapping' of communities. Suffice to say, here, that from the developing nature of grounded theory research, their importance for ICI practitioner's construction of innovation reality was identified and remains a subject for much further investigation (I shall return to this in Chapter Ten).

The next section considers the notion of 'legitimacy' in more detail, focusing upon the translation of current notions of innovation practice into the more widely observed and culturally held organisational 'norms'.

9.4 Legitimate Notions of Expectation

The case study outlined both the need for a high level of managerial control over events (section 6.13) and a sense of individual ownership of projects and ideas (section 6.12.1). Yet, typically, it proved difficult for managers to create an enduring and organisation-wide sense of what constituted coherent and strategically advantageous innovation practice as many practitioners interviewed felt distanced or 'removed' from the innovation practices in which other organisational activities, in Weick's terms, 'makes sense of what to do next' or 'where an organisation is headed' (section 6.12.3) (1979). Thus, most practitioners excluded from the Innovation Group had little opportunity to relate and learn the causal relationships between the vision expressions of managers, innovation practice and successful behaviour. Hence, the self-concept could not be enriched to include career advancement through being associated with successful innovation projects.

Section 7.10 suggested that within the emergence of organisationally shared assumptions, one can observe both conceptual and material issues that provide an explanation for the differentiation of practitioners notions of a particular event or phenomena. Certainly, a legitimate sense of what specific practice entails was not necessarily propagated uniformly throughout the firm. To effectively isolate what were considered legitimate and successful notions of innovation practice from the other cultural assumptions to which they contributed and drew from, in the way that the Innovation Group did, by excluding (unintentionally) some ICI staff from the innovation process, proved disadvantageous to innovation practice throughout the firm. This was because *all* innovation unwittingly became the Group's perceived responsibility, as other practitioners felt that innovation no longer related to their own self-concept (thus, they could not infer 'kudos' from it).

Thus, both physical and conceptual boundaries drawn around ICI's technological development were tightly construed as it was perceived to be the sole responsibility of the specific task group to foster its evaluation and generation. Indeed, innovation

(and the innovators) were often perceived by other practitioner's as being in 'splendid isolation' or as innovation taking place in 'ivory towers'. Consequently, managerial practices that sought to foster innovation were often described as 'independent' of their context; That is to say, many of ICI's practitioners did not feel a 'true' part of the innovation process. Thus, through practice, the self-concept and identity of many individuals did not possess any 'emotional' attachment to innovation, therefore the possibility did not exist of positive feedback inferring credibility on them. Consequently, they were unlikely to interpret vision expressions concerning future innovation as applicable to them. As the R&D Director suggested:-

"I don't know what it is they [the Innovation Group] do in their meetings and retreats, but its all they seem to do. We get memos and vision statements from them now and then, but I...mean [*dramatically rolled eyes to heaven*]. It's like a club that most of us aren't privy to. I know that part of their job is to try and get everyone, that's us, to innovate more and better, but I'm not sure how their remit or actual plans effect us really. I think we should just be allowed to get on with it" (C. Joyce, R&D Director).

To suggest descriptions of innovation practice (both external, in terms of observable activity, and internal, through a relationship to the self-concept), in terms independent of their specific context may have its attraction for both practitioners and researchers as it seemingly abolishes many of the theoretical problems of understanding the *context* of practice. However, a SitCog account of ICI's innovation processes constitutes an attempt to establish explanations within the context in which they are used, as little can be described or understood in self-explanatory or self-referential terms alone. Thus, understanding the learning of legitimate notions of practice and different interpretations of 'meaning' must also be construed in these terms, excepting not just 'raw' technological descriptions but also the practitioner's sense-making mechanisms and the influence of the functional groups and communities of practice in which they emerge.

Thus, from the discussion so far, I suggest that it is inappropriate to ask whether individual or group psychology is the more meaningful metaphor for examining the learning of innovation practice, a shared sense of commercial reality and the interpretations of the vision of managers. Drawing from the SitCog account developed here, the view is much more complex, involving interactions between the

learning processes of individuals, as individuals with distinctive experiences and expectations, and individuals as representatives of certain communities.

9.5 Situated Cognition as a Metaphor for Learning

Sfard (1998; 8) states that traditionally, learning has been considered as something 'acquired' in practice, whether that be a competency, skill, or capability. However, similar to Gergen (1984), Sfard also suggests that a more suitable metaphor for learning is that of participating in legitimate or 'authentic activity'. This view of learning has much in common with anthropologists and educationalists, such as Lave (1988, 1991) and Suchman (1993), who focus on the cultural construction of meaning, integrating aspects of anthropology with aspects of the socio-culturalism of Vygotsky (Forman *et. al.*, 1993; Newman, Griffin and Cole, 1989). Here, 'knowledge' is not considered an object, or memory an location, rather, knowing and learning are social and cognitive constructs, related to self-fulfilling action (section 9.3.1), within the accepted practices of sub-communities. In essence, without practice one cannot truly be said to 'know' or learn.

Drawing from the case study, I have argued that most learning of what legitimate innovation practice entailed, and hence the analytical focus, took place within particular communities of practice, centred on the problem-solving and decision-making skills required by practitioners, in the context of visions of technology-based activities. This is because it was often these communities, and not the functional groups, that came together to discuss current or proposed projects (section 9.3.2). That is to say, although people related notions of identity to their 'legal' roles, because of the move toward a 'human resource-pool' approach, actual *practice* typically occurred outside these functions, as project-work often no longer consisted of an 'over-the-wall' process (all R&D staff working on the projects and them passing it on to, say, marketing), but was more 'holistic' in nature. Thus, people from various departments first come together informally, and then more formally, to work upon assigned projects. Indeed, as SitCog accounts suggest, learning cannot be

characterised solely in localised situations but is emphasised within the ‘web’ of social and cognitive activity in which practice takes shape (Lave, 1991; 87).

Lave's research (Lave, 1988; Lave *et. al.*, 1989) also suggests that to understand the process of learning and what is ‘learnt’, one must not analyse it from a pedagogical viewpoint *per se*, but consider it from the point of view of the ‘learner’. Indeed, what seems clear from the ICI case study is that if a practitioner did not learn or perceive what senior managers *intended* to have been learnt, one cannot conclude that *nothing* was learnt at all. That is to say, vision expressions as performatives always ‘do’ things to practitioners' schemata (section 7.9.1), but not in a pre-determined fashion.

However, this begs the question ‘how did ICI’s practitioners identify and learn which cultural ‘tools’ were pragmatically applicable in a given situation’ and ‘what was the role of managerial vision in this process’? A consequence of focusing on a cognitive account can, to a degree, be explained by an implicit view of what learning amounts to. Within the account presented here, learning can be *explicitly* conceptualised as a cognitive process in that it is concerned with the transformation of the beliefs that practitioners hold regarding the material world and the perceived actions (and beliefs) of other practitioners; suggesting that such transformation results from changes in the available set of choices to the innovator. Indeed, the next section suggests that the notion of *cognitive apprenticeship* presents a helpful metaphor for understanding the way ICI’s practitioners learn legitimate practice (section 8.8.2). As Lave and Wenger argue:-

‘Apprenticeship models of learning are not pedagogical strategies in themselves. It is an analytic viewpoint on learning, a way of understanding learning. It is clear that learning through an apprenticeship occurs no matter which conceptual form provides the context for learning or whether there is any intentional ‘educational’ form at all. Indeed, this viewpoint makes a fundamental distinction between learning and intentional instruction ’ (1991; 40).

9.6 Learning Through Apprenticeship

Cognitive apprenticeship suggests a mechanism whereby practitioners become ‘enculturated’ into the legitimate and authentic practices of a community in a way

similar to that of traditional notions of craft apprenticeship. The phrase 'apprenticeship' emphasises the centrality of social activity in learning, highlighting its context-dependent nature; crucial in describing ICI's innovation practice, as well as describing how practitioners form their notions of reality (section 9.2), notions of identity (section 7.5), and the 'self' (section 9.3.1) As Brown explains:-

'Cognitive apprenticeship attempts to develop densely textured concepts out of, and through, continuing authentic activity. The term is closely allied to an image of knowledge as a tool. Cognitive apprenticeship supports learning, just as craft apprenticeship enables apprentices to acquire and develop the tools and skills of their craft through authentic work and membership of their trade. Through this process, apprentices enter the culture of practice' (Brown *et.al.*, 1988; 24).

Here, the 'enculturation' of practitioners meant that, for example, the influential cultural assumptions of ICI Paints (section 8.2) or notions of the self (section 9.3.1), were sublimated by the increasingly heterogeneous and pervasive sub-communities.

As Kenyon explained:-

"Our view of ourselves as stolid, conservative and such like, is always there in everything we do. It is like a sword of Damocles hanging over our heads, but that doesn't mean that it's always at the front of our minds. When you get talking to others, it's actually easy to bounce ideas off each other and get positive and more risk-taking. Of course the opposite can happen. We know the type of stuff we have been doing but that doesn't mean to say we *have* to follow it. That's what my group is trying to do. It's up to us to interpret it for our own ends"

Applying the concept of 'apprenticeship' to the cognitive skills of ICI's practitioners requires the externalisation of mental processes that are normally conducted internally. That is to say, practitioners are required to observe the mechanisms by which an 'expert' (or super-ordinate) or other community members 'think' and communicates to sub-ordinates (consciously or otherwise), 'how' and 'what' to learn and how to act in ways considered legitimate within a given cultural setting (Collins, Brown, Newman, 1989). Indeed, the constant observation of managerial belief and vision was identified as a *prerequisite* of the day-to-day practices of ICI's practitioners (section 8.4). The next section suggests several 'phases' within which ICI Paints undertook the 'apprenticeship' learning.

9.6.1 Cognitive Apprenticeship Learning Phases

In section 7.9.1, I briefly described how managerial vision was translated into action.

The following section considers, in more detail, a proposed outline of a cognitive apprenticeship that is suggested as descriptive of this translation, as well as the translation of repeated practice in schematic notions, relating to legitimate actions and beliefs. Using the metaphor of 'apprenticeship' and based on the case study, the process constitutes non-mutually exclusive elements, in the following phases.

Modelling

This element involves the observation of an expression of vision as an outline of future tasks, scenarios or perspectives. Sub-ordinates perceive them as 'important', relating them in inference to the 'self-concept' (section 9.3) and begin to construct an idea of the processes that they are required to understand, infer kudos from, and (eventually) accomplish.

A practitioner began with a personally held view of their commercial environment, including pre-scientific and pre-technological schemata (section 8.8.2) and notions of the 'self' (section 9.3.1). Expressed vision statements, as performatives, contained descriptions for future activity that related, in a fashion, to the broader aspects of the practitioner's 'commercial reality', as well as to technological specifications, functions or societal trends (section 7.7). Depending on the particular vision content that most related to the practitioner and the organisational 'power' of the visionary (section 8.5.1), levels of importance were ascribed to the expression; visions expressed as 'could' were taken as 'should' by the sub-ordinate practitioner. In essence, such expressions were the stimulus to proposed future action and the relevant conceptual change required to achieve an 'ideal' self (section 9.3.1).

The vision expressions of Miller-Smith, Margetts and other senior managers concerning ICI Paints (section 6.5.1, 6.5.3, 6.12, 6.12.1), for example, focusing upon the move towards a more market-orientated firm structure or an environmentally sustainable future (section 6.5.1, 6.5.2), had a major transformative influence on the career aspirations (self-concept) of Kenyon. Indeed, the position of Innovation

Manager was created largely as a response to these changing visions. His interpretation of them required that some aspects of the visions were considered to be more important than others and required action by him. He was especially interested in fostering organisation-wide working practices that supported innovation as, through these, he felt that they provided legitimate action and satisfied both his internal and external self-image; his need for achievement and for affiliation and power (section 9.3.1.) These schemata helped him form ideas concerning what innovation meant to him/ICI and how the Innovation Group/him should legitimately operate within the firm. As Figure 8 shows, focusing upon aspects of the vision expressions of managers and mitigated though important pre-conceived schemata (such as the self-concept), practitioners conceptualise 'idealised' notions of legitimate future activity.

