

Managing knowledge in organisations: a critical analysis of extant approaches and conceptual aids

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Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Abstract

Given the increased interest in the management of knowledge in corporations, there is a need for an analysis of the current level of sophistication of the most salient approaches and conceptual aids to knowledge management (KM). This study investigates the currently popular approaches to conceptualise knowledge and its management, in order to ultimately contribute towards a better understanding of the concept of KM. The study was conducted by way of investigation of the concept of knowledge as an organisational resource and the provision of critical analyses of current approaches and conceptual aids to KM. Theoretical investigations involving a comprehensive study of international research, both popular and academic, on relevant aspects of KM were undertaken in view of the purpose of this study. The most important conclusion that can be forwarded was that extant KM approaches and conceptual aids are not sufficiently sensitive to the resource they seek to manage, viz. knowledge.

An investigation of the concept of knowledge, as the resource to be managed through KM, was first undertaken. The investigation revealed that particularly important for the conceptualisation of knowledge in a business context, are the complex properties of this resource that impact its manageability. It was demonstrated that recent thinking on these properties has undergone a consolidation, through which two key aspects are crystallising, viz. firstly that knowledge can be tacit or explicit; and that it can, secondly, reside at the level of the individual employee, the group, organisational, or interorganisational level in the corporation. A significant conclusion was that the extant two-dimensional conceptualisation of knowledge does not encapsulate all aspects of knowledge that are impacting its manageability.

A critical analysis of the concept of KM was subsequently made. For this purpose, three conceptual models of KM that are currently popular among scholars, and that exemplify the potential of extant conceptual aids for managing knowledge in organisations, have been chosen eclectically: i) Spender (1996), ii) Hedlund (1995), and iii) Nonaka and Takeuchi (1995). Strengths and deficiencies of these models were discussed in order to enhance an understanding of the potential of the KM concept as it is currently portrayed in the literature. It was established that the three models analysed all use the above-mentioned inadequate two-dimensional conceptualisation of knowledge as a platform and conceptual frame of reference. This commonality was shown to compromise the potential of extant approaches and models for managing knowledge in organisations, and recommendations were made to overcome these deficiencies in future research in the KM field.

Auszug

Angesichts des zunehmenden Interesses an organisationalem Wissensmanagement ist es an der Zeit, aktuelle Konzeptionalisierungen von Wissen und seinem Management zu hinterfragen. Die vorliegende Arbeit untersucht das Konzept organisationalen Wissens, und analysiert kritisch aktuelle Managementmodelle fuer dieses Wissen. Die Basis dieser Untersuchung ist eine umfassende Analyse internationaler Literatur. Als wichtigste Schlussfolgerung dieser Analyse bleibt festzuhalten, dass die untersuchten Wissensmanagement Modelle nicht ausreichend sensibel fuer die Resource Wissen sind.

Die Untersuchung umfasst zwei Kernkomplexe. Im ersten wurde die aktuelle Konzeptionalisierung der Resource Wissen kritisch beleuchtet. Besonderes Augenmerk wurde auf die komplexen Eigenschaften organisationalen Wissens gerichtet, welche dessen Management zu beeinflussen scheinen. Die Literaturanalyse konnte zeigen, dass sich im Bereich dieser Eigenschaften eine Konsolidierung abzeichnet, durch welche zwei Kerneigenschaften kristallisieren, naemlich, erstens die Unterscheidung in stilles und explizites Wissen, und, zweitens die Frage ob solches Wissen auf der Ebene des einzelnen Mitarbeiters, der Gruppe, der ganzen Unternehmung, oder aber in Unternehmenskollaboration zu finden ist. Es konnte demonstriert werden, dass diese zweidimensionale Konzeptionalisierungen nicht alle relevanten Eigenschaften organisationalen Wissens umfasst, und daher dessen Komplexitaet nicht vollauf gerecht wird.

Im zweiten Schritt der Untersuchung wurden drei aktuelle Modelle des Wissensmanagments kritisch analysiert. Zu diesem Zweck wurden drei Modelle eklektisch ausgewaehlt, naemlich i) Spender (1996), ii) Hedlund (1995), and iii) Nonaka and Takeuchi (1995). Die individuellen Annahmen, Staerken und Schwaechen der einzelnen Modelle wurden untersucht, wodurch gezeigt werden konnte, dass die drei Modelle auf der inadeguat Konzeptionalisierung von Wissen aufbauen, welche im ersten Teil der Untersuchung vorgestellt wurde. Es wurde argumentiert dass diese Gemeinsamkeit das Potential der untersuchten Modelle limitieren koennte, und Vorschlaege zur Verbesserung der Konzeptionalisierung von Wissen und seinem Management wurden gemacht.

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Dedication

Für meine Eltern und die Nana,
ohne die ich wahrscheinlich gar nicht hier wäre.

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Part I: Knowledge management in perspective

CHAPTER 1: Introduction

1.1 Background to the study

The background to the study is formed by a change in corporate environments in the last twenty years. A variety of authors in many academic disciplines elaborate on the enormous transformations taking place in the corporate, but also in the wider social realm during the latter part of this century. One manifestation seems to be particularly important, viz. an economic and social order in which knowledge, not labour, raw material, or capital, is the most important resource for individuals, businesses, governments, and society at large (see, e.g. Drucker, 1969, 1994; Toffler, 1970, 1990; Reich, 1991; Quinn, 1980; Stehr, 1994). As Drucker (1993: 40-41) emphasises, "knowledge has become *the* resource, rather than a resource."

In view of its impact, it does not seem surprising that many authors in the business management realm are now addressing the relative importance of knowledge in corporate contexts. Contributing to this impetus seem to be recent developments that most businesses are currently facing, viz. faster changes in technology (Tidd, Bessant and Pavitt, 1997; Coombs, 1996; Buys, 1999), higher levels of competitiveness in corporate environments (Porter, 1998), vanishing industry boundaries (Evans and Wurster, 1997), and increasingly complex environments (Cilliers, 1998; Lissack and Roos, 1999) forcing them to rethink established approaches to conceptualise strategy, competition, and performance. In this world of "creative destruction" (Schumpeter, 1942), sustainable company performance will increasingly be based on corporate knowledge assets. Their systematic management will appear as a top priority on managerial agendas in the new millennium, as a range of prominent observers predicts (Nonaka and Takeuchi, 1995; Grant, 1997; Davenport and Prusak, 1998; Stewart, 1998; von Krogh and Roos, 1995, 1997, Zuboff, 1988).

The emphasis above has engendered a dramatic increase in management interest in knowledge and its management, as reflected in the recent proliferation of articles, books and conferences, especially since 1995. In parallel streams of research, practitioners and scholars alike pursue inquiries in the learning organisation (Senge, 1990), intellectual capital (Stewart, 1998; Sveiby, 1997; Edvinsson and Malone, 1997; Sullivan, 1998), "toolboxes" for managing and measuring intangible assets (Bontis, Dragonetti, Jacobsen, and Roos, 1999), organisational learning (Levitt and March, 1988; Huber, 1991; Brown and Duguid, 1998),

organisational knowledge creation (Nonaka, 1998; Nonaka and Konno, 1998), the knowledge worker (Drucker, 1999a, 1999b), and knowledge management (Alee, 1997; Spender, 1996; Badaracco, 1991).

Considering the emerging nature of the topic, these studies already seem to paint a fairly comprehensive picture of different aspects of knowledge management (KM). However, extant literature on KM has to a large extent one major commonality: arguments and lines of reasoning are strongly influenced by a very similar conceptualisation of the resource to be managed (see, e.g. Winter, 1987; Nelson and Winter, 1982; Teece, 1998; Chesbrough and Teece, 1996). This conceptual similarity has seemingly enticed scholars to construct KM approaches that are again structurally homogenous (see, e.g. Spender, 1996a, 1996b; Hedlund, 1994; Nonaka and Konno, 1998; Nonaka and Takeuchi, 1995). Especially at the present stage of research development in this emerging field, the merits of such consolidation should critically be examined, in order to provide an appropriate understanding of the concept of KM.

1.2 Statement of the problem

The potential impact of knowledge on corporate competitiveness seems to be of such magnitude that some observers refer to it as the "knowledge revolution" (Badaracco, 1991: 7). The above mentioned increasing importance of knowledge would call for uniquely adequate approaches with concomitant tools and mechanisms to enable the systematic management of knowledge in organisations, in order for companies to stay competitive in future. Without the systematic management of knowledge, a significant void could result in the management of corporate resources. Systematic management of corporate knowledge resources, however, seems impaired by a lack of understanding of the concept of KM and the corollary approaches and models. This drawback appears to be evident from the conception of KM approaches and models in the literature, which appears to be built on a pragmatic and structurally analogous understanding of knowledge and its management (Spender, 1996a, 1996b; Hedlund, 1994; Nonaka and Takeuchi, 1995). The pragmatic view may be premature at the present, evolving stage of research development in the KM realm. It tends to provide a simplistic outlook on the concept of KM, thereby detrimentally affecting an appropriate, more encompassing, understanding of the concept.

Taking into account the magnitude of the impact of knowledge as an organisational resource and factor input, this perceived inadequacy is likely to compromise corporate competitive performance in future. These facts and trends provide the inspiration to undertake a study to

enhance insights into the current level of sophistication of KM approaches and conceptual aids. Through such clarification the potential of KM, as it is currently perceived, and the limitations possibly associated with the extant perception in the literature may emerge, thus making the practical implications for management clearer. The important issue is that businesses will have to employ increasingly clear and holistic thinking to orchestrate the management of knowledge as an organisational resource.