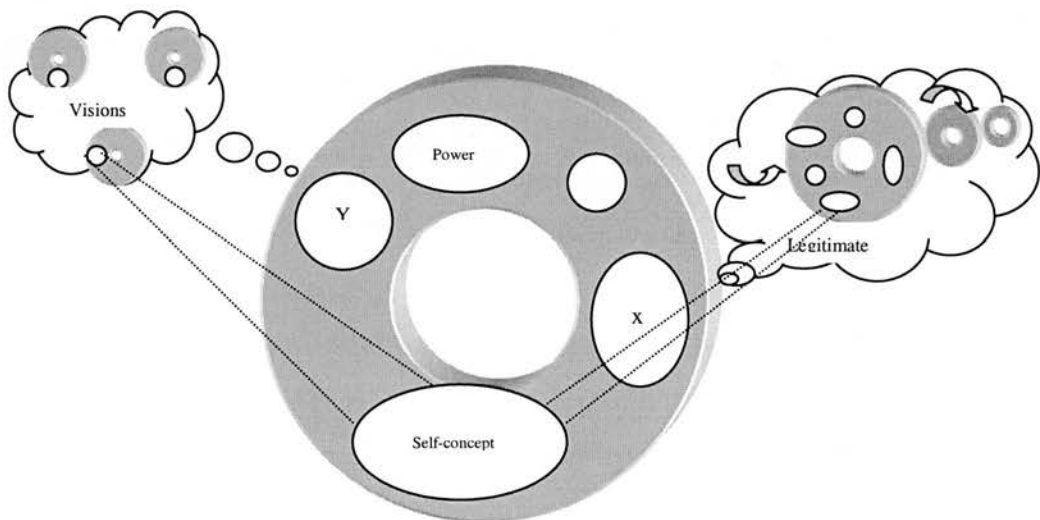


Figure 8: The Practitioner Begins to Model Future Activity

The large circle represents an individual's notion of reality. The inner and misshapen smaller circles represent particular schemata, for example notions of the 'self' and 'power'. The different shapes and sizes of the inner small circles represent the fact that they have different conceptual dimensions and some may be considered more important than others. The thin outer-line of these smaller circles suggest that they are still conceptually open to change and are not yet 'fixed' or taken-for-granted. The

'cloud' on the left of the figure, represents the individual's perception of the vision expressions of senior managers. The vision contains several perceptions of a future reality with associated 'perceived' schemata that can be related to the practitioner's own (section 7.7). So, for example, section 7.7; Level One, suggested that within some vision expressions are notions that relate directly to the self-concept of the practitioner. The cloud on the right of the figure, represents the practitioner after observing the vision, constructing 'models' of how their own schemata may have to change to align with the possible consequences, if the vision expression comes to pass (shown as a change in shape between the self-concept of the vision 'cloud' and the self-concept of the legitimate notion 'cloud'). The notion of the self-concept may continue to evolve with other expressions and practice, thus, I show three smaller circles within the legitimate-action 'cloud' (notions of reality) developing as the practitioner internally tests their own mental projections (section 7.2).

Coaching

This element in traditional trade apprenticeship consists of the super-ordinate observing sub-ordinates, while also considering how they may conduct a task and suggest hints, feedback and reminders. The 'observing' may take an informal approach, such as 'socialising' or 'politicising', or more formal practices of presentations, meetings or peer reviews. However, drawing from the case study, I suggest that the practitioner is far more pro-active in their learning experiences, actively seeking out new vision expressions as confirmation of their existing beliefs while also re-configuring elements of their schemata to best suit their own personal aspirations. Indeed, as section 8.4 argued, sub-ordinates observed their superiors' visions, interpreting environmental anomalies and their beliefs accordingly.

In this sense, senior managers also, unwittingly, became a 'coach', directing the learning experiences and aiding the construction of the practitioner's sense of reality, in often unintentional ways. For example, McMahan, intentionally expressed his belief that he did not view the role of the Innovation Group as being in the best

interests of innovation practice within ICI Paints (section 6.12.2). To the Innovation Group, he seemingly replaced Kenyon's vision in importance, with his own; in this description becoming 'coach' or expert, as the comments of D'ath suggested (section 7.9.1). Consequently, his pronouncements (both formal and informal) took on increasing importance in directing 'how' and 'what' practitioners should consider as legitimate action and belief; in essence, to do otherwise was to risk one's self-concept to peer review. Figure 9 demonstrates that the modelling of 'reality' takes on a more 'fixed' perspective, drawing not just from vision expression, but also from a reciprocal co-evolving dialogue with visionaries.

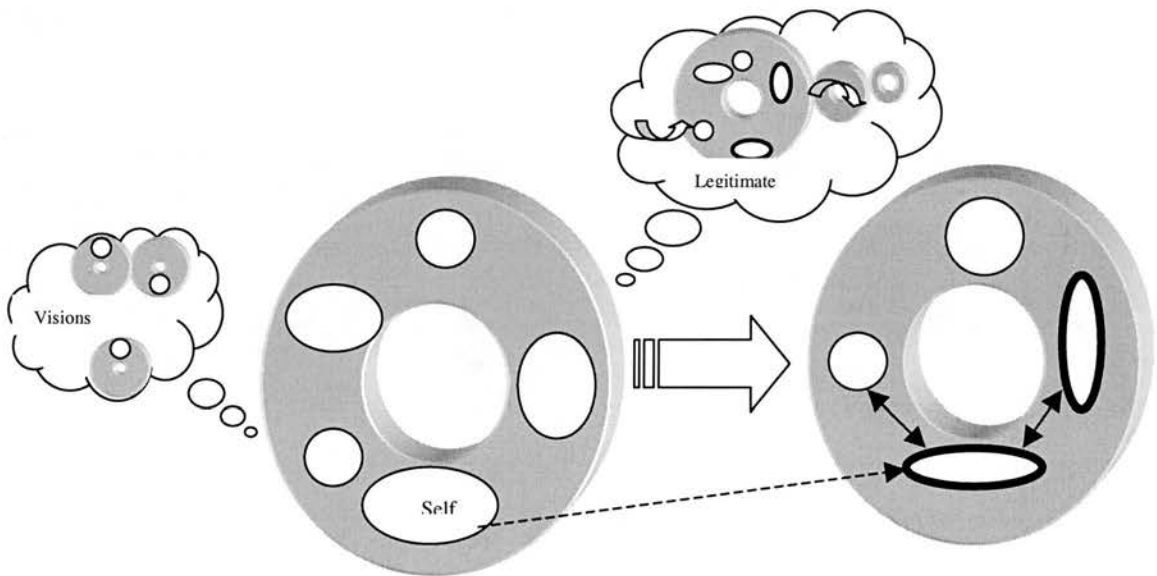


Figure 9: Schemata Becomes More Rigid

Following on from the last figure, through observation of the vision expression (cloud: left) and the modelling of potential changes to the practitioners schemata (cloud: right) and the observed feedback of superordinates (section 9.3.1), several schemata become more important (shown by the thin dotted arrow), represented by the circles changing shape. Other schemata became more taken-for granted, shown by the smaller circles becoming more thick-lined. In essence, through observed feedback and practice the practitioner is beginning to develop more formulated notions of legitimate practice. The dark double-headed arrows represents that, now,

as schemata become more developed, several of them may become intertwined. So, for example, notions of kudos and a particular aspect of technological knowledge is inseparable; to possess and demonstrate expertise in one, is to refer to the other.

Articulation

This phase represents both super and sub-ordinates expressing their reasoning or problem-solving *behind* their beliefs of a particular future, in a direct and communicable manner, focused on more explicit and specific problems and tasks. The articulation phase need not be an actual expression of a ‘fixed’ set of beliefs, but more a continual and developmental process of arriving at an ultimately formulated set of legitimate practices. The articulation of beliefs takes place at many different content levels of explanation (section 7.7) in a reciprocal process; that is to say, as ‘performatives’, vision expressions always do ‘something’ to the schemata of others (e.g. re-enforcing, disregarding, supporting). Figure 10 demonstrates that as practitioners representations of reality develop, they draw from both the cultural assumptions of the firm, and in a reciprocal fashion, the communities of practice.

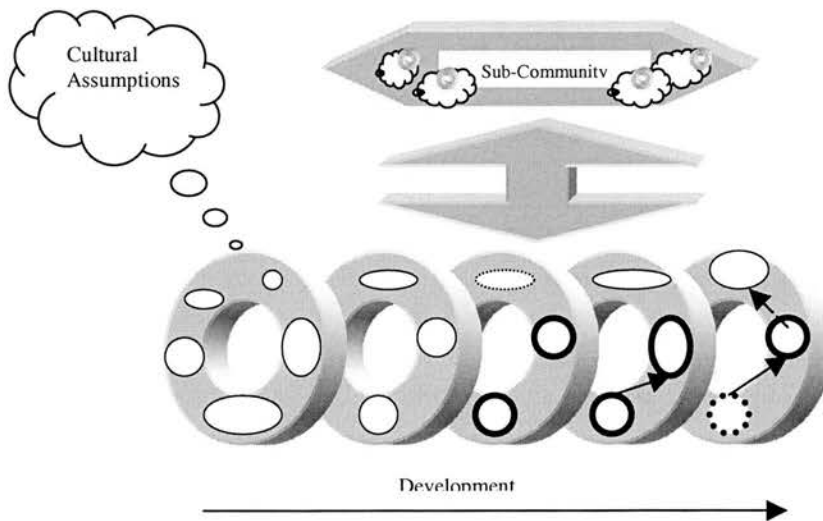


Figure 10: Developing Visions and the Affect of Community

Following on from the last figure, the five large circles represent the development of a practitioner's schemata. Through practice, the individual begin to share their notions externally, within the social space of particular communities of practice, represented by the flattered diamond shape at the top of the picture. Community members had their own notions of reality, represented by the four 'clouds', with at least some similar schemata (the small circles within the clouds). The double arrow between the community and the practitioners developing schemata, shows that the reality of the practitioner can both change, and be changed by, other perceptions of legitimate practice; in essence, they influenced one another in a reciprocal fashion. The large cloud on the left of the picture, represents the fact that when practitioners created and adapted their notions of reality, they did so influenced by their interpretations of the firms assumptions (section 8.2).

Reflection

As figure 11 shows, practitioners compared their own sense-making mechanisms with those of 'experts' or other successful practitioners within communities, as well as the firm's assumptions, either formally, in terms of a peer review of a projects performance, or more informally, by the political and social processes of gaining personal credibility or kudos, outlined as crucial to innovation within the case study.

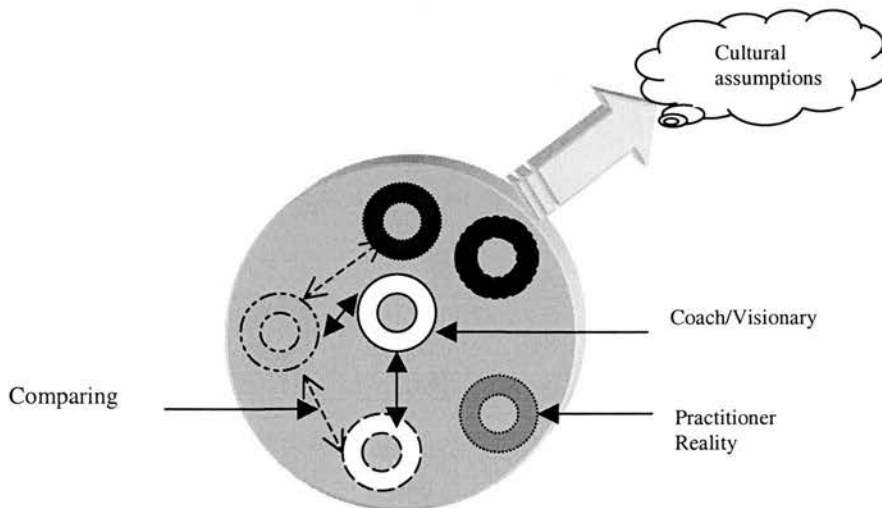


Figure 11: Practitioners Reflect Their Notions Against Others

The large circle represents a particular community. The inner circle represents individual practitioners. Although each practitioner maintained slightly different realities (represented by the different hues of the smaller circles), each remained within a broad conceptual band of the group. They were constantly comparing their notions of 'vision' to the visionary (section 8.8.4), represented by the thick double-headed arrow, as well as to each other, represented by the thin dotted arrow, as well as to their 'legitimised' notions of the firm's assumptions (section 8.2), represented by the large arrow and the cloud-shape at the top of the picture.

Exploration

As Figure 12 shows, this phase entails the natural compulsion of practitioners to further explore concepts and theories freely, and judge which questions and problems are relevant and solvable (Collins, Brown, Newman, 1989; 481-482). In essence the particular community of practice/individual has responded to a perceived 'shock' or problem and has 'learnt' various assumptions and moved on to new problems or anomalies.

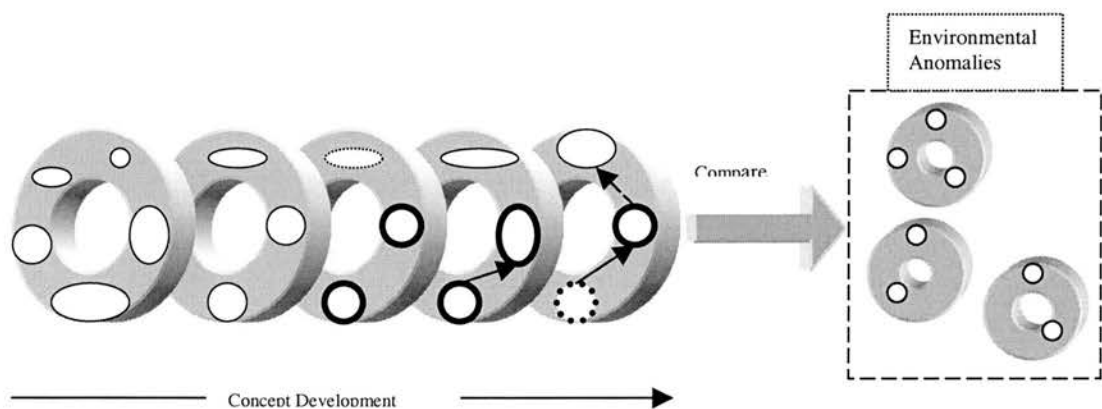


Figure 12: Exploring The Environment

The five circles represent the development of a practitioner's schemata. The last circle represents the 'final' stage (one of the individual small-circles shown in figure: 11), whereby most schemata have become 'enriched' or 'fixed' through repeated

practice. The practitioner, when observing the external environment 'beyond ICI', (represented by the dotted lined box), uses sense-making mechanisms to observe 'anomalies', represented by the small circles within the box. The inner circles, within each anomaly, represents the notion that certain aspects of events or phenomena *may* relate and be identified, in some manner, to aspects of the practitioner's reality. To describe how this is actually done is not the aim of this thesis. Suffice to say here that, practitioners utilised the existing representations of their reality to comprehend the external environment, constituting their 'bounded' notions of reality (section 8.4.1, 8.7.2, 9.2.1); in essence without at least some 'similar' notions, practitioners became 'blinded' to potential innovation opportunity.

9.6.2 Summary of Apprenticeship Learning

ICI's practitioners typically observed vision expressions and re-interpreted their beliefs accordingly. Sub-ordinates constantly reaffirmed or altered their own notions by seeking confirmation of their practices to aid their judgement and choices. They checked for supporting notions, or confirmation, from their immediate conceptual sub-communities and visionaries before expressing their ideas in more concrete terms, establishing consistent and culturally acceptable notions, within the broad remit of widely-held cultural assumptions of the firm.

The next section discusses further the issue of ICI's pervasive cultural assumptions, outlining how notions of technology affected the apprenticeship learning of practitioners enculturalised notions of technological development and 'validated' innovation practice.

9.7 The Learning of Cultural and Technological Assumptions

Schein claims that practitioners often build their practices, values and basic 'self-images' around their notions of the underlying technologies of a firm (1985). Similarly, he argues that various organisations also structure their 'self-image' in the same way. The case study suggests that both the formal vision statements (section

6.12), and the more informal comments of managers, were also related to what practitioners considered to be the technological 'core' *raison d'être* of ICI Paints and their own notions of identity (section 7.5). These were often expressed in terms that closely related to the commercial and technological targets that practitioners spent much of their time working to achieve. In particular, visions were described in terms that related to the individual's technological and functional role within ICI Paints (sections 6.12, 6.12.2, 7.5).

Schein further proposes that organisation's sub-consciously 'socialise' new entrants into central technological assumptions, also outlining the importance of the culturally-held assumptions as something 'to be taught to new members as the correct way to perceive, *think* and *feel* in relation to those problems' (1985; 33). In essence, this can be seen as supporting the importance of 'learning' ICI's cultural assumptions, demonstrated in Figure Ten (section 9.6.1).

Consequently, in Schein's description, the process of learning is not only construed and mitigated by certain pervasive cultural assumptions and technologically-based 'self-images', but is a process itself capable of being, for example, conservative, unreliable or conflictual. That is to say, the processes by which practitioners learn the firm's 'ways of doing things' are similarly dependent on the same bounded notions of technological choice, as are the mechanisms that 'bind' the conception of vision. In essence, to learn certain commercial and technological notions, identify particular environmental anomalies, or be able to associate with particular aspects of a vision, successfully, one must at least possess *some* similar notions to begin with.

As I have argued (section 6.12.2, 7.5,7.10), ICI's practitioners possessed different 'maps' of departmental responsibility. Indeed, March *et. al.* (1991) also demonstrates that what is learnt from particular experience varies substantially throughout the organisation. This suggests that what is actually learnt by various sub-communities may not be uniformly held throughout the firm. March further propounds, inclusive of Schein's claims, the importance of individual experience, particularly of 'critical

incidents', in shaping the learning processes of the group. However, he warns:-

'Because of the ambiguities associated with any single incident, responses and interpretations tend to be adopted more as a result of their temporal proximity; cognitive availability, or political convenience, than by virtue of their obvious validity' (March *et. al*, 1991; 7).

Thus to March, there is a pragmatic expediency in how practitioners 'guide' the learning processing and hence the 'encuturalisation' of legitimate technological practice. This is not to say that certain environmental events may always 'shock' practitioners into adopting radically 'new' technologies or behaviour, but that the existence of such 'shocks' may well contribute to the formation of 'dominant heuristics' that have been said to play an important role in the learning and utilisation of ICI's influential cultural assumptions (section 8.2).

The *shock* of the possible take-over from Hanson Plc and the subsequent strategic move towards a more dynamic and market-sensitive product range can also be seen as supporting a 'political convenience' for certain types of managerial or technologically strategic initiatives, such as McMahon's 'brand-management' strategies and the marketer's increasingly important role within ICI Paints innovation process (section 8.8.6). Here, the validity of learning how to utilise certain new market and technological knowledge (as opposed to the traditional importance of the existing R&D-based technical knowledge) was reinforced by the further development of new strategic practices, shaping the sense-making mechanisms of practitioners, subsequently utilised in further decision-making. In this way, such 'shocks' were quickly subsumed into the sense-making mechanisms of both practitioner and community.

9.7.1 The Learning of Validating Practice

Many practitioners expressed the importance of their pre-communicable notions 'still in the making' (Figure Eight and Nine; section 9.6.1), when considering new ideas, best shown by P. Taylor's comments:-

"You get a vague sort of idea about the sort of things you'd like to see happen, but with the exception of some 'talking-shops' like some of the retreats we have here, you don't just go talking to everybody

about everything you can possibly think of. It's more a case of building a legal case over a period of time, looking for evidence and running through things in you head, such as how people will respond to it, what sort of questions they might ask and that sort of thing, before you put it out there to see if it sinks or swims" (P. Taylor. Senior R&D Manager).

Bateson argues that individual validation is a highly important aspect of conceptual or experiential learning as 'one performs more easily in a world in which our own, and the cognitive characteristics of others, are judged first and then externalised' (1972).

These evaluative mechanisms later constituted an external construction of personal beliefs, providing a 'second-order' or explicit and generalised cognitive mechanism with which to frame potentially new problems (Bateson, 1972; 187). In this light, the vision expressions of ICI senior managers can be seen as a first step in creating new and shared validation routines subsequently utilised by practitioners and communities to judge potentially new environmental anomalies (Figure 12; section 9.6.1). An example of this 'second-order' validation is outlined by Kenyon's proclamation to the Innovation Group:-

"For senior managers to express how we were doing in terms of performance is very important to us, in the sense of providing a justification for what we are trying to achieve here. It's probably more true to say though that it matters more to me than to my group, they look to me for what we should be doing and after all it's my neck on the line here. I don't want to say 'all my eggs in one basket' but it's probably true. So yes, if I say it's important it probably is to my team and I've told them this in no uncertain terms" (I. Kenyon. Innovation Manager).

Here, Kenyon demonstrates the centrality of the 'self-concept' in judging the importance of potential innovation practice as well as expressing that this notion had led to him communicating his judgement and validations to his group. Hence, part of the enculturation process for the Innovation Group was to at least be aware that their actions seriously effect their career opportunities and that of their superordinates.

Dosi suggests that pre-technological based validations also have powerful exclusionary effect on practitioners' pre-judgements (1982). Thus, according to Dosi, practitioners will often neglect other possible alternative paths, by rendering themselves unable to perceive certain information as they focus on their own existing evaluation and judgement routines. Indeed, as certain evaluation routines became

increasingly externalised by ICI's practitioners, they began to influence the selection of particular technological paths but only when they became generally accepted as legitimate. Indeed, the 'downfall' of Kenyon and Harris, accepted by most as caused by their conceptual disagreements with senior managers (such as McMahon), served to provide McMahon's vision for a more 'market-orientated' and 'brand-management' with a greater sense of organisational legitimacy to others.

Information consistent with existing validation routines were more likely considered as valuable and 'arranged' in ways that reinforced individuals beliefs (section 7.4). Thus, ICI's practitioners were more interested in establishing their beliefs as 'correct' than in trying to prove them wrong by relying on existing validation routines, perceived of as 'less risky' (also see Weick, 1979; Langlois, 1998).

This reliance on existing validation is also what MacMahon referred to when he explained about bringing with him his prejudices of 'doing business his way' (section 6.12.2). He chose to follow a 'customised brand-management strategy as this had traditionally been successful for him within other firms. To him this is a validated 'rule' that has worked with repeated examples. Thus, when notions become 'fixed' (as the darkened-lined circles show in Figure: Nine and Ten; section 9.6.1), they often remained 'fixed', even when applied to new problems. However, other senior managers claimed that such a highly personalised judgement routine was not openly discussed or open to challenge and was simply expected by McMahon to become *the* explicit and dominant rule for others to follow. In essence, there was little negotiation of competing schemata between members (Figure Ten; section 9.6.1). They simply *had* to accept the notion, 'like-for-like', irrespective of other relationships between their schemata that they may have already had.

To other senior managers, McMahon is following a 'pre-chosen' course of action, regardless of the beliefs and 'evidence' of other choices or validation routines. McMahon's vision led to co-existing or 'plural' notions advocated by conceptual-based communities with each sub-community seemingly attempting to enact their

own sense of validation.

What senior managers may also be attempting to do by expressing vision statements throughout the firm, is to direct the learning of cultural 'norms' by making various communities 'share' at least *some* similar aspects of a proposed reality, as a basis for considering coherent future decision-making. In this sense, although the R&D and commercial functions maintained many dissimilar notions of their role within ICI Paints and dissimilar ideas for the direction that ICI should take in the future, there remained a basic sense of organisational 'synchronicity', based on several underlying cultural assumptions and responses to commercial or technological problems. The next section shall consider this 'shared set of public meanings', in more detail.

9.8 The Shared Meaning of Technological Change

Within a SitCog account, to say that 'meaning' is derived from the social and cultural aspects of a firm (as witnessed by its practitioners) is to say that meaning relates to specific 'contexts and purposes'; that is, within specific sub-communities, practitioners developed ways of responding to particular environmental anomalies within the context of a given vision expression. Gee calls these 'discourses':-

'Discourses are socio-historical co-ordinations of people, objects, ways of talking, acting, interacting, thinking and valuing, that allows for the display and recognition of socially significant identities...' (1997; 255-256).

Thus, individuals also exchanged explanations that are related to particular socio-cultural groups (Gee, 1992; Shore, 1996). These cultural 'tools' were not simply held by individuals but were also specific to the practices in which the group engages, the jargon they used and the commercial settings in which they practiced (section 8.8.2). In this sense, communities of practices can not only be seen as collectives of 'like-minded' practitioners, brought together, focused on particular conceptions of 'vision', but also are bound together and directed in their decision-making by their interpretations of the communally-held cultural assumptions of the firm. Indeed, as senior marketing manager, Hulme, suggests, it may even be occasionally appropriate

to talk about ICI Paints itself as ‘unified’ community of practice :-

"Although we try not to think of it this way, we really do have a ICI ‘way of doing things’; almost like a fall-back position. If we are not sure of how to progress we normally find that we fall back on our very considered, justified, well-marketed and safe ways of going about things. You’ve only to look at how long it took us and how safe we were about it, the Internet...right!. We were never going to launch straight in, so we went the safe route first and got Lotus Notes. Classic ICI! Doesn’t mean we all come to the same conclusions though. Sure we have lots of disagreements, I guess it’s how you and your groups and other groups look at it" (K. Hulme, Senior Marketing Manager).