The implications from the above indicate the following:

- (a) A sensitivity to the complex properties of knowledge would be fundamental for an appropriate understanding of the concept of KM as such. The usefulness of KM models and conceptual aids could be conditional on their level of sophistication in catering for the properties of the resource to be tended to, viz. knowledge. An important premise in this context is that knowledge reveals distinctive properties that make it different from other organisational resources and hence impact its manageability. Current thinking on these properties and their implications for KM, appears to have undergone a consolidation through which two key characteristics of knowledge have crystallised, viz. firstly, the question whether knowledge is tacit or explicit; and secondly, the question whether knowledge resides on the level of the individual and/or the organisation (e.g. Winter, 1987; Nelson and Winter, 1982; Teece, 1998; Chesbrough and Teece, 1996). The consolidated, and, so far, undisputed view on knowledge would need to be critically analysed and its limitations need to be realised in order to build and sustain an adequate understanding of the concept of KM.

- (b) As KM is growing rapidly and is gaining great impetus in the business environment, it seems incumbent upon managers to familiarise themselves with current KM approaches and conceptual aids in the literature. For this familiarisation, a thorough understanding of prominent KM models, of their premises and assumptions, and of their relative strengths and weaknesses would be useful. A general and as yet unchallenged consensus in approach and conceptualisation of KM, predicated on a structurally similar notion of knowledge as the resource to be tended to, seems to be establishing itself in the literature (e.g. Spender, 1996a, 1996b; Hedlund, 1994; Nonaka and Konno, 1998; Nonaka and Takeuchi, 1995). This would suggest that the current level of refinement of KM models could be predicated on the appropriateness of the conceptualisation of knowledge as the resource to be managed. In addition to this, it could further depend on the inherent usefulness of the individual models.

Integral to a comprehensive understanding of the concept of KM would therefore be, firstly, a critical examination of the conceptual frame in which current KM approaches are developed; and secondly, a scrutiny of the respective logicity and sophistication in catering for knowledge of the models themselves.

1.3 Objective of the study

The overall objective is to contribute to an enhanced understanding of the concept of KM, especially with regard to the current level of sophistication of extant approaches and conceptual aids to KM.

1.4 Scope of the study

KM can be seen as a multidisciplinary area of study with innumerable partitions, or as one observer (Allee, 1997: xiii) put it, inquiry into KM is "messy" in a terminological sense. Therefore, a fundamental task would be to forward a working definition of KM. The following definition has been made specifically for the purpose of this study, after extensive scrutiny of the literature:

This study endeavours an inquiry into the concept of KM as it can be utilised to impart relevant knowledge timely to appropriate circles of organisational influence, either within or beyond corporate boundaries.

The above definition excludes deeper investigations into KM in the sense of commercialising knowledge to create value for the company. It is self-evident that knowledge itself does not ensure profits. Knowledge would need to be deployed and formed into marketable assets (e.g. products, services, patents, licenses) to bestow profits and to ultimately confer competitive advantage. It must clearly be appreciated that KM is not an end in itself. The analysis will not, however, be concerned with examining issues pertaining to commercialisation per se (Sullivan, 1998 provides an in-depth analysis of such commercialisation). The focus of this study is deemed appropriate because KM should be seen as a concept that functions as an enabler and facilitator to commercialisation.

While it is acknowledged that KM is a research realm that involves several disciplines; for the purpose of this study, the inquiry is conducted by adopting a business management perspective. Only where appropriate, is research from other disciplines considered and investigated in terms of the insights offered into the concept of KM. In particular, it should be appreciated that while information technology may constitute an important tool to facilitate

KM, this study is not concerned with investigating its benefits any further than its contextual relevance to business management. It should also be emphasised that the business perspective adopted in the present study implies that this analysis attempts to provide insights into KM as it appertains to the business sector. While this focus does not deny a general applicability of the KM concept to non-profit organisations, or those in the public sector, it is considered that KM assumes greatest pertinence to the business sector (Drucker, 1994; Davenport and Prusak, 1998).

It should also be appreciated that this study is not concerned with delimiting the conceptual boundaries of KM and related constructs, such as intellectual capital management, or the management of technology. For a brief analysis of the former, see, e.g. Wiig (1997), for the latter, see, e.g. Burgelman, Maidique, and Wheelwright (1996).

Finally, due to the relative novelty of the topic, there is a general dearth of domestic (i.e. South African) research, with the majority of the literature being of international origin. Further, a North-American/European/Japanese bias is evident in the sources consulted, with implications for the possible ramifications for e.g. African countries. Within the delimited scope of literature analysis, three approaches and conceptual aids to KM (viz. Spender, 1996; Hedlund, 1995; Nonaka and Takeuchi, 1995) have been chosen eclectically. It is the considered impression of the author that these models seem to exemplify the potential of the extant approach and conceptualisation of KM in the literature. Moreover, the models that are chosen, predicted upon the author's understanding, present the most eminent among actual models in KM research. Particularly Nonaka's approach seems very well established in the literature. While other "models" can be found in the literature (see, e.g. Whitaker, 1998; von Krogh, 1998; Davenport, Eccles and Prusak, 1998), these generally do not seem to be very influential.

1.5 Method of the study

An enhanced understanding of KM entails synthesising existing streams of research, which can only begin when common ground appears. Synthesis implies reconfiguring and realigning analyses in ways that render them compatible. For this purpose, literature from both academic and popular sources in the strategic management research and organisational studies' realm is assimilated and evaluated. The scope of this literature analysis has been rather extensive and a fairly comprehensive study of international research, both popular and academic, on all possible aspects pertaining to KM has been attempted. This investigation comprises books, articles, research works, both published and

unpublished, Internet sources, and other relevant documents. The basis of this conceptual study, deductive in nature, is thus an interpretative literature review. Where appropriate and feasible, opinions and advice from international experts in the field were sought, either through personal communication or usage of electronic mail.

The literature study was undertaken to obtain an insight into the current state of research and thinking on the emerging topic of KM, using a qualitative research methodology, which is inspired by the "dialectical research cycle" as adapted from Rowan (1981). This approach has been chosen, because the research problem and aim require a methodology that is well suited for synthesising qualitative data. The dialectical research cycle seems to be a powerful framework for such synthesising, because it accommodates incoherent and fragmented perspectives by simultaneously reducing the data to an understandable simplicity while adding more connections to the data to make them more understandable. The cycle therefore seems well suited for the evolving state of theory development in the area of KM.

The dialectical research cycle is comprised of several sub-cycles, each of which on its own account, and in combination, would contribute to meet the objective of the study. McNiff, Lomax, and Whitehead have emphasised that under these circumstances it would be beneficial to provide the reader with "summative evaluation statements at strategic times during the research" (1996: 107), in order to demonstrate how individual subsections contribute to the achievement of the objective. In this spirit, extensive use will be made of such summative evaluation statements throughout the present study.

A major limitation to the methodological validity should be realised. It arises from the fact that while only one researcher conducted this study, the dialectical research cycle is specifically designed for utilisation by at least two co-researchers.

1.6 Structure of the presentation

For expository purposes, the study is presented in three parts comprising a total of six chapters.

1.6.1 Part I: Knowledge management in perspective

This part comprises the first three chapters and provides a general introduction to the study and puts the ensuing analysis in perspective. For this purpose, the nature and concept of knowledge in an organisational context is explicated by reference to the complex properties of knowledge in an organisational context and the implications for KM. Sensitivity for the

properties of the resource to be managed through KM would be a fundamental building block of an improved understanding of KM itself.

Chapter 1 serves as an introduction to the study and also gives the necessary background. The problems, which motivated the study, are indicated. The scope within which the objective of the study is pursued is delineated, and the method of investigation is outlined. Ultimately, the structure of the study is provided to guide the reader through the following discussion.

Chapter 2 investigates a number of relevant properties of knowledge that seem to have critical implications for its management. It attempts to review, analyse and synthesise the thought on these properties as evident from the literature, in order to provide relevant implications for KM. Attention is drawn to a consolidation of thought on these properties by the research community. The limitations associated with this consolidation are systematically identified and discussed. The suitability of the consolidation as a platform for the construction of KM approaches and models is scrutinised.

Chapter 3 examines two key properties of knowledge that emerged through the consolidation of research as evident from chapter 2. The major characteristics of these properties and their implications for KM are discussed through analysis of available literature. The development of a thorough understanding of these pivotal properties and their implications for KM cannot be overemphasised in view of the influence they exert in current discourse on the management of knowledge.

In summary, part I is concerned with expounding extant theories concerning the central features of knowledge, indicating the important implications for KM, and evaluating the appropriateness of these theories in view of their potential contribution to the complex task of managing knowledge in organisations. Part I is ultimately designed to sensitise the reader to the nature and concept of knowledge in organisations and the concomitant implications for KM. The analyses in part I on the concept of knowledge in organisations serve as a benchmark for the evaluation of the current level of sophistication of extant KM models, which is conducted in part II.