The importance of the notion of ‘community of practice’, to the description of innovation within the case study, can be further understood by considering them in relation to the existing and conventional functional and project-based groups of ICI. During the period of study, ICI Paints were increasingly moving from a well-defined function-based ‘over-the-wall’ working structure, towards a more project-intensive practice, where a great number of personnel had no distinct functional base and were drawn upon from a ‘pool’ of human resources on a project by project basis. The project workers of ICI Paints were now beginning to define their own functional roles as a ‘series of concurrent and short-term project assignments’ that contributed to a more ‘holistic’ approach to innovation practice that managers were trying to achieve with this new way of working. I shall discuss the possible ramifications of this practice, in relation to self-concept and social identity, expressed in section 10.9.

This approach depended on practitioners continuously refreshing and transferring skills and learning not only the cultural assumptions of ICI Paints, but also the specific ‘legitimate’ practices of how particular communities related to new visions or projects; a potential problem noted by some practitioners. As Kenyon outlines:-

“My group did have some initial problems that we’re still trying to iron out. We all came with a lot of pre-conceived ideas which I didn’t really want us to, as the whole point is to think and act differently. Some of us had trouble seeing things from other’s point of view; especially the heavily R&D people and the market researchers who had never really even visited the factory site [the R&D facilities].”

Indeed, the widely held cultural assumptions, such as the ‘regular’, ‘conservative’ or ‘stolid’ behaviour of senior managers, seemed only to provide a sense of practical meaning to practitioners, outside their obvious lexical terms, when they were related to current practice within communities. For example, the term ‘non-risk-taking’

became imbued with actual practical reference when related to the 'here and now' projects of innovation practitioners. As Harris explains:-

"It's true that you will hear a lot about our way of doing things. People come in from the outside and say it and people who have been here all their lives say it, but what does it mean to our products. Saying things like, 'we don't take risks' can all be quoted by people, but I mean... so what! Its how these things relate to actual products that counts. Brilliant Whites was like 'Colour in the Lid' because it was just a step on from the production set up before them. This wasn't risky because we knew it was going to be a go'er. It was the project group that decided how to develop it [Colour in the Lid]. It was simply because it's the way the last one worked [Brilliant Whites]. The only things that changed were our new ideas of where we want to go into the future with it".

This may suggest a difficulty of learning what constitutes legitimate practice when there are no geographical or conceptually stable bases for individuals to establish and negotiate shared or collaborative meaning of past and present events and self-identity. Whilst such cultural reference points did exist throughout ICI Paints, they only gained practical meaning when they were legitimated and used in reference within particular communities of practice. Maybe then one can say that vision expressions also provide a set of unifying concepts *between* groups.

That the usage of these reference points may not be utilised in exactly similar ways throughout the firm emphasises the fact that different sub-cultures in organisations are often organised around distinct practices or competencies (Wenger, 1990, 1991). Schein echoes this by describing several types of 'occupational' culture, arguing that researchers often misconceive the analysis of organisational culture when focusing on issues of organisational learning. To Schein, it is the sub-communities that begin their own learning routines and typically do not have them 'forced' upon them through adherence to any organisational-wide 'norms' of behaviour (1996; 9).

Many theorists who argue for shared assumptions of culture as 'promoting' learning, may have overlooked the many conflicting beliefs that occur between sub-communities. As such, aligning both the firm's 'structural' and 'agent-based' boundaries with perceived notions of organisational performance may prove highly problematical if notions of learning are based purely on areas of function. Indeed, much strategic research has attempted to describe the relationship between the learning of organisational competence and firm performance (Hamel and Prahalad,

1994; Leonard-Barton, 1992, 1995), but has yet to adequately operationalise the nature of competence or explain how it can be developed, renewed or learnt within organisations (Leonard-Barton, 1995; Nonaka and Takeuchi, 1995); research that may benefit from the SitCog account, outlined here.

9.9 Conclusions

This account suggests that 'learning' takes place as a result of the interaction between the 'knower' and the situation in which knowledge becomes 'known'. Thus, SitCog researchers traditionally take an interactionist view, stating that behaviour is a function of both environment and personality (Mitchell and James, 1989; Pervin, 1989). Specifically, it is argued that a dynamic and reciprocal interaction occurs between the person and the situation when social practice occurs. Thus, as a result of past experience, ICI's practitioners (for example, McMahan's singular advocacy of 'brand-management') approached current practice with characteristic modes of thinking that contributed to a determination of the unique meaning of that situation for that person; a meaning that was continually being updated (or simply re-confirmed) through experiential learning during day-to-day practice.

The notion of 'community of practice' not only embodies competence, but is 'learning embodied' (Wenger, 1990; 218). Thus, to understand the 'social interest groups' that constitute an important element of, say, social constructivist approaches, requires an explanation of social learning and personal competence. Indeed, organisational competencies are rarely static, communities were engaged in a continuous process of learning, ensuring that competencies are re-built, shared and applied (also see Linn and Snyder, 1997).

ICI Paints were well aware of the need to construct new competencies but could not agree on the issues that best sustained a competitive advantage (section 6.12.1). Certain managers did recognise that extending the firm's capabilities from familiar to unfamiliar technology was a necessary prerequisite for continued success, yet this

translation would prove to be highly problematical (section 6.12.1). However, they were in the minority, as most were content to focus on existing capabilities, which remained confined to considering current chemical processes and marketing techniques; expertise which had traditionally conferred credibility and personal kudos and had given the 'confidence' to act in repetitive ways (section 7.4).

It was said that with the move towards a 'resource-pool approach' the majority of the construction of legitimate action, the interpretation of cultural assumptions of the firm, and the reciprocal process of translating managerial vision into practice, occurred within communities of practice, rather than through functional departments or organisational-wide initiatives. Indeed, practitioners, who felt that substantial organisational and technological change was required, did not immediately attempt to express their beliefs on the wider stage of the firm as this would risk their 'self-concept' to public criticism, but instead tended to primarily explore ideas within their own communities of practice (section 9.3.2).

Organisational Competence

It may prove difficult to separate the process of learning from the construction of organisational competence if that competence is suggested as being the ability of a firm to learn 'on-line' (Snyder and Willians, 1982) to reflect the learning of practitioners in action (Schon, 1983), and consider what it is to be 'knowing', and not merely 'knowledgeable'. In this sense, a competence may be the explicit and legitimate target of the learning process. However, the discussion here suggests that the 'social learning' of practitioners, often stimulated by the vision expression of senior managers was far more *ad-hoc* and implicit; thus what is supposedly expressed as legitimate or correct practice may not be that which is actually learnt and acted upon.

The process of learning may also be inexorably related to the notion of organisational competence in that much of it is also tacit in nature (Prahalad and Hamel, 1990).

Hence, also from the discussion here, the managing of competence can be said to involve practitioners partaking in continuous and informal learning processes within sub-communities, through consistent ‘apprenticeship’, dialogue, peer-coaching, and shared practice, all related to the ‘need’ for personal achievement (section 9.3) (also see Schon, 1987; Wenger, 1990).

Innovation and Co-Evolution

From this SitCog perspective, innovation within ICI Paints can best be described as a ‘co-evolutionary’ process, with continual and reciprocal interaction between technology, mental processes and the socio-cultural environment in which the individual is embedded. The commercial environment helped constrain or enable the development of new technology and the identification of external threats, while participants’ mental schemata were re-created and re-altered accordingly. Indeed, as the work of Fleck suggests, the crucial unit for understanding technological evolution may well be this *artefact-activity* couple. Fleck argues:-

‘This couple, rather than either the artefact by itself or the knowledge which produces it, is the essential building block of technology development and the basic element of technological practice. In essence, this couple is the mutually supporting combination of artefactual elements within the immediate human activities in which those elements are used and produced’ (Fleck, 2000; 248).

Indeed, from the discussion of ICI Paints here, I argue that to understand ‘activity’ requires understanding practice and to understand practice requires an exposition of the influences upon the decision-making mechanisms of practitioners, formulated within communities of practice, and within the specific technological ‘terrain’ of the potential innovation (section 9.2.2).

Beliefs concerning future innovation opportunity were exchanged, modified and appropriated through a continuous ‘narrative’, within a given particular cultural order of meaning. Though they often appear to be anathema to traditional ‘rote’ learning, the ‘subjective’ and ‘interpretative’ processes, identified here and learnt through ‘cognitive apprenticeship’, were an essential component of innovation practice within ICI Paints, providing a ‘high-level’ of access to much tacit and distributed

knowledge, and an elaborate system of supporting notions generated from within the social web of communities of practice (section 9.6.1).

Such a concept also requires ICI's practitioners to continuously engage in 'seeking out' the visions of senior managers and applying their existing conceptual 'patterns' of behaviour to their current and proposed experiences. That is to say, the identification of environmental anomalies (or vision expressions), outlined in Figure Twelve (section 9.6.1), can provide the input for practitioners to re-interpret their 'realities', shown in Figure Eight (section 9.6.1). In essence, this process is similar to the grounded theory researcher who, in seeking to 'make sense', constructs theoretical patterns from more generally available raw data. They have existing pre-conceived notions that become enriched, disregarded or adopted in their usage.

Reflections on their environment and 'legitimate' notions of practice, generated categories of schemata and classifications for practitioners, that evolved from past experiences and practice, to help organise their perceptions, constituting memory, experiences and actions (also see Holland *et al.*, 1986;20). Building upon these categories, and mitigated by their need for personal achievement or identity (section 9.3), practitioners then formed new schemata to help interpret the environment most relevant to their perceived visions of future activity.

The next chapter offers some concluding arguments, focusing upon the research issues posed in Chapter Five and the general epistemological and methodological approaches utilised throughout this thesis. The chapter also discusses the construction of the practitioner's 'reality', suggesting other avenues of future research.

10

Concluding Discussion and Future Research

10.1 Introduction

The aim of this chapter is to address the research issues outlined in Chapter Five, to further discuss the 'bounded' nature of innovation practice and vision, outline the epistemological and methodological conclusions of this thesis and suggest areas for future research.

The account of innovation within ICI Paints presented here suggests notions of apprenticeship learning, communities of practice and 'self-concept' are the main analytical focus of this research. These issues help describe and condition the cognitive and social reality of a practitioner's relationship with both the *interpersonal* and *physical* levels of analysis. Such an account relies upon the description of the practical and applied activities in which practitioners and communities generate and interpret legitimate expectations of future innovation.

Chapter Outline

Section 10.2 provides a thesis outline, with a summary of the general findings of this research described in section 10.3. This suggests that practitioners develop a sense of reality, consisting of 'taken-for-granted' and shared commercial and technological assumptions, largely conditioned by their interaction with particular communities of practice. Innovation activity is infused with underlying 'pre'-interpretations of various issues which helps to guide or 'bind' the search for new innovation opportunity. Sections 10.4, 10.5 and 10.6, respectively, takes each research issue outlined in Chapter Five, and provides a summary of the pertinent discussions within this thesis. Section 10.7 relates the argument from the previous three sections to a

general epistemological approach of a SitCog account, suggesting how this may also contribute to broader social science enquiries of technological change. Section 10.8 reassesses the main focus of analysis within the SitCog account; that is to say, the issues of the self-concept, cognitive apprenticeship, technological and cultural assumptions and vision 'empowerment' within communities of practice. Section 10.9, drawing upon the previous section, I outline several areas of interest for future research, and argues that a SitCog account requires further study in a number of methodological and theoretical directions. The chapter concludes in section 10.10, with several personal observations of managerial practice and the research process conducted here.

10.2 Thesis Outline

Chapter One outlined several issues of concern for understanding technological change, and suggested that a good deal of literature, focused upon institutional environments, offered little in understanding why organisations might resist change or how practitioners 'mentally' experience innovation. A failure to properly perceive environmental conditions requiring change and a failure to understand the underlying nature of the problem typically engendered a reluctance to innovate. Explanations of why mature firms in particular, were slow to innovate, frequently drew upon technological, economic or strategic descriptions. However, human interaction and understanding were suggested as being 'at the heart' of the process. Hence it was suggested here that an approach that draws upon certain cognitive literature, may prove a useful aid in investigating innovation.