1.6.2 Part II: The concept of knowledge management

The increasing impact of knowledge as an organisational resource and factor input seems to emphasise the rising importance of appropriate KM approaches and conceptual aids to cover

this reality. Part II, which comprises chapters 4 and 5, builds on the insights developed in part I. It reviews and critically analyses three extant KM models in terms of their sophistication in dealing with the complex properties and implications of knowledge in organisations as evident from part I.

Chapter 4 enhances an understanding of the concept of KM, as it is portrayed in the contemporary literature, through a comparative analysis of three established approaches to, and models of, KM. Analytically, this investigation compares the approach utilised as well as the operationalisation of this approach for the individual models. Particular emphasis is put on the discrimination of relative contributions of each model. The analysis in chapter 4 serves as a background to the more comprehensive analysis in chapter 5.

In chapter 5, the level of sophistication in dealing with the properties of knowledge will be more specifically highlighted. The discussion in this chapter is analytically structured, investigating firstly, the appropriateness of the paradigm within which current KM approaches seem to be conceived (in terms of the conceptualisation used, as well as with reference to the illustrative format adopted); and, secondly, the level of refinement of the individual models themselves. Structuring the analysis in this manner yields insights into the potential of current KM models beyond the boundaries of a comparative analysis as presented in chapter 4.

To summarise, part II is devoted to a critical analysis of extant approaches to, and models of, KM, with the ultimate aim of developing a better understanding of the concept of managing knowledge in organisations. The inherent limitations in accommodating the properties of knowledge (as evident from part I) of the models reviewed is given particular attention. It is hoped that part I and part II together contribute to an improved understanding of the concept of KM.

1.6.3 Part III: Summary, concluding observations, and recommendations

This part consists of chapter 6, in which the summary, conclusions and recommendations of the study are made. Attention is given to the implications for research and the development of a prioritised research agenda, providing suggestions for the advancement of theory, as well as for possible further investigation of business applications. This exercise seems appropriate in view of the current state of thought on, and practice of, KM. The recommendations for the advancement of research ultimately serve the purpose of putting

this study in perspective, thereby further expanding the understanding of KM beyond the scope of the present study.

1.7 Summary

In this chapter, the background to the study was presented. Following from this, the problem statement, which had motivated the objectives, was formulated. Based on the problem statement, the objectives of the study were identified and the scope within which the study was conducted, was delimited. Thereafter, the method, which was adopted for this study was briefly sketched and its selection justified. Ultimately, to guide the reader through the ensuing discussion, the structure of the presentation was outlined.

CHAPTER 2: A review of the literature on the properties of knowledge

2.1 Introduction

The foundation for a new management theory is often a set of initial premises, which form the basis for the logical development of propositions concerning the structure, approach, and processes that constitute the theory. To this extent, fundamental to an investigation of KM would be a discussion of the premises surrounding the conceptualisation of knowledge as the resource to be managed through KM. Hence, developing a sensitivity for, and enhancing an understanding of, the concept of knowledge appears to be a necessary inclusion in a study on KM, because “the way you conceive of knowledge influences the way you manage it” (von Krogh and Roos, 1996: 334).

Inquiring into the concept of KM would raise epistemological issues, and eventually leads to the question, what knowledge really consists of. This question seems very challenging to answer. Since inquiry into the nature of knowledge “has intrigued some of the world’s greatest thinkers, from Plato to Popper, this is not an area where [one should] choose to compete” argues Grant (1996: 110). The point here is therefore not to resolve epistemological debates, but to observe that knowledge as such is a highly contentious concept, far too problematic to be resolved within the confines of a limited study such as the present one.

Fortunately, the above mentioned difficulties are not insurmountable, if the scope of analysis is limited to the properties of knowledge that are pertinent to KM in a business context. For the purpose of this study, a fundamental task would be to establish and discuss the most salient properties of knowledge as evident from the literature that have critical implications for KM. The present chapter is therefore concerned with establishing a sensitivity for the complex nature and concept of knowledge in organisations by reviewing extant theories that attempt to delineate pivotal features of this resource. For this purpose, the analysis is divided in three main parts: firstly, a review of the findings of a literature survey on properties of knowledge is presented; secondly, an investigation into a currently emerging consolidation of thinking on these properties and its implications for KM is made; finally, the main aspects of the analysis and the concomitant implications for KM are summarised. The theoretical analysis of the complex properties of knowledge in the present chapter serves as a benchmark for the evaluation of the current level of sophistication of extant KM models, which is conducted in chapter 6.

2.2 A review of the literature on the properties of knowledge

After it was found that knowledge has been the root cause for a number of familiar failures and successes in management practice, it was discovered that the management of this important resource assumes wide applicability to various industries. The next logical step for scholars then appears to have been to learn more about the structure and concept of this resource. The current thought on the topic of knowledge in organisations is characterised by two distinct streams. The first stream distinguishes between knowledge as a factor input and more conventional factors of production, such as land, labour, and capital. As was pointed out at various occasions in this study, authors in this stream observe a shift in factor composition towards knowledge, with far-reaching economic and societal consequences (e.g. Toffler, 1970, 1990; Reich, 1991; Quinn, 1980; Drucker, 1993). Knowledge, it is echoed, has become the paramount factor of production and thus deserves adequate managerial attention.

Predicated on the assumption that knowledge differs from other resources in dimensions such as ownership, storage, and development, situations where knowledge is the predominant resource call for uniquely adequate approaches to cover this reality. Possibly in recognition of this requirement, in the second stream of research, the discourse is less concerned with differentiating knowledge from other resources, than with an exploration of the different types of knowledge itself. The ultimate goal of this stream is to discern salient properties of this resource that have critical managerial implications (Nelson and Winter, 1982; Winter, 1987; Nonaka and Takeuchi, 1995; Grant, 1996; Spender, 1996a). These properties, it is often argued, tend to make knowledge less amenable to management when compared to some of its more conventional counterparts and deserve adequate attention. For the purpose of the present study, this second stream of thought shall be investigated in some depth and the remaining pages of this chapter are devoted to its exploration.

2.2.1 Early attempts – Nelson and Winter

It is interesting to note that despite the wide recognition of the importance of knowledge in managerial theory, few attempts are made to construct the concept itself. Early attempts at shedding light on the unique properties of knowledge in business and the taxonomic dimensions along which different types of knowledge may be classified were made by Nelson and Winter (1982) in their evolutionary theory of the firm. These authors revisited the differentiation of knowledge in tacit and explicit forms as stipulated by the philosopher Polanyi in 1958 and introduced this conception to the management economics literature. Very briefly, Polanyi's epistemology rests on the claim that individuals tend to be in the

possession of tacit knowledge, pertaining for example to the skills of making a violin. Such knowledge typically is either impossible or difficult to articulate, i.e. it is often difficult to make explicit (chapter 4 provides an analysis of Polanyi's original work and its managerial implications).

As Spender has discovered, the treatment of Nelson and Winter (1982) parallels later analyses of Fuller (1988) and Plotkin (1994) who, as sociologist and psychobiologist respectively were not aware of Nelson and Winter's earlier work (Spender, 1996a). All echo that social organisations, firms, species and societies evolve by adapting the body of knowledge that is shared by their members and that much of the process takes place at a tacit level (Spender, 1996a). At this tacit level, shared knowledge, similarly to individual tacit knowledge may often be difficult to articulate.

Winter in a later analysis resumes his earlier contention (Nelson and Winter, 1982) and again perceives tacitness and explicitness as paramount properties of knowledge in organisations. The author goes, however, a step further and deduces two additional properties from the original tacit/explicit distinction (which is now referred to as "tacit/articulable"). The two subdimensions that result are "teachable/not teachable," and "articulated/not articulated." With regard to the former, it is argued that tacit skills may be teachable though not articulable. In this case, for example, teaching requires the direct contact of teacher and pupil in order for knowledge to flow (Winter 1987: 171). This observation is fundamental, because it suggests that tacit knowledge may only be transferable directly, i.e. through personal contact between interacting parties.

The second subdimension as identified by Winter, is the distinction between articulable knowledge (i.e. his terminology for explicit) that is articulated and articulable knowledge that is not.

"The latter situation may be illustrated by the case of a complex computerprogramme that has gone through a number of major revisions since its documentation was last brought up to date. Simple answers to questions about the programme's functioning could be articulated in principle but may not be articulable in fact if the information is no longer in someone's memory" (Winter, 1987: 172).

To summarise this far, early attempts at shedding light on the concept of knowledge in organisations have revisited the explicit/tacit distinction as originally conceived of by the philosopher Michael Polanyi and have introduced this distinction to the management

literature. It has been discovered that a fundamental implication of the tacit/explicit phenomena is the transferability of the knowledge in question. Possibly in order to capture this aspect better, two subdimensions have been deduced from superordinate explicit/tacit distinction, viz. teachable/not teachable, and articulated/not articulated.

Winter further complements his earlier analysis (Nelson and Winter, 1982) in that two additional properties are suggested. The two categories added are “observable/non-observable” and “independence/element of a system” of the knowledge in question. In contrast to the two former properties, the hierarchical position of these characteristics is perceived as parallel to, rather than subordinate to, the articulable/tacit phenomenon.