Chapter Two argued that, despite certain social theories having a great deal to offer, they also provide much 'conceptual baggage' which may exclude other important aspects of explanation. However, a review of several accounts of technological change offered some 'hints' as to where a cognitive perspective may have complemented such approaches, focusing upon the role of the *mechanisms* of change and the role of *agency and structure*, by which technology is shaped and developed.

Chapter Three provided a review of several characteristics of innovation research, in particular, the importance of the perception of future technological possibility and the 'bounded' nature of innovation choice. The importance of the cultural heritage of the firm, empowered individuals, and the mechanisms of business rules and routines were also suggested as having an important influence upon innovation practice.

A review of the literature concerned with managerial vision suggested that it involved a perception of future technological and competitive environments, with preconceived biases such as, notions of strategy, sets of personal values and cultural assumptions, all affecting its creation. The social mechanisms for transmitting and justifying vision expressions to other practitioners itself, formed 'bounded' mental structures that provided a sense of 'empowerment' for certain key individuals to stimulate technological change within particular trajectories.

Chapter Four outlined the broad epistemological position of this thesis, suggesting that traditional notions of cognitive enquiry, such as Information-Processing accounts, typically used a 'mind-as-computer' metaphor of individual and group 'thinking' that is wholly inadequate for describing many of the issues within this thesis. Situated Cognition arose largely to counter much of the criticisms of this theory and is suggested here as being, potentially, a useful source of enquiry for considering certain aspects of technological change.

Chapter Five provided the methodological position of this thesis, discussed how the ICI case study was structured, and outlined the research, design and methodology practiced. The chapter argued for a general qualitative approach, best suited for this research and then outlined the specific research methodology based upon the grounded theory approach of Glaser and Strauss (1967). A further amended grounded theory 'checklist' was proposed as more accurately 'under the auspices of good science' and the demands of 'openness and flexibility' (Easterby-Smith *et. al.*, 1991). The checklist involved a cyclical process of data-pattern observations and further literature re-evaluation, guided by the case study evidence. This provided the

method of theory generation followed throughout this work.

Chapter Six provided the case study of ICI Group and ICI Paints. The account showed a firm with a long history, currently undergoing dramatic corporate change. The greatest transformation of the Group was the realisation of their relative decline in certain technological capabilities, a failure to respond to new exploitation of the value chain and the 'unanswered' market-growth of several main competitors.

The overall view of ICI Paints was that, as a mature industry, rates of product innovation were on the decline. Competitive differences now lay in the 'image and branding' of products, cost-cutting and process manufacturing. The lack of radically *new* innovations and the focus on product 'branding' strategies saw a rise in the importance of marketing functions and the demotion of once central R&D departments. This changing internal focus led to the re-establishment of political order and personal 'kudos' of practitioners and departments, which in turn led to a great deal of confusion concerning the perceived technological and strategic directions that practitioners should be working towards.

Indeed, the lack of overall strategic vision provided by senior managers has caused a great deal of 'angst' amongst junior staff. Many of the senior managers are considered 'stuck in the old ways' of 'technologically-pushed' innovation, rather than in touch with the new and faster 'market-oriented' view of ICI, touted by the Group CEO, Miller-Smith.

ICI's cultural heritage was described as a system of entrenched values, a sense of hierarchy being the natural order, a concern for 'ownership of ideas' and 'taking care of the details' of today with only a limited interest in the firm's long-term aims and goals. Indeed, within such a climate, practitioners regularly considered the prevalence of 'political opportunism' as providing the wrong environment in which to innovate successfully.

The account also suggested that the content of managerial vision expressions were shaped through discourse, practice and learning and consistently remained open to revision within the boundaries of 'ground rules and agreed prejudice' laid down by functional and conceptually-bound groups in which practitioners operated. One reason for this seems to be that, no matter how many procedures and guidelines, or how well defined the role of individuals, there remained a huge scope for multiple interpretations of possible future activity. Indeed, ICI's practitioners appeared to possess a sense of personal 'ownership' of parts of the vision and strategy and derived a sense of 'identity' and kudos from their role in shaping its process and content.

Chapter Seven outlined the interpretative and cyclical nature of managerial vision within ICI Paints and the various levels of content in which visions were expressed. The chapter also highlighted the influence of vision in the creation of a 'bounded' sense of future innovation opportunity. Issues of importance were described as, the prevalence of general cognitive mechanisms and thought styles, the influence of a pervasive organisational 'dominant logic' and technological assumptions, and the influence of informal social and conceptual groups of 'like-minded' practitioners, bound together by aspects of vision expressions.

Chapter Eight illuminated the political and social aspects of the 'milieu' of ICI Paints and the importance of the firm's cultural and technological assumptions to the construction of a practitioner's sense of a 'commercial reality'; that is to say the mechanisms utilised by practitioners to 'make-sense' of the world. In particular, the chapter, drawing heavily upon situated accounts of cognition, discussed the 'assumptions' embedded within the firm's practices, and the influence of different 'sub-cultures', each with their own organisational map and notions of legitimate behaviour.

Beliefs concerning future innovation opportunity were exchanged, modified and appropriated through a continuous narrative, with an order of 'shared' meaning,

provided by the cultural heritage of the firm, the 'terrain' of the particular technology and the legitimising influence of functional and conceptual communities. Though they appear often anathema to traditional notions of learning, the 'subjective' and 'interpretative' processes utilised by ICI's practitioners were an essential component of innovation practice, providing a 'high-level' of access to much tacit and distributed knowledge within the elaborate supporting systems of the 'social web' of the firm.

Chapter Nine continued the development of a situated cognition account of innovation, focusing upon the processes of experiential learning, concept change and the role of functional groups and communities of practice in establishing 'legitimate' notions of innovation activity and vision comprehension. Through participation in such groups, practitioners altered and adapted their lexical understanding of the firm's publicly-held cultural assumptions into more influential and conceptually 'rich' exemplars of practice. Consequently, ICI's practitioners interpreted managerial vision expressions in terms of pre-conceived schemata, relating their importance to the influential 'self-concept' and 'need for attainment', as well as to their pre-scientific and pre-technological judgements of innovation practice.

The account here suggests that 'learning' the legitimate notions of innovation practice within ICI, took place as a result of the interaction between the 'knower' and the situation in which practice becomes 'known'; in essence constituting a form of cognitive apprenticeship. Specifically, it was argued that a dynamic and reciprocal interaction occurred between the person and situation when practice occurs, or when visions are expressed. Thus, as a result of past experience (their own and other practitioners), individuals approached innovation practice with characteristic modes of thinking that contributed to the unique meaning of that situation for that person; a meaning that was continually being adapted through day-to-day practice.

The account considered learning as part of an incomplete and dynamic process, enacted within the shared and social space of various communities, influenced by the

personally-held 'reality' of practitioners. Consequently, the construction, meaning and transmission of essentially (at least initially) abstract notions such as visions, were also situated within the meaning that existing practice and technology has for individuals. Visions were reciprocally developed during the process of ongoing activity and were understood in terms of the specific practices and technological arenas in which they were proposed to play a part. Thus, akin to notions of 'bounded rationality', what is learnt can *never* solely be described in terms of what was *expressed*.

10.3 Main Findings Summary: Understanding Encultured Practice

This thesis has aimed to understand managerial vision and its role in engendering innovation activity. The research design allowed for the conduct of an in-depth investigation of ICI, contrasting certain findings with other similar research studies. Through a series of in-depth interviews with practitioners, I studied the different meanings they attributed to notions such as vision, innovation and strategy, what they regarded as their core technologies, how they organised their working practices and how they chose between various innovation options.

The study has shown that through day-to-day activity, practitioners developed their sense of reality, which incorporated much that was inaccessible or 'taken-for-granted'. In taking part in innovation processes, practitioners also reinforced their shared commercial and technological assumptions through repeatedly exercising their personal capabilities and identifying 'legitimate' meanings of current and future practice. The study has also shown that practitioners constructed different (often competing) realities from one another. Indeed, practice was often imbued with underlying, and often substantially different, interpretations of visions, governance and empowerment, technology, self-motivation and attitudes to commercial risk. In particular, practice within functional and conceptual communities shaped innovation choice by 'binding' the conceptualisation, uptake and communication of vision expressions, thus shaping the cognitive mechanisms and social interactions that

determined the range of innovation choice considered by practitioners.

10.3.1 Innovation Practice Within ICI Paints

Innovation practice within ICI Paints was guided by the cultural heritage of the firm (section 8.5, 8.5, 8.7, 7.3), the shared meanings and assumptions derived within certain communities (section 8.2, 8.8, 8.8.1, 8.8.2, 7.10), expectations of possible future scenarios (section 7.7, 7.8) and the application of existing business 'rules' (section 7.4). These inter-played with the more individualistic interpretations (section 9.3.1, 9.3.2), involved in achieving credibility and success (section 9.3). This was described as being learnt by a process of cognitive apprenticeship (section 9.6, 9.6.1, 9.6.2). The scope for innovation choice remained conditional upon the political and social behaviour of practitioners, constituting different assessments of situations, events and the empowerment of certain individuals, as well as the identification of commercial and technological anomalies (section 9.2.2, 9.2.3).

The inseparability of 'facts and values' and the range of 'interpretive flexibility' of choices between varying technological or commercial paths, meant that although beliefs were, in a sense, 'guided'; ICI's practitioners were also creative in how they chose to interpret and express potential commercial opportunities and how they chose to design artefacts, processes and organisational practices, best suited to their personal aspirations (section 9.3, 9.3.1, 9.3.2, 9.4).

Presenting innovation as a discernible element of the analysis of business culture, requires an understanding of the subjective interpretations of choice, and presenting the firm as adapting through various 'sub-communities' to the external environment. As such, a great deal of mainstream literature on innovation and managerial vision often fails to acknowledge that much innovation practice is about the crystallisation of a range of interacting social and cognitive processes with which practitioners represent their innovation 'reality'. Treating, say, the 'political' or 'self-motivating' behaviour of innovators as an unwanted by-product of transforming managerial

vision into pragmatic practice (indeed, ICI Paints attempted to 'abolish' these issues by the use of their StageGate Portfolio Tool; section 6.11.2, 6.12.4), is to misunderstand their intrinsic importance to innovation activity. Further, by conceiving of much of the practical knowledge generated within innovation practice as objective and rationalistic or, in a sense, a 'true' representation of phenomena 'out there' in the commercial environment, researchers (and practitioners) may fail to acknowledge the inseparability of 'facts' from 'values' and 'context' from 'content', a description suggested as crucial to situated cognition accounts of innovation.

Discussion within Chapter Seven, Eight and Nine was largely guided and informed by consideration of the empirical research given outlined in Chapter Five. The next three sections address these issues in more detail, not simply to provide a summary of previous arguments but also, drawing upon the wide range of innovation and cultural studies reviewed, to discuss the synchronicity of SitCog accounts with other theories of technological change.

Indeed, the reflection upon other broad explanations is an important part of Glaser and Strauss's grounded theory (1967), Easterby-Smith's *et. al.* amended checklist (1991) and Thagard's notion of explanatory coherence (1992), outlined within Chapter Five. The aim here has not been to provide a completed notion of theory evaluation suggested by certain grounded theory researchers, constituting high degrees of predictiveness, heuristical value and generalisability (section 5.7), rather by progressing through Easterby-Smith's grounded theory checklist, the goal has been to generate notions of theoretical consistency, explanatory power and 'fit to data'. As such, I have provided an exploratory account that has presented grounded concepts suited to further methodological and theoretical investigation.

10.4 How do Visions Emerge and Become Taken up by Others and How Does This Help Direct Behaviour?

On reflection, these initial research issues now appear far too broad in scope and with

hindsight, could have been separated into more discrete research themes to guide subsequent discussion. Nevertheless, from the account of the innovation process within ICI Paints described within this thesis, I have argued that a practitioner's reflection on their day-to-day activities and the construction of 'legitimate' notions of practice and vision expression, generates categories of classified schemata to help organise and give meaning to their perceptions of the environment. Building from these representations, practitioners form new schemata to help interpret the changing environment, relevant to salient aspects of their 'vision' of future commercial and technological expectations.

When ICI's practitioners constructed their sense of reality, they did so utilising 'pre-scientific' and 'pre-technological' knowledge, derived from their historical experience of both technological practice and the technological specifications of particular innovations. This reality was often considered 'objectified' and 'taken-for-granted' by them, providing limitations on what innovation choices practitioners considered were available to them.