The observable/non-observable category involves the extent of disclosure of underlying knowledge that is necessitated by the use of that knowledge. For instance, “the design of a product is a secret that is hard to keep if the product is made available for purchase (and inspection) by all comers in an open market” (Winter, 1987: 172). Process technology, however, is different in that it may not be as easily ascertainable by potential competitors as product technology. While in some instances, a process technology with the underlying systemic knowledge may be discernible from scrutinising the final product, generally this is not possible. Therefore, much of the process knowledge can be protected if the company is rigorous in protecting its trade secrets in the factory. Hence, process technology may be inherently more protectable and less prone to imitation than product knowledge (Winter, 1987).

Independence/element of a system is the second additional property that is added in Winter's later analysis (Winter, 1987). This taxonomy, is later elaborated by Teece (1998) and Chesbrough and Teece (1996), where it is referred to as “autonomous/systemic.” It constitutes an important dimension along which knowledge in organisations can be classified, because it seems to hold implications beyond the transferability of the knowledge in question. The analysis in this chapter will investigate this property and its implications later on. Before the analysis can turn to these implications, it is first useful to illuminate what independence/element of a system denotes. The authors reviewed agree that some knowledge may be seen as autonomous, i.e. it can be pursued independently from other knowledge. Under this scenario, autonomous knowledge yields value for the company without major modifications of systems in which it is embedded. A new turbo charger to increase horsepower in car engines, for instance, can be developed without major modifications of the engine itself or the rest of the car (Chesbrough and Teece, 1996). Unlike autonomous knowledge, some knowledge can be fundamentally systemic, i.e. its benefits

can only be realised in conjunction with related, complementary innovations. To profit from instant photography, for instance, Polaroid needed to develop both new film technology and new camera technology. In a similar vein, lean manufacturing requires systemic knowledge, because it demands interrelated changes in e.g. product design, supplier management, and information technology, explains Winter (1987).

Winter's contribution seems to reside in complementing earlier analyses with two additional properties of knowledge. It is important to note that these are perceived as unrelated to the prevailing explicit/tacit distinction with its two subcategories, as presented in his earlier analysis (Nelson and Winter, 1982). Hence the position of the two additional properties parallel, rather than subordinate to, the explicit/tacit distinction. The first of the newly added properties (observable/non-observable) suggests implications for the ease of imitation. It can be argued that, similarly to the two foregoing subordinate categories, the new observable/unobservable property still appears to be inherently concerned with implications as they apply to the transferability of knowledge (that is, if imitation is interpreted as a form of knowledge transfer). It must be appreciated that the second additional property (independence/element), however, holds implications beyond the transferability of the knowledge in question. It suggests that some knowledge (particularly systemic knowledge) may not be pursued in isolation, thereby possibly demanding changes in systems in which it is to be embedded. This in turn would be indicative of, inter alia, more complex and by implication more expensive product development processes.

2.2.2 Additional properties – Teece

An author closely identified with knowledge taxonomies is Teece. This writer shares with Nelson and Winter (1982) the view that in a business context, it is beneficial to consider whether the knowledge in question is explicit/tacit, observable or not, or if it is an element of a system, rather than independent (Teece, 1998). Similarly, Teece echoes the contention of these authors that explicitness/tacitness have implications for the articulability of the knowledge in question and ultimately for its ease or difficulty of transfer. Teece further refines previous analyses in that he suggests the knowledge in question may also be "positive or negative" and may or may not enjoy "protectability under intellectual property law." With regard to the former property, it is argued that a discovery in an innovation process (i.e. positive knowledge) can

"focus research on promising areas of inquiry, thereby avoiding blind alleys. However, it is frequently forgotten, that knowledge of failure ("this approach doesn't work"

[indicative of negative knowledge]) is also valuable as it can help steer resource allocation into more promising avenues [thereby dismissing less promising ones]. For this reason, firms often find it necessary to keep their failures as well as their successes secret, even letting aside issues of embarrassment" (Teece, 1998: 64).

Notwithstanding the relevance of Teece's observation to the structure of many innovative processes, it may sometimes actually be in a company's interest to pursue less promising alleys of inquiry during such processes, thereby possibly discovering new usage for knowledge that would otherwise be dismissed. A useful illustration would be Minnesota Mining and Manufacturing Company (3M). This company seems to exemplify a thrive for agile product development through the corporate target demanding that 30% of the company's annual sales come from products less than four years old. The momentum behind such agility is often ascribed to 3M's axiomatic "thou shalt not kill ideas for products," i.e. an institutionalised advocacy of the negative knowledge dismissed by Teece's treatment (see, e.g. Nonaka and Takeuchi, 1995: 136-139, also Graham and Pizzo, 1996: 342-344). In fact, such negative knowledge appears to be "the source of countless stories, including the one that tells how [the CEO] tried five times (and failed) to kill a project that yielded the 3M blockbuster, 'Thinsulate'" (Graham and Pizzo, 1996: 343). Whatever the benefit of negative knowledge in innovative processes may be, it seems evident that the differentiation between positive and negative knowledge would hold implications beyond the transferability of a particular knowledge asset.

The second property that is added by Teece is concerned with the issue of whether the knowledge in question is protectable under intellectual property law. Not all components of the corporate knowledge portfolio qualify for such protection and those that do may qualify for different forms of intellectual property protection. Of fundamental interest to KM is further the question which species of intellectual property rights is best suited for a specific task, given that a particular knowledge asset does qualify for lawful protection (Teece, 1998).

Some sceptical comments about the protectability of knowledge assets in general have been offered by Winter. He suggests that it is useful to consider what the term intellectual property entails in the first place. This author has found out that, according to the dictionary definition, "property" refers to "things owned, possessions." In legal terms the use of the word "property" carries with it the inference of a relationship of proprietorship between the fruits and someone, i.e. one's own fruits of the intellect (von Seidel, 1998). A basic copyright for instance may represent a discrete bundle of legally defined and enforceable property rights. Such items of property can be conveyed from one owner to another just as a stock certificate

or deed can. Often however, the knowledge in question cannot so easily be separated from the context from which it emanates, thus making its mobilisation and proprietorship more difficult. Winter (1987: 160) reminds that

“it is decidedly problematic whether the realities denoted by such things as knowledge, competence, skills, know-how, or capability are the sorts of things that can be adequately discussed as items of property. The word item is suggestive of a discreteness, of a potential for severance from the prevailing context, that is frequently not characteristic of the skills of individuals and organisations” (Winter 1987: 160).

Consequently, while the term “intellectual property” may be established in legal parlance, there are often profound ambiguities regarding the scope and locus of the rights associated with the “possession” of some forms of knowledge assets, particularly those involving tacit knowledge. The distinctive properties of tacit knowledge often make protection under intellectual property rights difficult, if not impossible (Winter, 1987).

To summarise this far, Teece’s analysis, similarly to Winter’s (1987) adds two additional properties of knowledge that are indicative of implications for managerial practice. An important concern is the transferability of the knowledge asset in question. Teece appears to be more explicit terminologically, if one compares the protectability under intellectual property law as suggested by Teece with Winter’s observable/unobservable property. It is noteworthy however that, unlike protectability under intellectual property law, the second property by Teece (positive/negative) seems to suggest implications beyond the transferability problem.

2.2.3 A fundamental complexity: the cognitive entity

The properties of knowledge as presented above are adopted by a great number of authors in the field of KM and seem to enjoy general acceptance among scholars and practitioners. An additional, fundamental, complexity that appears to be underlying these properties has, however, been discovered. Apparently since knowledge with the above-mentioned properties needs to be captured, owned, and developed, interest has sparked in the literature concerning the question as to who actually owns and processes knowledge. An important question investigated by this stream of research is who may be regarded as a cognitive entity, the individual, the department or the organisation (Nonaka and Takeuchi, 1995; Spender, 1996a; Roos and Roos, 1996; von Krogh and Roos, 1995). A critical issue in KM

research seems to revolve around the managed disclosure of relevant knowledge assets among individual employees, within organisations and among organisations themselves.

The concern with the locus of knowledge seems understandable, because it raises questions concerning the protectability of knowledge assets. For example, in a strategic alliance, a production engineer (as a cognitive entity) working with a production planner from the partner company may forget about his mother company, and focus on the common task. This immersion in the task to be performed may often disseminate more knowledge than necessary or desirable from the side of his mother company (von Krogh and Roos, 1995). This problem seems to be particularly rife among Western engineers collaborating with Japanese partners (Hamel, Doz and Prahalad, 1989).

The locus of knowledge would also raise questions pertaining to the transparency of knowledge in the organisation. Knowledge and expertise in organisations is often present, yet difficult to ascertain and transfer from where it is known to where it is not. This is epitomised in the significant preoccupation for the enhancement of transfer of internal best practices (Brown and Duguid, 1998; O'Dell and Grayson, 1998), particularly to foreign subsidiaries (see, e.g. Lyles and Salk, 1996; Hu, 1995).

A review of the literature suggests that the recent surge in interest in cognitive entities or "knowledge agents" has spurred a renaissance of interest in *human* resources in the literal sense of the word. It is imaginable that this may be attributed to the fact that knowledge which resides in individual employees only seems to reach its full potential to create value for the firm if it is embodied in organisational routines (Badaracco, 1991; Nonaka and Takeuchi, 1995; Spender, 1996a; Davenport and Prusak, 1998; Lank, 1997). Another, related reason for the renewed interest in human resources appears to be that the cognitive competence of the organisation hinges on the mobilisation of individual cognitive resources (von Krogh and Roos, 1995). As other observers have put it,

"the individual then, is, more than ever, placed at the centre, not financial capital or production processes. Unlike their comrades during the industrial revolution, these human beings, in many cases and seen from many aspects, hold the very essence of the firm captive" (Bonara and Revang, 1993: 193).