Practitioners typically behaved in ways that aimed to 'satisfy' both their 'need for attainment' (section 9.3) and the legitimate confines of certain other reference or functional group members, first to gain acceptance and, after achieving this, to gain or maintain social status. Indeed, ICI's practitioners established their social identity through involvement within these groups. These communities helped determine a legitimate profile of traits, competencies and values for particular notions of legitimate action or legitimate interpretations of vision expression; they established and communicated the relative values and status of successful action and personal credibility; and they provided a basis for interpreting feedback regarding levels of personal and organisational competence.

Whilst the 'legal' or functional groups tended to provide practitioners with notions of the broad organisational goals appropriate for their roles within the firm (section 7.5), the communities of practice, in which practitioners came together to discuss

potential projects focused upon certain aspects of the vision expressions (section 7.7), typically were said to have provided practitioners with notions of legitimate behaviour in day-to-day practice.

This is because it was often these 'communities of practice', and not the 'functional groups', that initially discussed current or proposed projects (section 9.3.2). Hence, although people related notions of identity to their 'legal' roles, actual *practice* typically occurred outside these functions, as innovation often no longer consisted of an 'over-the-wall' process (all R&D staff working on an innovation and then passing it on to, say, marketing), but was more 'holistic' in nature. Thus, people from various departments first come together informally, and then more formally, to work upon assigned innovation projects. Indeed, as SitCog accounts suggest, learning cannot be characterised solely in localised situations but is emphasised within the 'web' of social and cognitive activity within which practice takes shape (Lave, 1991; 87).

The importance of these communities for understanding what was considered 'legitimate' activity was referred to time and again, yet due to their ephemeral nature, they may be considered difficult to identify. Indeed, it was not the aim of this thesis to provide a 'mapping' of such communities. Rather, based upon the 'developmental' grounded theory research design, it was to identify and consider their importance for ICI practitioner's construction of innovation reality and relate this to current research studies.

Reflection on Future Research

From the literature review in Chapter Three and an overall impression of the case study in Chapter Six, a general 'truism' observed about the 'character' of innovation within ICI is that it was a highly complex process, involving many decisions taken by many different people. Often, these decisions were made on the basis of intuition or the perceived expectation of likely events; notions that are hard to understand in a 'deterministic' or 'rational' manner. A tendency still exists, among some researchers

however, to conceive of organisational processes from rational and purely individualist perspectives, leaving much of the 'non-rationalist' aspects of innovation largely untouched (Pfeffer, 1992). Indeed, that decision-making mechanisms can (or should) be studied as a rational process has been challenged for sometime by several authors (e.g. Simon, 1955; Cyert and March, 1963, Penrose, 1959). Whilst not completely dismissing the idea of 'rational choice', such authors argue for a far less restrictive description of 'rational' as directed or reasoned behaviour; a view supported by this research. Rationality in decision-making is an 'ideal', and possibly, if it could be achieved, preferable and superior as a method of harnessing various aspects of knowledge involved within the decision. Moreover, on a scientific level of analysis, the explanation somewhere has to be rationally based, even if this means assuming the irrationality of certain groups and the exercise of power.

In Chapter Three, I argued how 'bounded rationality' suggested that practitioners made decisions with limited access to often incomplete information. Decisions can only be described as 'rational', in that search activities are consistent with practitioner's mental representation of the environment. This notion was largely borne out within the ICI case study, as practitioner's search for future innovation possibilities were limited, or 'bounded', to a few considered 'legitimate' options. Legitimacy of choice did not simply mean satisfying financial or economical constraints. Legitimacy also followed a negotiated narrative within particular sub-communities (8.8.3, 8.8.4), concerning what was important to proposed strategic initiatives (section 7.6) and consistent to the firm's cultural assumption (section 8.2), whilst also satisfying the 'need for achievement' of individual practitioners (section 9.3). The 'need for attainment' of practitioners was also related to other schemata, say, the empowerment of certain individuals to force certain visions of activity in illegitimacy' (section 8.5.1, 8.8.6).

Consequently, I have suggested a modified interpretation of the 'bounded' characteristic of cognitive representation. Here, an act/performative (such as a vision expression) signifies one possible *status* of meaning that a proposed event may have.

A *proposed* event, just as an actual event, constitutes a relationship between a 'happening' and a 'context'; an encompassment of the 'phenomenon in itself', and has a meaningful value to practitioners from which specific organisational (or community) effects follow. A researcher interested in the relationship between 'structure' and 'event', must take into account not only the order, witnessed by the relevant practitioners, of existing and proposed structure, but also its contingency within specific communities of practice and technology-based functions, as well as its affect upon 'social-identity' (section 7.5, 9.3.2) and notions of the 'self' (section 9.3).

10.4.1 Vision Expression as Landscapes

As Penrose and Simon show, the exploratory account here considers the firm's decision-makers as 'image creators' rather than as 'information processors'. Penrose, for example, begins her analysis with the 'cognitive world' of managers; a world that is bounded within the context of the firm's commercial environment and its specific productive routines. However, rather than provide an analysis of the contingent environment 'out there', she describes:-

'The environment is treated...as an "image" in the entrepreneur's mind of the possibilities and restrictions with which he is confronted, for it is, after all, such an 'image' which in fact determines a man's behaviour' (1959; 5).

Yet exactly where do managers' images arise if they are not directly related to the processing of external data? According to Penrose, these images arise from the experience and knowledge generated within the firm, enabling them to 'see' aspects of the external world. Further, I suggest that such 'images' constitute a far more rich and varied mental construct, still 'in the making' and not 'fixed'. This image, rather than provide an objective picture of 'how the world might be', is also imbued with personal judgements of the importance of proposed innovations to the success of the firm and more importantly, to the individual's self-concept (section 9.3). Consequently, the visionary and listener are engaged in a creative 'dance', enacting possible outcomes through reference to existing or past practice, a 'need for personal attainment' and the legitimising influence the firm's cultural and technological

assumptions which are inexorably intertwined with the communities in which individuals practice.

In this sense, 'vision' constitutes a focused cognitive 'space', outlining possible scenarios and a belief in the likelihood of that particular future actually occurring. They can be seen as a newly charted 'landscape', as opposed to a quantifiable or 'knowable' system of fixed and deterministic rules for proposed future practice. The assumptions of ICI, as they existed, may well have described the traditional location of possible innovation opportunity and provided a sense of empowerment for certain key individuals/departments to facilitate such events (section 8.2, 8.5, 8.7), yet the landscape also provided a dynamic milieu (or background influence), requiring practitioners to consider themselves as 'explorers' in a new land, mapping (or constructing) their commercial environment as they went.

To extend such a metaphor, some directions may have proved fruitless, or at least appeared more difficult to realise than others, whilst alternative paths initially may have seemed more promising. The practitioners involved with building, maintaining or charting such a landscape and the individuals that profit from it (or indeed, follow the direction laid down by others) are not always necessarily the same. Indeed, the case study showed that a strong and determined leadership was not the only thing required to continuously maintain or defend a vision (section 6.12.1). It was also those with suitable personal skills (such as the Innovation Manager, Kenyon) that often could obtain or persuade an acceptance and commitment from others, that typically took advantage of new opportunity, until that is, the empowered vision of ICI's leaders changed course, leaving those strongly committed to other paths behind (section 6.12.2, 8.8.4).

10.5 What is the Significance of Vision and How is it Manifest in the Harmonising and Alignment of the Innovation Practices of the Firm?

The reception of managerial vision was not a passive process of simple transmission, as practitioners typically challenged, expanded, altered and generally developed them

within the process of them becoming operationalised (section 7.9). Indeed, the case study showed that the transmission of vision is a co-operative, cyclical and interpretative process, mitigated by the sub-groups in which practice took place (section 7.10). In particular, the often temporary 'communities of practice' reinforced a sense that innovation practice reflected the shared notions of commonly held 'theories' throughout the firm, of how practice *should* be organised and which types of behaviour were considered 'acceptable'. That is not to say however, that the firm is a mere collection of separate communities of practice.

Shared ideologies created a sense of commitment between groups of similar 'minded' individuals and gave rise to joint explanations of the perceived interaction between vision expressions and innovation practices. Similarly, the harmonious sense of 'ownership' of innovation practice, described within the account presented here as a relationship between personal identity (kudos and credibility) and one's 'legal' function within the firm, had implications for how practitioners worked together, not just within communities, but also within the firm at large.

Vision statements were considered by senior managers as a *resource* in themselves. To express a vision was to utilise them as a social and cognitive mechanism, to build resources and facilitate their conversion into practice, to legitimise a particular view; and to justify existing innovation projects, providing a call on specific funds. Such expressions also focused the attention of individuals and attracted people to particular projects in the hope of conferring 'kudos' upon themselves; that is to say, as a way of reducing the perceived personal uncertainty or 'risk' that individuals faced when committing their 'self-concept' to a broad peer review.

The dominant logic of ICI's assumptions, consisting of simplified terms such as, conservatism, short-termism, political expediency and non-risk-taking as well as behavioural 'traits' such as a sense of ordered power and hierarchy (section 8.4), constituted culturally held beliefs that practitioners related to specific vision expressions. Far from being abstract, these terms appeared to help infer legitimacy

and reinforced the notion of shared practice. Indeed, it was the integration of these shared assumptions, within communities of practice, that helped facilitate the learning of encultured practice amongst practitioners. So, for example, irrespective of the potential attractiveness for satisfying the self-concept of a particular vision, was the assumption that the vision of a manager with a greater level of 'legal' empowerment, say, McMahan over Kenyon, took precedence. An assumption that was eventually to contribute to Kenyon departing the company (section 8.8.4).

Indeed, vision statements may also help to direct the learning of cultural 'norms' by making various communities 'share' at least *some* similar aspects of a proposed commercial reality as a basis for considering coherent future decision-making. In this sense, although different functional departments maintained slightly diverse notions of their future roles within the firm (section 8.8.6) and indeed, the future of the firm itself, there remained a sense of organisational 'synchronicity' and shared responses to commercial or technological 'anomalies' (section 8.3.2, 8.7.2, 9.2).

10.6 What Role Does Vision Play in Setting the Values and Beliefs of the Organisation and How do They Change Over Time?

The description of proposed innovation practice within ICI Paints, suggested that the possible 'choice sets were constrained by the limitations upon practitioners' ability to organise and processes 'anomalous' information; limitations inferred by the legitimate values of the 'legal' groups, from which they obtained their social identity (section 7.5), the more ephemeral communities in which vision expressions were first discussed and operationalised (section 9.3.2), as well as the technological assumptions of the firm (section 9.8, 9.7). The technological assumptions, including knowledge of the technological specifications of innovation, as well as the subjective selection criteria for recognising 'potential' technological threats and opportunity (section 9.2.1). Hence, choices about potential innovation were *bounded* by a comprehension of the practitioners' sense of a commercial and technological reality, as well as their ability to contest and negotiate a shared understanding of the likely personal and organisational consequences if that reality occurred.

Knowledge about the values, beliefs, successes and failures of ICI were described as learnt through a form of cognitive apprenticeship (section 9.6). This process of *enculturation* had an inertia (or time-lag) built in, as its content was largely based on historical and personal experiences that had typically become dissociated from their original meaning. Such 'core values' re-emerged to dominate practitioner's decision-making processes, even after shared agreements suggested that such values may have already proved unsuitable within a given commercial context. Indeed, the often conflicting interplay of older and newer values, alluded to in the vision expressions of senior managers, were often said to hinder organisational and technological change, with ensuing conflict contributing a high personal cost to participants.

The notion of apprenticeship was fundamentally reliant on 'practice'. As such, it was the informal communities that were said to provide the more suitable environment where practitioners', utilising sets of broad and shared discourses, values and assumptions, were better able to exchange thoughts and explanations without substantial peer 'ridicule' or misunderstanding.

10.6.1 Historical Meaning: Action and Creativity

It has not been my aim within this thesis to discuss 'cultural heritage' *per se*, but rather focus on that part of ICI's historical past and current social milieu that is most concerned with the formation and propagation of managerial vision. As such, I suggest that ICI's heritage is best described as 'culturally ordered'. Meanings of events, actions or behaviours were re-valued as they were practically enacted. On the one hand, ICI's practitioners seemingly organised their projects and gave significance to their commercial environment from their existing understanding of their cultural order and their pre-scientific and pre-technological schemata. Thus, in this sense, ICI's business culture was historically reproduced in action. Indeed, as Geertz observed, an event is a unique actualisation of a general phenomenon or a contingent realisation of a cultural pattern (Geertz, 1961). This may well be a good characterisation of historical or cultural heritage *tout court*.