Similarly, Roos and Roos (1997) observe that the "crux of the matter" may be that individuals and not the company control the chief source of competitive advantage, namely the knowledge of organisational members. According to some authors, there seems to be a

mutual dependency, between individual employee and organisation. As Drucker (1994, 1999a, 1999b) conceptualises it, in the knowledge era, the company needs to serve and nurture the “knowledge worker,” but at the same time, the knowledge workers themselves need the value creating processes and infrastructure of the company to unleash and leverage their knowledge, i.e. to deploy their knowledge to profitable ends.

Roos and Roos' as well as Drucker's statements of a mutual dependency between organisation and knowledge worker would need to be qualified slightly. As Bonara and Revang have alerted their readers, the mobility of knowledge workers gives them relative power. If employees are not satisfied with their working conditions, they may leave and work for a different employer, or start their own business. Thus, it is argued, the rising power of educated brains within organisations in many industries is creating organisations that are internally controlled and geared towards retaining key personnel; i.e. firms strive to limit such mobility. This internal control can be exemplified by many situations, found in, for example, law firms, where the best employees are offered partnerships. Another example is biochemistry, where share programmes for employees represent a material incentive to remain in the company (Bonara and Revang, 1993).

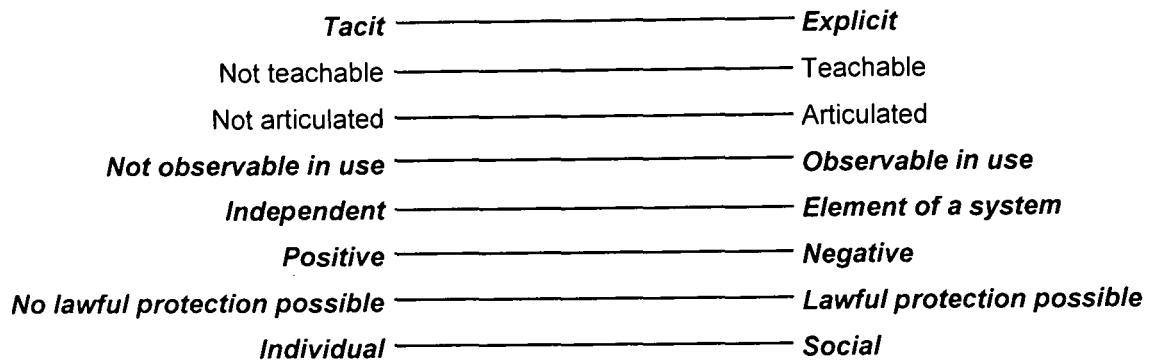
This suggests that switching costs, which may be seen as unevenly distributed among knowledge workers and the company, put the notion of a mutual dependency of knowledge worker and organisation in perspective. The dependency, whether mutual or not, is at the heart of an ongoing debate in the literature as to who may actually be considered as the knowledge agent – the company or the individual. As Spender observed:

“Discussions of organisational knowledge remain divided over whether we mean individual knowledge shared by all the organisation's members or on the generation of some kind of objectified knowledge that [is] embedded in the organisation's rules and routines” (Spender, 1996a: 47).

To summarise this section, with the recent interest in knowledge related matters seems to have come the recognition that an additional, fundamental question underlying the previous properties relates to the locus of knowledge in the corporation. Extant discourse seems to have agreed upon a critical property of knowledge, viz. that it may be possessed by, and disclosed among, individuals, groups of individuals, and organisations (e.g. Grant, 1996; Nonaka and Takeuchi, 1995; Spender, 1996a; von Krogh and Roos, 1995). A crucial issue in KM therefore seems to revolve around the managed disclosure of relevant knowledge assets among individual employees, within organisations and among organisations themselves.

Extant approaches to the properties of knowledge can be illustrated by a set of continua as in figure 2.1.

Figure 2.1: Key properties of knowledge



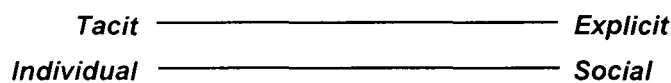
It should be emphasised that typically, writers perceive the properties of knowledge not as dichotomies (e.g. knowledge is not either completely tacit or fully explicit) but as a set of continua (e.g. all knowledge encompasses tacit and explicit elements, albeit in varying degrees). The review of the literature has further suggested that a major implication following from these properties can be attributed to the transferability of the knowledge in question. For example, in figure 2.1, a position left of any of the continua of properties would be suggestive of difficulty in transferring a particular knowledge asset. Underlying these properties of knowledge in organisations seems to be the contention that the delineation of the primary agent of knowledge in organisations is critical.

2.3 A Consolidation of thought in the literature

An important observation to be made from extant discussions on knowledge in organisations is a consolidation of thought on the properties of knowledge. As may be obvious from figure 2.1, and as was already hinted at in Winter's discussion of subordinate properties of the tacit/explicit dimension, not all of the identified properties are mutually exclusive. (In figure 2.1, the fact that "teachable/unteachable" and "articulable/unarticulable" is written using regular typeface is meant to suggest that these properties are subordinate to explicit/tacit.) This logic has presumably led some prominent observers (most notably Hedlund, 1994; Hedlund and Nonaka, 1993; Nonaka and Takeuchi, 1995; Spender, 1996a, 1996b; Davenport and Prusak, 1998) to the realisation that virtually all of the above categories can be subsumed under the explicit/tacit heading, without major sacrifices to content. For example, tacit knowledge may not qualify for lawful protection, whereas trademarks, patents, etc. can cover many forms of explicit knowledge. It is apparently contended that the explicit/tacit distinction authentically captures most of the key dynamics referred to above.

In addition, it was found that a fundamental feature underlying these consolidated properties would be the question of the cognitive entity. Consequently, interest among scholars sparked concerning the question as to who actually owns and processes knowledge, and who may be regarded as a cognitive entity, the individual, the social group or the organisation (Nonaka and Takeuchi, 1995; Spender, 1996a; Roos and Roos, 1996; von Krogh and Roos, 1995). Thus, from a review of the literature, it is further evident that scholars have discovered that underlying the explicit/tacit distinction may be an additional complexity. It was found that knowledge, which resides in individual employees only seems to reach its full potential to create value for the firm, if it is embodied in organisational routines. In other words, researchers pondered the question whether knowledge is a primarily individual construct, or can be seen as a social phenomenon. The two resulting pivotal properties of knowledge are illustrated in figure 2.2.

Figure 2.2: Two pivotal properties of knowledge



It should be appreciated that careful analysis of the literature reveals that the basic argument in extant discourse builds on the premise that the management of knowledge in an organisational context revolves around two pivotal issues, viz. firstly, the interplay of tacit and explicit knowledge; and, secondly, the diffusion and conversion of knowledge between individuals, departmental units within organisations, and organisations themselves. These distinctions are fundamental to the delineation of some of the most prominent approaches to KM (chapters 4, and 5 provide a comparative analysis and a critical review of extant approaches to KM). For the purpose of the present study, it is therefore fundamental to scrutinise the appropriateness of this consolidation as a platform from which to build KM approaches.

2.3.1 The consolidation of thinking: some critical comments

The basic argument in the literature seems to be predicated on the belief that KM revolves around two issues: the interplay between tacit and explicit knowledge, and the diffusion of knowledge between its different agents or carriers (e.g. the individual or the organisation). Although this pragmatic view on the complexity of knowledge in organisations represents an exiting perspective for managers, the merits of a consolidation at the present stage of research development would clearly be debatable.

This is not to say that the present consolidation is without merit to the study of KM, nor central to the understanding of knowledge in organisations. Its limitations need to be appreciated, however. The consolidation, while appealing in its conceptual pragmatism, may be premature. The tremendous growth of contributions and applications in the KM realm does not appear to have addressed all the limitations, yet. Critical comments concerning the status quo of research are not abundant and focus on generic topics surrounding “the knowledge based approach to the theory of the firm,” apparently without challenging the present consolidation (see, e.g. the debate between Kogut and Zander, 1996; and Foss, 1996a, 1996b).

For the purpose of the present study, an adequate critique of the status quo would, at a minimum, need to consider the consolidation that led to the confluence of properties on the explicit/tacit continuum. Two areas of investigation lend themselves to this discussion: firstly, the explanatory logic of the argument would need to be analysed; and secondly, it would need to be scrutinised whether the pool of properties from which the argument has been extrapolated can be seen as comprehensive in the first place.

2.3.1.1 The explanatory logic of the argument

The explanatory logic that led to the realisation that the explicit/tacit continuum essentially captures extant properties is built on the premise that individual taxonomic dimensions are not mutually exclusive. While this conjecture may be intuitively plausible in some instances (particularly in the case of articulability being a subordinate concept to explicit/tacit), it seems less cogent for other properties, as the previous analysis has suggested. For example, the issue whether the knowledge in question is positive or negative would not be easily accommodated by the prominent dual epistemology: it is arguable, whether positive knowledge is a priori either explicit or tacit. Hence, it might be argued that some categories actually are mutually exclusive. To this extent, it would appear that the superordinate distinction as advocated in the literature might not capture all of the allegedly subordinate concepts. This could limit the usefulness of the concept as a platform on which to build models for the management of this resource. The potential and sophistication of such management models could be predicated on the appropriateness of the conceptualisation of the resource that they seek to manage.

Models based on such reasoning would also tend to preclude or at least obscure some of the critical implications hinted at in the review of knowledge properties. Even if the concepts were subordinate, i.e. if the properties in figure 2.1 were not mutually exclusive, the extant

explicit/tacit distinction may not authentically capture all the implications that follow from subordinate properties. This suggests that a further error of omission possibly made by the extant explicit/tacit perspective on knowledge relates to the implications that follow from some of the properties that actually are captured. Typically, the focus in recent discussions is put on implications for KM as it appertains primarily to transferring knowledge (see, e.g. Davenport and Prusak, 1998, von Krogh and Roos, 1995). For example, it is commonly echoed in the literature that a position left on any of the continua in figure 2.1 would be indicative of difficulty of transfer (e.g. Winter, 1987; Nonaka and Takeuchi, 1995).

Other critical implications following from certain properties, which may be obscured by the explicit/tacit template, however, should not be neglected, either. For example, It must be appreciated that the type of knowledge needed is likely to have implications to the choice of organisational design, suggest a number of authors (Chesbrough and Teece, 1996; Badaracco, 1991; Hamel, 1991). These implications seem particularly relevant in the present economy, where few companies can afford to develop internally all knowledge that might provide an advantage in the future, thereby suggesting the value of co-operative strategies to alleviate "knowledge gaps." As evident from the foregoing chapter, traditionally such co-operative strategies were mostly concerned with product market potentials.

Recently, however, many companies seem to have found the merit of "knowledge links" (Badaracco, 1991), often taking advantage of the potential found in complementary knowledge and mutual knowledge development (Hamel, 1991; Aadne, von Krogh and Roos, 1997). Under these circumstances, selected knowledge requirements can be acquired from outside sources through licenses, partnerships and strategic alliances, whereas other, important knowledge needs to be developed and retained internally (see, e.g. Hamel, Doz and Prahalad, 1989; Hamel, 1991; Lei and Slocum, 1992), thereby possibly impacting organisational design. In view of their relevance to the current business environment, such implications for corporate structure would deserve particular attention.

These implications for organisational design seem to follow from the autonomous/systemic distinction. As was outlined in the foregoing literature review, some knowledge may be autonomous, i.e. it can be pursued independently from other knowledge. Unlike autonomous knowledge, some knowledge can be fundamentally systemic, i.e. its benefits can only be realised in conjunction with related, complementary innovations (Winter, 1987). As was demonstrated, Chesbrough and Teece have revisited Winter's original contribution and have deducted the additional implication for organisational design. Their analysis lends itself well to demonstrate the pitfalls of ignoring some of the critical implications which may be

obscured by the prevailing view on knowledge in organisations, and shall serve as the basis for the following discussion.

By implication, innovations based on systemic knowledge may require organisational configurations that are characterised by high degrees of vertical integration. Such vertical integration is advocated because innovations calling for systemic knowledge typically demand information sharing and co-ordinated adjustments throughout an entire product system. Under this scenario, a market-based approach characterised by extensive subcontracting of unaffiliated companies, linked through arm's length contracts is seen as ill suited to achieve sufficient co-ordination. Typically, in such configurations knowledge sharing can be reduced or biased, as each player seeks to realise the most gain from the innovation, often at the expense of the other. Therefore, an open exchange of knowledge, which is conducive to innovation, is seen as easier and safer within company boundaries (Chesbrough and Teece, 1996).

A more networked approach, consisting of several smaller players, however, may be well versed upon innovations based on autonomous knowledge. Here, and typically in industries where technology is changing rapidly, the networked companies linked through arm's length contracts may be able to quickly access the knowledge resources required, often outperforming more integrated, less agile configurations in their speed to market. Unlike innovations requiring systemic knowledge, where independent companies may not be able to achieve the co-ordination and trust needed to integrate interrelated knowledge, they are seen to offer benefits for innovators resting on autonomous knowledge that do not require such integration (Chesbrough and Teece, 1996).

The knowledge view on the network paradigm as presented by Chesbrough and Teece (1996) seems to put the often dramatic calls to arms for the reformation of integrated companies and similar mandates for developing networks (e.g. Achrol, 1991, Cravens, Shipp, and Cravens, 1994) in perspective. The knowledge perspective would qualify the often single mindedly cost-centred rationale for corporate reconfiguration. Badaracco, for example, pinpoints the difference between what are called "product links" and "knowledge links." The former seem to focus primarily on issues such as cost and risk reduction, market access and flexibility, while the latter may be of substantial importance for building and sustaining strengths for future competition (Badaracco, 1991 cited in Aadne, von Krogh and Roos, 1997).

The knowledge perspective would also usefully shed new light on the demise of companies that un-reflectedly adopted a networked approach to concentrate on core competencies, in order to achieve greater agility, only to find out that they were affected by symptoms of "corporate anorexia" (Nasser and Vivier, 1993), "corporate amnesia" (Romhardt, 1998), or were even suffering from "phantom limb effects" (von Krogh, Roos, and Hoerem, 1997). Often, these companies seem to have realised that while a networked approach may be a worthwhile choice for turbulent environments, it may be ill suited for the exchange of knowledge needed for systemic innovation. IBM is an enlightening example to illuminate the perils and dangers of networked approaches to pursue innovation.

Case 3.1: IBM: knowledge and corporate design

When IBM launched its first personal computer (PC) in 1981, the company elected to source all the major components from the marketplace. By tapping the capabilities of other companies, IBM was able to launch its first product in only 15 months. By using outside parties for hardware, software, and distribution, IBM greatly reduced its investment in bringing the PC to the market. The IBM PC was an early success and it spawned what became the dominant architecture of the entire microcomputer industry. By 1984, three years after the introduction of the PC, IBM replaced Apple as the number one supplier of microcomputers, with a 26% share of the PC market. By 1985, IBM's share had grown to 41%. Many observers attributed this success to the creative use of outside relationships and a number of business analysts advocated the IBM PC development as the model for doing business in the future.

With the passage of time, though, the downside of IBM's decentralised approach has become apparent. IBM failed to anticipate that its networked and open approach would prevent the company from directing the PC architecture it had created. Particularly the autonomy of its vendors invited design "mutinies" and the entry of IBM compatible PC manufacturers. Once compatibility was attained, manufacturers could purchase the same CPU from Intel and the same operating system from Microsoft, run the same application software and sell through the same distribution channels. IBM had little left to establish a competitive advantage (Chesbrough and Teece, 1996: 31-32).

The experiences of IBM can be interpreted as illustrating the strategic implications of knowledge in corporate organisational structure. Networked approaches to corporate architecture may encounter serious problems when companies seek to integrate the broad-gauged knowledge needed for systemic innovation, such as PC development. It appears that

key knowledge assets that are needed to conduct interrelated development activities should be retained in-house to capture the rewards from long-term R&D investments even in turbulent markets such as the PC business, where speed to market is critical. This suggests that certain properties of knowledge may have critical implications not only for KM as it appertains to transferring relevant knowledge; they may also exhibit implications for organisational structure. These fundamental implications may not be covered by the prevalent explicit/tacit taxonomy.

2.3.1.2 The comprehensiveness of the argument

Beyond challenging the assumption of mutual exclusiveness of taxonomic dimensions and their ramifications for the concomitant implications, for the purpose of this study, it is useful to consider whether the properties propounded in the literature are exhaustive in the first place. It would appear that the discussion that led to the crystallisation of the tacit/explicit continuum is far from exhaustive with respect to the dimensions along which types of knowledge can be described. Examples for additional properties seem to include, but may not be restricted to, measurement, accountability, and benchmarking. In dynamic environments, to recall Teece, Pisano, and Shuen (1997), "narcissistic organisations" are likely to be impaired. Particularly the propensity for benchmarking KM practice may therefore be of considerable interest as a property of knowledge.

The issue of benchmarking best internal knowledge practice, however, seems to be compounded by the question of how to measure such performance. Without agreement on standardised measurement schemes, and common bases, comparing performance would be a futile effort. Developing such measures in turn seems compounded by the question of which properties are to be measured. These problems suggest worthwhile questions for further research.

In conclusion, it must be appreciated that beyond the possible hazards concerning the explanatory logic underlying the emerging consolidation of thinking on the topic, a major limitation could arise from its somewhat arbitrary treatment of the pool of properties that crystallise in the explicit/tacit continua. It must also be emphasised, however, that due to the complexity of the phenomenon under investigation, any attempt at conceptualisation will necessarily lead to some caricature. This should clearly be welcomed to the extent that it creates new insights through balancing complexity with a comprehensible mode of presentation. Thus, the current amalgamation in thought can be seen as a useful first step in

developing a preliminary view of knowledge that makes a meaningful discussion about its management possible.

2.4 Summary and key implications for knowledge management

2.4.1 Summary

The basic nature and concept of knowledge in organisations can best be understood by examining its constituent properties that appear to have critical implications for KM. An important premise in this context is that knowledge exhibits unique properties that are distinctly different from traditional corporate resources, such as land, labour and capital. These properties, it is argued, make knowledge less amenable to management as some of its conventional counterparts and should therefore be contemplated.