On the other hand, the contingent circumstances of practice, both physical (in terms of the specific technological ‘terrain’ of artefacts) and socio-cognitive (in terms of the subjective interpretations of, say, selection criteria) need not always conform to the actual significance certain communities might assign to them; thus practitioners have some scope to creatively reconsider their conventional schemata. A good example of this was the (re)conceptualisation of the big DIY stores from ‘customers’ to ‘competitors’ (sections 6.11.1, 8.7.2). In this example, the ‘empowered’ visions of McMahan focused upon the future strategy of ‘brand-management’ (section 6.11.2), helped re-conceptualise the ‘meaning’ of what exactly ‘competitor’ and ‘customer’ constituted to practitioners.

Consequently, the pervasive cultural assumptions of ICI Paints were also capable of being historically altered in action. One could even talk of a ‘structural transformation’, since the alteration of meanings ascribed to other environmental anomalies may change the importance of certain commercial or technological issues within specific communities of practice. Indeed, this may even lead to the construction of major new policy initiatives. That is to say, ‘structure’ in this sense, describes the symbolic relationship of a historical and cultural order to the proposed changes in that order.

10.6.2 Historical Influence on Conceptual Change

An issue arising from this research topic is the dual existence and interaction between the structural order as constituted by the practices of a firm and as *imagined* by practitioners. That is to say, the more formally structured characteristics of organisational culture can exist in convention, action and practice, as well as having a pervasive and ‘virtual’ existence that influences activity.

In their everyday projects and social arrangements, ICI’s practitioners submitted their conceptual categories of future events (including the ‘self-concept’) to degrees of empirical risk. To this extent, the meanings of various characteristics of future innovation opportunities held by practitioners, may eventually become pragmatically

realised or altered. Thus, to ICI's practitioners, 'culture' is, as some anthropologists claim, a meaningful order still in action, as the meanings of most notions past, present and future, are constantly at risk (Geertz, 1980).

Concepts are risked, for example, by extending their meaning to include the new visions or routines of others. Certainly, specific vision expressions possessed a disproportionate sense of importance to the specific communities in which they were comprehended (also see Sahlins, 1985). One has only to consider the effects of McMahon's 'challenging' of the Innovations Group's concept of innovation to see the often unintentional effects that he had upon *all* practitioners associated with the innovation process. Consequently, the meanings ascribed to a vision expression may acquire connotations that are far removed from their original and intended meaning. Nevertheless, all pervasive notions have at least found a degree of legitimacy within certain communities.

The social milieu of ICI Paints constituted an amalgam of variations in practice, successfully recalled by those who enacted them. Thus, the cultural heritage of ICI Paints can be understood as a collective 'gamble' played against the commercial environment, in the course of which practitioners wittingly or unwittingly utilise, 'the old names that are still on everyone's lips' (Bloch, 1966).

10.7 Towards a SitCog Account of Technological Change

An epistemology defines (or at least implies) a knowledge system that may encompass the knower, the known, the types of relating mechanisms utilised and the corresponding activities of knowledge accumulation. For example, a positivist epistemology applied to the study of technological change would typically suggest that knowledge deals with the things 'out there' for which people seek positive evidence. In particular, it approaches questions of 'culture' as an objectively observable entity.

Typically, such accounts may suggest procedures for discovering 'the world', that is presumed to be essentially 'fixed', and provide general principles necessary for that world to become comprehensible to practitioners.

Such an objective methodology, in opposition to the research here, typically separates the 'knower' from the 'known', focusing upon the object of 'observation' be it physical products, aspects of managerial practice, social-systems or historical events. However, the account here argues that to do so is to 'ignore the possibility of moving the theorising to a genuinely dynamic framework' (Miles *et. al.*, 1997).

Pluralist accounts, for example, often reject the notion of a single reference point in which the researcher establishes explanations. Indeed, Rescher, within his pluralist account of social analysis, shows that descriptions need not only be based on well understood concepts, but also on the many different and poorly defined ways that individuals reason (1993:99). Distinguishing between a pluralism of belief and a pluralism of research method, Rescher suggests that such notions are inevitable in a world of 'bounded rationality', since no individual can possess absolute knowledge of a subject (1993:64).

As the account here claims, experience and practice are the principal source of learning the 'legitimate' meanings of events and phenomena. Consequently, conflict and 'confusion' appeared to be the natural state of mind for ICI's practitioners, as very few meanings were forever 'fixed; most remaining ephemeral and nearly always open to re-interpretation. As such, a suitable enquiry may be one that focuses on those systems that help practitioners accept 'dissensus'. Indeed, the work of Penrose (1959) centred upon the internal processes of the managerial 'images' which propel the firm's growth, and the research of Simon (1958), suggesting the boundary conditions that restrain such images, have intimated for some time the importance of the analysis of the 'dissensus of thought'.

The epistemology here has aimed at facilitating an understanding of the organisation

as a dynamic but essentially 'human' artefact, shaped as a social and cognitive system for managing the interactions of different types of uncertain knowledge. This does not suggest however, that descriptions of innovation are 'voluntaristic'. Indeed, as I have suggested, certain technologies may 'condition' what may be fully achieved, irrespective of their identification by the firm (section 9.2.1). Rather, this thesis has largely concerned itself with understanding the method of identification and choice of action and the ensuing affection of the vision expressions, 'after' identification has occurred.

For practitioners to attempt to manage the processes associated with vision and innovation involves, in part, resolving specific sets of inadequately explained or personally interpreted concepts and attempting to realign their 'imagination' with the concerns of senior managers. The next section broadens this discussion by focusing upon a sociological discussion of agency and structure.

10.7.1 Structure and Agency of Sociological Accounts

According to Giddens, sociological disciplines possess at least two major divisions for future epistemological research (1981; 167). Functionalist approaches deal with structure, and phenomenology and symbolic interactionism deals with agency. Functionalism considers structure as an external issue, applied 'behind' the individuals involved and often ignoring processes of interaction in the social reality of practitioners. Hence, 'structure is seen to progress *disembodied* from the practitioners involved in its transformation' (Turner, 1986; 459).

Phenomenology largely ignores structural constraints on social processes, instead focusing on 'face to face' or symbolic interaction. Thus, it suggests that the 'role playing' of practitioners largely explain how any outcome results from dynamic social interactions. Here, structure is considered mostly redundant to explanation, as the analytical focus is placed upon the 'here and now', or short-term encounters, and personally-held notions of reality.

Structure is only deliberated through a perception of the structural constraints placed upon individuals. That certain actions are considered more successful than others is largely ignored. Structure may sometimes appear in a description of individual roles, but again, they often negate the achievement and transformative power of individuals (Turner, 1986; 460).

Attempts to fill the theoretical gap between functionalist accounts and the constraining action of 'structure' may involve posing essential questions such as, 'how does action lead to structure' and 'how do these structures enable and constrain action'? Such questions have been central to this thesis, not because the aim has been to directly propose solutions to these enquiries, but rather because of their conceptual importance to the investigation of the role of managerial vision within the dynamics of organisational innovation. Certainly, the research here can also be seen to contribute to the broader concept of sociological theories of technological change.

The discussion of vision provides a description that includes issues of 'agency' and 'structure', at the level of the organisation and sub-community, as well as at the level of the individual. The 'vision to action' cycle (section 7.9), and the notion of the cognitive apprenticeship of practitioners (section 9.6), suggests how structure may emerge, shaping action in which the specific content of vision expressions and the constant re-interpretation of meanings, matter as much as traditional sociological categories of explanation. The vision expressions of senior managers bring practitioners together, 'forcing' action and structure to emerge and shape further 'directed' or intended activity. Hence, within this account, structure is also considered in terms of its *prospective* and as yet *un-realised* nature, providing motivation to act within a bounded set of proposed choices. The next section provides a summary of one of the emerging issues of this thesis requiring further investigation; that of communities of practice.

10.8 Analysis of Communities of Practice

The case study suggests that individuals within communities often possess substantially different conceptions of a given phenomena or event. Managerial vision expressions rarely transferred a conception of a likely future scenario unimpeded or unaltered. The ascribed meanings of an expression were an eventual output of a complex interaction of existing cultural and technological assumptions, individual heuristics and entrenched (and often, previously successful) practice, all subject to legitimisation within the functional groups and communities of practice in which practitioners operated.

Indeed, that communities of practice were said to initially form around 'similar' notions of the content of vision expression (section 7.7) suggests two major issues for the practice of innovation. First, that communities of practice were bounded by similar notions of reality reduced the risk of there being fundamental differences in say, the self-concept or technological assumptions. In this way practitioners felt 'conceptually liberated' to develop notions further (section 7.7; Level One) without the loss of credibility or kudos. Consequently, communities of practice may be seen not just as a convenient place for accumulating the individual knowledge of members, but they may also give rise to synergistic insights and solutions that may not emerge without them (Schoenfeld, 1999).

Second, this may suggest a starting point for developing appropriate methodologies to identify and 'map' the creation and development of certain communities of practice, their levels of empowerment within the firm, their size, how they relate to one another and to the firm's broader goals and aims.

With their gradual and *ad-hoc* move from traditional functional-based departments to a more project-based 'pool' of human resource, the implementation of ICI's innovation projects required that practitioners have at least a basic understanding of the many different roles practised by individuals necessary to complete various

strategic tasks. For an individual to be able to envision all the functional responsibilities that a task may entail is a monumental cognitive endeavour. However, the notion of 'community' appeared to allow the various nuances of the roles to be displayed within collectives, allowing for a degree of 'non-risk-taking' and reflective narrative and discussion about the suitability of certain ideas and beliefs.

Thus, the cognitive apprenticeship description of learning undertaken by practitioners could also be described as a social phenomenon in that practitioners organised their learning processes around the social communities to which they belonged. Practitioners' knowledge of the commercial world was integrated into the daily workings of their communities of practice and project groups that shared the same (or at least a substantial proportion) values, beliefs and languages. In this way, I have argued that a notion of reality is inseparable from community-based practice; it is not possible to fully *know* the cognitive and social 'characteristics' of innovation practice within ICI Paints without *doing it*. By 'doing', practitioners inevitably 'learn'. In such a way, practitioners' schemata are thus integrated into the 'doings' of the social relations and expertise of their communities.

10.8.1 Vision and Community

Vision expressions often constituted the 'boundary' points at which environmental *anomalies* were incorporated into the considerations of communities of practices. Thus, in addition to acting as possible 'choice sets', vision expressions of senior managers also helped constrain other conceptual avenues, providing an influence or 'performative' justification to re-evaluate existing schemata.

To argue that much of the specific declarative knowledge within vision expressions does not always successfully transfer between tasks, is to ignore the fact that the successful transfer of skill and practice between tasks often depends on practice in several domains, and the degree of shared social and cognitive elements between the

declarative elements. Similarly, different communities of practice were said to also share the same basic core-assumptions of the firm (section 8.2). For example, issues of governance, hierarchy and power provided a uniting element throughout projects, groups, functional departments and indeed, the firm at large.

Whereas the discussion in this thesis has attempted to understand processes and structures at the level of individual and community, a situated perspective may also be taken to focus on interactive systems of communities and the resulting 'trajectories' of individual participation. Knowledge is not just 'in the head' of practitioners, but also consists of the ways practitioners interact with other people, other situations and other groups. A situated perspective cannot claim that group learning will always be productive regardless of how it is organised, or that individual practice does not contribute to a group possessing more successful participants in the social milieu of the firm. Sub-ordinates may need practical opportunities to actively participate in other groups, formulating and evaluating problems, questions, conjectures, conclusions and arguments, with suitable allowances made for salient feedback from a range of super-ordinates.

Successful transformation of 'vision to innovation' may also require improved participation of the subordinates that are supposed to be motivated by them. Whether a successful transfer occurs may also depend on how the situation is transformed by the expression of vision and how the sub-ordinate is 'attuned' to the constraints and affordances that such expressions insinuate. If practitioners learn the 'legitimate' rules for translating 'vision into action' (section 7.9), without learning how such expressions reflect upon other complex and encultured relationships, what they understand may be sufficiently abstract, but not necessarily applicable to successful innovation practice.

10.9 Future Research

An assertion made here is that many authors (and practitioners) often exaggerate the

extent to which innovation is an individualistic and 'rational' process. However, the suggested importance of cognitive apprenticeship learning, situationally-based 'rules of thumb' and the communally-based justifications of legitimate action, suggests otherwise. Certainly, ICI's practitioners all possessed expectations of future commercial and technological reality which helped to 'guide' their actions, yet the case study and subsequent discussion also supports, for example, De Mey, Weick and MacKenzie, who claim that rationality and personal judgement are not necessarily simply applied in an *ad-hoc* fashion, but form part of the collectively ordered flow of culturally-based experience and practice.

This thesis also suggests that simply asking whether managerial vision drives or reflects a 'hoped for' future outcome is inappropriate, because such an assertion may seek deterministic causes and effects between the possession of shared assumptions and day-to-day innovation practice.

That ICI's practitioners sought to attribute a certain degree of unchallenged or 'take-for-granted' objectivity to their technological representations belied the fact that, often, such conceptions seemed both innately tacit and poorly understood, remaining open to a great deal of subjective interpretation. Such a view of technological practice supports, for example, the analyses of Barnes, Bloor and Pinch and Bijker, who demonstrate that knowledge claims in both science and technology are often largely subjective and that 'facts' and 'values' are inseparable. However, the attribution of situationally motivated stimuli is an unavoidable consequence of the analysis of interpersonal and physical notions of technological development. This illustrates a need for practitioners (and researchers) to be highly critical when assessing the relationship between issues such as competitive performance and strategic intent.

Whipp and Clark (1986) observed the reciprocal shaping of the firm's capabilities and the competitive structure of its sector, demonstrating that many firms share a substantial part of their commercial reality with others of the same sector or industry

(Huff, 1982; Child and Smith, 1990). While organisations within the same sector may share certain elements of expertise (Fincham *et. al.*, 1994), they will also possess unique communities of practice with unique 'thinking styles'. Yet the question remains for the researcher, 'how do these differences and similarities shape the sector', and 'how can researchers make sense of the different ways organisations interpret and express common industry practice'?

10.9.1 Managerial Schemata

Simon's work in particular (1957, 1976, 1980), suggests that managerial schemata represent both simplified models of the relationships between environmental variables relevant to existing strategic problems and the declarative characteristics of an event or phenomenon. This thesis suggests that 'schemata' also applies to proposed or 'virtual' phenomena, in the minds of managers. Indeed, cognitive schemata have been used by researchers in different ways (Johnson-Laird, 1983; Genter and Stevens, 1983). Here, it has referred to the generative mental representations that practitioners form during practice which embodies crucial characteristics of an event or phenomena. Schemata are utilised to make 'predictions' about possible future commercial events. Hence, although the vision expressions of managers often appeared to be created 'on the spot' to deal with the immediate demands of a particular situation, certain elements of them (typically those that have proven useful in the past) have been held as separate mental structures and are retrieved (or at least 'emerge') within active explanations.

Any application or generalisation of existing schemata to new or potential problems involves certain generic cognitive mechanisms (section 7.2, 7.4). Indeed, with the complexity and limitations of practitioners to envision all possible alternatives, some form of problem reduction is an ineliminable part of decision-making. Hence, personal bias is crucial to the practice of innovation and constitutes a mechanism by which vision expressions are either transferred from one domain to another or by which they infer specific meaning in a given context. However, such mechanisms do not suggest a deterministic methodology or clearly specify the processes by which

they affect anomaly comprehension and thus, must remain a topic for future research.

The interpretation of a 'meaning' that a vision has for a practitioner remains a subjective enquiry. For example, the availability heuristic *might* cause decision-makers to use dramatic and vivid events for the basis of their problem-defining analogies, even though these events may bear little resemblance to the problems they are attempting to understand or describe (section 7.4). Similarly, the illusion of control bias *may* lead decision-makers to use certain practices in situations in which they perceive themselves to have a great deal of control over the outcome (section 7.4).

In short, the findings here suggest a need to develop an appropriate set of methodological tools to help practitioners appreciate the extent to which their practices shape and reflect their commercial reality. Once, topics such as financing in-house R&D or 'taking care to listen to customer requirements' were typically vaunted as keys for success within some industries. Although these are still heavily influential, now, many also consider the route to success as moving towards inter-organisational networks and synergistic alliances (Rothwell, 1992). These extensive changes in generic managerial practice highlight a need for forms of analysis that retain some scope for understanding the various types of situated and context specific experiential and apprenticeship learning processes, crucial to innovation.

There remains a need to conceive of analytical approaches that are sensitive to the evolving locus of competition and the elaboration and transformation of managerial 'vision to practice', and to the unique and shared sense of reality. How useful is it to talk of a collective consciousness, socio-cognitive schemes, and community-based styles of thinking? While SitCog research provides certain insight into an analysis, as I have alluded to here, its combination with the study of a sociology of scientific knowledge and social constructivism may prove more fruitful in 'making-sense' of the differentiated meanings within (and external to) communities of practice. I have shown here, how many facets of explanation are largely complementary to one

another, yet a basic question remains, 'is a true synergy possible or even desirable'?

10.9.2 SitCog as Research Methodology

I have described here only a fragment of a future agenda for a fully developed SitCog theory of innovation. Clearly much research, focusing upon the situated aspects of managerial cognition, remains to be done. A more developed notion may also claim that activity and perception are epistemologically *prior* (at a pragmatic level) to practitioners' concepts of future innovation practice. Indeed, future research within situated cognition must, among other things, try to frame a convincing account of the relationship between the 'explicit' knowledge of practitioners, the personal or emotional aspects of self-motivation and identity and the 'implicit' technological assumptions and understandings that have had such an influential role upon the propagation of managerial vision within ICI Paints.

Within this thesis, I have also attempted to move away from cognitive descriptions that identify limited and causal relationships between mental structures and physical or reified objects (typical in 'mind to computer' metaphors), to a recognition of the contextual dependence of explanation, both for current and proposed practice. Practitioners create in their interactions with other individuals and within their communities, their methodological considerations and their 'oriented' actions and plans. Yet these do not deterministically control behaviour. Clancey suggests:-

'How plans are interpreted is itself an interactive, non-predictable process. Every behaviour is an improvisation.' (1997; 27). 'Human behaviour is inherently ad-hoc, inventive, and unique (1997; 28). 'People do not simply plan and do. They continuously adjust and invent. Managing this process means managing learning, not managing application of a plan' (1997; 39).

Clancey's approach has important implications for SitCog theorists (1997):-

'The researcher must go into the community of the practitioner, using ethnographic methods of observation and reflection and develop a focus of how the community learns' (1995; 33-34).

Indeed, a major task facing SitCog researchers is to develop the means of further integrating levels of explanation. Such methodologies, both for research and for practice, are still in early stages of development. I suggest that until better tools are

developed, the aim of researchers of 'learning environments' should be inclusive of many similar theoretical approaches and seek a viable integration of the salient aspects of various perspectives of technological change. Indeed, Greeno also suggests that such a methodological 'mission statement' for SitCog approaches involves an integration framework for future research:-

'We need to organise learning environments and activities that include opportunities for acquiring basic skills, knowledge, and conceptual understanding, not as isolated dimensions of intellectual activity, but as contributions to the development of strong identities as individual learners and as more effective participants in the meaningful social practices of their learning' (Greeno, *et. al.*, 1998; 17).

This suggests a methodological focus that places an understanding on how a 'learning environment' combines elements of decision-making and problem-solving to accomplish certain goals. Such questions as; 'is the learning environment successful in accomplishing the managerial goals', 'how do the various participants and cultural tools interact to form new communities of practice', 'how can these communities be easily identified and their changes mapped' and 'do their interactions facilitate or impede a desired content', would therefore form the basis of further research.

10.9.4 Grounded Methodology

Hannifin *et. al.*, (1997) demonstrates the suitability of SitCog research for a grounded theory approach to methodology design, utilised within this thesis. To them, the systematic implementation of processes and procedures, rooted in established theory and research in human learning, is ideal for the burgeoning research endeavour of SitCog as the 'theoretical and conceptual boundaries, are as yet, to be fixed' (Hannifin *et. al.*, 1997; 102).

Indeed, the purpose of positioning this thesis as an exploratory account accepts this point wholeheartedly. I did not attempt to begin this research from a set of pre-defined hypotheses, but rather, generated topics of interest from the patterned data of the ICI case study, as Easterby-Smith's *et. al.*, (1991) grounded theory checklist suggests (section 5.7). As directed, using 'raw-data' in a reciprocal and cyclical

manner to guide further research from a wide range of complementary sources, grounded research topics were identified and clarified for further investigation and theory development. Consequently, the grounded research approach utilised here, has attempted to accommodate several established theories concerned with practitioner 'learning' and innovation, such as concepts of 'self-motivation' (section 9.3) and cognitive apprenticeship learning (section 9.6); in essence the aim has been explanatory coherence, rather than a general theory of coherence (section 5.7).

10.10 Towards Managerial Practice: The 'Real' Nature of Culture

The account considers organisational culture as a powerful mediator of apprenticeship learning and practice. To a major extent, the cultural assumptions of a firm and their mediation within various sub-communities (functional and conceptual) define what is *possible* and what is *real* to its constituents. Consistent theoretical grounding in the vision expressions of managers was only possible where participants shared at least some common ideologies. Even with a firm's dominant logic (section 7.3), certain sub-communities possessed a tendency to diverge in many of their core beliefs. Indeed, an essential characteristic of a community of practice was that they typically sought innovation and vision expressions from a variety of different sources. The resulting business culture of ICI is therefore a compromise or 'amalgam', reflecting both the plural and changing diversity of participant's beliefs and the communally-held ideologies of the firm, reflected against the 'empowered' vision expressions of senior management.

Rather than being considered a weakness in theoretical consistency, the discussion here suggests that managers should view such compromise and transitory change as an important 'reality check' on the firm's innovation processes. Through a continued dialogue, local solutions may be found to certain problems, synthesising the diverse interests and beliefs that cross many of the ideological boundaries between different sub-communities. Certainly, many managers interviewed believed wholeheartedly that the firm's managerial processes should conform to their own personal designs,

governance and 'visions', as if the firm were merely a mechanical system rather than a contextually rich and dynamic social system that, in many circumstances, can only be influenced indirectly. Thus, the implication is that practitioners should at least be willing (and able) to question the basis of their existing 'taken-for-granted' beliefs and assumptions.

Similarly, managers must also understand the effect of their vision expression upon practitioner's conceptions of 'personal risk' and 'self-image' (section 9.3.1, 9.3.2), and even to the innovation process itself, as well as the dangers of intervening in established and informal practices. Indeed, a great deal of organisation theory appears to ignore the risk of managerial 'invasive' action upon individuals' sense of 'self' and 'identity', and its affect upon the motivation of practitioners to act within certain conceptual trajectories. Indeed, if McMahan had been aware of such concerns would it have been prudent for him to challenge the Innovation Group in the way that he did; should Kenyon have so closely related his notion of 'self-image' to the success of the Innovation Group; and what are the prospects for generating successful streams of innovation within ICI Paints as they move away from the more traditional functional-based project roles of practitioners, towards a less well defined 'resource pool' approach to human resources? Will practitioners still associate their 'self-image' with their technological or commercial functions (section 7.5, 9.3.1) and how will they generate notions of kudos (9.3) and how will the day-to-day influences of empowered visionaries change accordingly (8.5.1)? Such questions serve as the starting point for further research.

10.10.1 Concluding Remarks

When practitioners analyse their competitive environment they are at the same time implementing many innate practical consequences of their tacit mental frameworks of reality. Were practitioners to analyse their capabilities in terms of, say, a technological knowledge base with its associated cognitive and social structure and its distribution of risk, expertise and power, they may well construct an alternative understanding 'vision' and 'innovation'.

In seeking to develop practices that stimulate innovative behaviour, develop artefacts, or instigate organisational change processes, practitioners may be better advised to attempt to understand the consequences of their actions, when the analytical focus is placed upon the broader notions of technology practice, rather than the narrower description of artefactual technology. Such an approach brings to the fore the interrelatedness between the characteristics of technological artefacts, work organisations, shared assumptions, expectations and the ideologies of the firm.

In conclusion, this thesis has shown that in the pursuit of successful innovation, practitioners working together, both within their functional or 'legal' role, and their conceptually bounded and ephemeral communities of practice, invoke variations of a shared reality. This reality remains provisional as it is constantly being made and re-interpreted in practice and is a reality that reflects potential futures, as well as 'right' and 'wrong' ways to co-operate, compete and plan for that future.

Having spent the last few years researching the nature of managerial vision and, in particular, the processes by which it shapes the scope and choice of innovative activity, my understanding of innovation practice has been inexorably transformed. I have become conscious of the personal nature and malleability of innovation practice and the importance of social and cognitive mechanisms in generating notions of a shared reality. Consequently, I have also become acutely aware of the importance of confronting one's entrenched beliefs of 'innovation' and 'vision'.

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