This chapter has presented some of the properties of knowledge along with their implications, in order to develop a sensitivity for the nature of this important resource. This sensitivity seems necessary for a scrutiny of the current level of sophistication of extant KM models in catering for the properties of knowledge in an organisational context. An analysis, based upon the author's perception through investigation of relevant literature of these properties has been made. This analysis has revealed that recent thought on the topic has witnessed a consolidation through which two key properties of knowledge were extrapolated. It is generally consented that the issue whether the knowledge in question is tacit or explicit is of fundamental interest to management. The second key property that crystallised relates to the agents of knowledge. More specifically, it is argued that knowledge may reside at the level of the individual employee and at the organisational level.

The analysis has emphasised that the status quo in thinking on the properties of knowledge as pertinent to management, while useful in its conceptual pragmatism should not remain unchallenged. It has been demonstrated that the emerging consensus may be premature, indicating further exploratory analyses in order to achieve wider validity for the propositions suggested in the literature. This seems particularly important in view of the fact that a conceptualisation of knowledge as a resource would have profound implications for its management. This in turn would imply that the sophistication of KM approaches seems predicted upon the appropriateness of the object to be tended to, viz. knowledge. Hence von Krogh and Roos' perceptful observation at the beginning of the chapter, "the way you conceive of knowledge influences the way you manage it."

2.4.2 Key implications for knowledge management

The increasing importance that knowledge assumes in corporate competitiveness is likely to demand more sophisticated and broad-gauged knowledge about knowledge. The major implications of an enhanced understanding about this important resource as this chapter attempted to present are:

- (a) Intellectual property rights are often advocated for the protection of corporate knowledge assets. It should be realised, however, that intellectual property rights cover explicit knowledge that is imitable because it is transferred with relative ease; codified information (e.g. specifications that are captured in design classifications) may often be transferred as effectively from one company to another as it can within a single company. Because such knowledge is easy to duplicate, it has little inherent protection. Sometimes intellectual property rights may be used for protection, but, as Chesbrough and Teece (1996:29) metaphorically put it, "... trade secrets and patents are small islands in a broad ocean of knowledge." It is therefore important to appreciate that not all components of the corporate knowledge portfolio qualify for lawful protection. Even if such expertise does qualify for protection under intellectual property rights the procedures involved in attaining such protection typically involve considerable time and monetary resources, especially if conducted on a global level (von Seidel, 1998). Companies are therefore advised to seek additional protection, e.g. through constant innovation.

- (b) Several other factors in addition to intellectual property systems seem to impact the imitability of corporate knowledge assets. The observability of technology, in particular of autonomous technology, is one such important factor. Should intellectual property protection not be in place, vistas into organisational knowledge, e.g. product technology can be gained. This can be done *inter alia*, through reverse engineering, as the near-demise of IBM has shown. Generally, however, this is not the case for process knowledge, which, by virtue of its complexity, would be more difficult to ascertain. Moreover, as Teece (1998) reminds his readers, firms typically do not need to expose their process technology (e.g. in products sold) in order to benefit from it. Often, however, and particularly in the case of strategic alliances and similar knowledge sharing arrangements, such process technology represents the very rationale for the partnership. Here, a balance should be sought between limiting the flow of knowledge from one parent to another parent in some areas, while enhancing it in others. Thus, proper protection mechanisms should be sought to afford fair

protection of respective knowledge contributions to monitor progress and to ensure compliance with the original rationale that motivated the partnership.

- (c) The fact that the gauge of a particular knowledge asset (viz. autonomous or systemic) can be fundamental in suggesting organisational design deserves attention. The knowledge requirements needed to integrate systemic innovations with established standards and processes often exceed the capabilities of loosely networked firms and are therefore best accommodated using a more integrated organisational design. Autonomous knowledge, however, may well be accommodated in such networked approaches. These, by virtue of their agility in product development are particularly well suited for turbulent environments, where speed to market is crucial.

In conclusion, it should be emphasised that knowledge seems to be a very complex organisational resource. Analysis has revealed that knowledge would be characterised by unique properties and concomitant implications that are likely to impact its manageability. A number of these properties have been pointed out in the course of this chapter. To be useful, KM models would have to capture them. In KM models based on a concept of knowledge as it is presented here, these complex characteristics would have to be modeled explicitly and as authentically as possible.

CHAPTER 3: Two pivotal properties of knowledge

3.1 Introduction

Careful analysis of the literature has revealed that the basic argument in extant discourse on the concept of knowledge in organisations builds on the premise that corporate KM revolves around two critical issues, viz. firstly, the interplay of tacit and explicit knowledge; and, secondly, the purposeful disclosure of knowledge between individuals, departmental units within organisations, and organisations themselves. These properties are fundamental for the delineation of extant approaches to, and models of, KM (chapters 4, and 5 discuss and critically review extant approaches to KM). With regard to the treatment of these properties in extant KM models, however, one can only agree with Stehr, who emphasises that “the most serious deficiency of existing theories of modern society assigning a central role to knowledge is their rather undifferentiated treatment of the key ingredient,” viz. knowledge itself (Stehr, 1994). For the purpose of the present study, it is therefore considered useful to investigate the two constituents in greater depth. This investigation should further sensitise the reader to the unique properties of knowledge and their ramifications for KM.

The primary objective of this chapter is twofold. Firstly, the original theory of Polanyi’s explicit/tacit distinction shall briefly be introduced and its implications for KM practice shall be illustrated. For the purpose of this study, this would be a beneficial exercise, because, although the concept of tacit/explicit knowing seems to belong to common vocabulary today, Polanyi’s underlying epistemology appears to not to be commonly known (Sveiby, 1996). Secondly, within the stream of research, which yielded the contention that an important property of knowledge is that it can have different agents or carriers, there appear to be different schools of thought concerning the question whether knowledge may be possessed and created by the individual employee and/or the organisation (see, e.g. Grant, 1996; Roos and Roos, 1996; Nonaka and Takeuchi, 1995; Spender, 1996a). In view of this disagreement, the second objective of the present chapter is to review the relative merits of each school of thought in view of their respective contributions to KM.

The overall analysis in this chapter is structured using three broad areas of investigation. An analysis of tacit and explicit forms of knowledge and their interaction is presented first; this is followed by a debate as to whether both the individual and the organisation can and should be regarded as cognitive entities; finally, the main suggestions of the present chapter are summarised.

3.2 Tacit and explicit knowledge in organisations

With regard to taxonomic dimensions along which knowledge in organisations can be classified, the first key property that crystallised through a consolidation of thinking on the topic would be the interplay of tacit and explicit knowledge. The philosopher Michael Polanyi has elaborated the distinction between tacit and explicit forms of knowing in 1958. This epistemology has then been introduced to the management literature by Nelson and Winter (1982) in their evolutionary theory of the firm, and more recently been analysed by Nonaka and Takeuchi (1995) where it forms an integral part of their theory of organisational knowledge creation (chapters 4 and 5 provide a discussion of Nonaka and Takeuchi's theory).

Part of the recent popularity of, and interest in, particularly the tacit dimension of organisational knowledge has been attributed to the assumption that a corporation's tacit knowledge, rather than its explicit knowledge base confers competitive advantage. Typically, it is contended that tacit knowledge, by virtue of its immobility, idiosyncrasy, and sustainability is harder to imitate than explicit knowledge (Spender, 1996a, 1996b; Brown and Duguid, 1998; Nonaka and Takeuchi, 1995; Aadne, von Krogh, and Roos, 1997). Tacit knowledge would therefore be of particular interest to those who are inquisitive of the concept of KM, yet few authors in the management field seem inclined to explore its unique characteristics that form the cause of such immobility, sustainability and similar ramifications for managerial practice.

To provide a good grasp of what the distinction between tacit and explicit knowledge entails and to identify the properties of each as pertinent to KM, it seems useful to explore this dimension in greater depth. Polanyi's (1958) original analysis would be a good point of departure, as it offers rich insights into the nature of the problem and its implications for the management of corporate knowledge assets. This section reviews some of the insights gained by Polanyi and attempts to deduct relevant implications for business. To put Polanyi's work and its applicability to the management realm in perspective, the rationale behind his analysis is given first. With this understanding, Polanyi's main study is outlined and a brief case study is presented to illuminate the relevance of this philosopher's work to a business context. Subsequently, a central concept in Polanyi's epistemology, i.e. the tradition of knowledge, is presented. To conclude this section, relevant business implications are deducted from Polanyi's analysis.

3.2.1 Polanyi's main thesis

In order to enhance an understanding of Polanyi's epistemology and its ramifications for KM, it would be useful to first appreciate the rationale that motivated his analysis. Spender discovered that Polanyi's intent was to criticise the positivist norm of doing good science, viz. that scientists should interact only the explicitly rationalist and empiricist traditions by formulating logical hypotheses and doing repeatable tests. For Polanyi, argues Spender, science essentially represented a process of explicating the fundamental "tacit" (i.e. intuitive) understanding that was driven by the subconscious learning of the focused scientist (Spender 1996a). The title of Polanyi's opus magnum, "Personal Knowledge," (1958) seems to epitomise this rationale. Polanyi appears to have titled his book *Personal Knowledge* because the author wanted to underline that the intellect also in science may be connected with a "passionate" contribution of the person knowing. Emotions, to Polanyi, constitute an integral component of a person's knowledge (Spender, 1996a). This, however, does not make understanding subjective (Sveiby, 1996). In fact, Polanyi suggests that

"we may distinguish between the personal in us, which actively enters into our commitments, and our subjective states, in which we merely endure our feelings. This distinction establishes the conception of the *personal*, which is neither subjective nor objective. In so far as the personal submits to requirements acknowledged by itself as independent of itself, it is not subjective; but in so far as it is an action guided by individual passions, it is not objective either. It transcends the distinction between objective and subjective" (Polanyi, 1958: 300; emphasis in original).

This personal element seems to shape the knowledge generated by the "focused scientist," as the following citation from Polanyi's later work obviates:

"The declared aim of modern science is to establish a strictly detached, objective knowledge. Any falling short of this ideal is accepted only as a temporary imperfection, which we must aim at eliminating. But suppose that tacit thought forms an indispensable part of all knowledge, then the ideal of eliminating all personal elements of knowledge would, in effect, aim at the destruction of all knowledge. The ideal of exact science would turn out to be fundamentally misleading and possibly a source of devastating fallacies. I think that the process of formalising all knowledge to the exclusion of all tacit knowing is self-defeating" (Polanyi, 1966: 20).

With Polanyi's rationale in mind, his main thesis can better be appreciated.

Polanyi's main thesis

The tacit knowledge that underlies the explicit knowledge is fundamental; all knowledge is either tacit or rooted in tacit knowledge.

In view of Polanyi's main thesis, it would be important to realise that in this author's analysis, socially conveyed knowledge may blend with the experience of reality of the individual:

"Both Quantum Mechanics and the theory of relativity are very difficult to understand; it takes only a few minutes to memorise the facts accounted for by relativity, but years of study may not suffice to master the theory and see these facts in its context. At all [these] points the act of knowing includes an appraisal; and *this personal coefficient, which shapes all factual knowledge*, bridges in doing so the disjunction between subjectivity and objectivity" (Polanyi, 1958: 16-17; emphasis added).

Predicated on this belief, new experiences are always assimilated through the concepts that the individual disposes of and which the individual has gained from others. These concepts could be tacitly based and are typically not easily communicated. This suggests that knowledge, which can be assessed in words and numbers may represent only the "tip of the iceberg" of the overall body of possible knowledge (Nonaka and Takeuchi, 1995: 59-60). Hence Polanyi's key argument that all knowledge rests in a tacit dimension, and hence the oft-quoted phrase "we know more than we can tell" (Polanyi, 1966: 4).

3.2.2 Polanyi's main thesis in a business context

While Polanyi argues the concept of tacit knowledge further in a philosophical context, it is also possible to expand his idea in a more practical direction. As Nonaka and Takeuchi explain, tacit knowledge includes cognitive and technical elements. According to them, the cognitive elements centre on "mental models," in which human beings create working models of their environment by developing and manipulating analogies in their minds. Mental models, such as schemata, paradigms, perspectives, etc. may help individuals in perceiving and defining their environment. Technical elements on the other hand include know-how, crafts and skills (Nonaka and Takeuchi, 1995).

Polanyi frequently stresses that when individuals are tacitly involved in a process-of-knowing, they act without distance. This describes how and why things are taken "for granted." The individual typically changes and adapts the concepts in the light of experiences and

reinterprets the language used. As a result, when new words or concepts are brought into an established system of language, both affect each other. This can be a mutually beneficial process, as the system itself enriches what the individual has brought into it and vice versa (Polanyi, 1958, 1966). To use a business analogy, the individual engineer, for instance, typically needs the organisational infrastructure, social exchange with other employees to nurture and exploit his or her knowledge just as the organisation needs his or her specialised knowledge input. In this process of mutual enrichment, new organisational knowledge may be created, much of which might be tacit.

Individuals can, however, also get involved explicitly in processes, thereby acting in a more rational and focused manner. In each activity, there may thus be two different levels or dimensions of knowledge, the tacit and the explicit. These two different levels of knowledge may interact in each activity. The first level would be knowledge about the object or phenomenon that is in focus, viz. explicit, or as Polanyi also calls it, focal knowledge. The second level would be knowledge that is used as a tool to handle or improve what is in focus, viz. tacit knowledge. Both levels of knowledge appear to be constantly in dialogue (Polanyi, 1958). Part of the challenge for KM can be seen as surfacing and integrating tacit elements with other knowledge in order to leverage it eventually, i.e. to (re-) deploy existing knowledge in a new setting (Nonaka and Takeuchi, 1995). The development of the “Matsushita bread baking machine” is a fascinating example of how such transfer, integration, and leverage can evolve in practice.

Case 4.1: The Matsushita bread baking machine

Matsushita’s “Home Bakery” was the first fully automatic bread-making machine for home use, introduced to the Japanese market in 1987. It transforms raw ingredients into freshly baked bread, doing everything from kneading and fermenting the dough to actually baking bread of a quality that compares favourably with what a professional baker could produce. Thus, when the bread baking machine was designed, providing the opportunity for fresh, home-baked bread every morning seemed a to be a worthy and profit generating goal. Among the many problems the design team needed to solve, however, was that none of its prototypes could turn out dough with the proper texture.

The team’s solution: several engineers apprenticed themselves to a master baker, observing him at length and discovering that he made a special twisting motion that seemed to be the secret to his special touch with dough. The team was able to surface, integrate and finally leverage his technical skill, i.e. to transfer the tacit

knowledge in his hands to the kneading mechanism in the bread-making machine. When it finally came to the market, the breadmaker turned out to be a major success for Matsushita. Moreover, the success of Home Bakery led to the creation of “Human Electronics,” and a series of successful products that embodied the same concept was launched at Matsushita, thereby further leveraging the tacit knowledge acquired from the master baker (Nonaka and Takeuchi, 1995: 95-123).

As this case suggests, the work of Polanyi usefully sheds light on knowledge that is embodied in individual and organisational practices and cannot readily be articulated. Through the integration of various knowledge bases involved in developing the product (i.e. the baker’s tacit kneading skill and the engineer’s technical expertise), Matsushita was apparently able to leverage these bases individually and in conjunction. An important aspect can be observed here: while explicit knowledge can relatively easily be transferred indirectly, i.e. through various media, tacit knowledge, by default of appropriate media can only be transferred through direct contact of individuals. For example, it would not have sufficed to have the master baker send a fax describing the expertise needed to develop dough of the proper texture.

3.2.3 Tradition of knowledge

One of the central concepts in Polanyi’s concept of knowledge is the concept of “tradition.” Tradition in his analysis describes how knowledge is transferred in a social context. Tradition is defined as a system of values outside the individual that impact the conception of personal knowledge. As was emphasised before, “personal” knowledge is not the same as subjective opinions in Polanyi’s theory. Sveiby suggests that personal knowledge may be more akin to the knowledge of a judge who within the framework of the law and praxis (i.e. the tradition) gives a judicial decision based on his judgement in a particular situation. Another judge should in principle be able to take the same decision (Sveiby, 1996).

“An art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists. It can be passed on only by example from master to apprentice. This *restricts the range of diffusion to that of personal contacts*. We find accordingly that craftsmanship tends to survive in closely circumscribed local traditions. While the articulate contents of science are successfully taught all over the world in hundreds of new universities, the unspecifiable art of scientific research has not yet penetrated many of these” (Polanyi, 1958: 53; emphases added).

In this view, to learn by example would be to submit to authority. Polanyi's contention seems to align well with the Matsushita case. By watching the master baker and emulating his efforts in the presence of his example the apprentice was able to emulate the rules and traditions of the art, possibly including those which may not even be explicitly known to the master himself.

For example, a society, which wants to preserve a fund of personal knowledge needs to submit to and preserve traditions, suggests Polanyi (1958, 1966). (It is noteworthy that in Polanyi's theory, tradition is an essentially static construct, as Polanyi's focus on preserving tradition indicates.) Analogously, as may be argued, organisations should submit to, and preserve, their own traditions in order to tap in, and assimilate the personal knowledge bases of their individual employees. There seems to reside a danger, however in a single-minded focus on preserving tradition, as shall be discussed shortly.

It should again be appreciated that tacit knowledge has the tendency to restrict the range of diffusion to that of personal contacts, as Polanyi's direct quote above obviates and as the Matsushita example has attempted to demonstrate. As a result of the personal element in knowing, knowledge would become a constructed entity made by each and every learner through a learning process. The term utilised in the present study, - knowledge "transfer" may therefore not be quite appropriate, since knowledge is not typically moved as other organisational resources are. Rather, the receiver is likely to reconstruct his version of the "supplier's" knowledge (see, e.g. Hallowell, 1999 for the effects of such reconstruction).

3.2.4 Polanyi's tradition of knowledge in a business context

Even if not discussed explicitly by Polanyi, one might use his concept of tradition for identifying "traditions" of a particular industry, organisation or department, the latter being the "tradition within the organisation." Two generic insights into KM could be gained from the ramifications of Polanyi's concept of tradition to a business context.

- Firstly, it seems probable that intra-organisational groupings, through sharing their specialised knowledge may often create a form of synergistic knowledge that transcends the expertise of individual contributions (e.g. Brown and Duguid, 1998; Nonaka and Takeuchi, 1995; von Krogh and Roos, 1995). In this process, it is imaginable that idiosyncratic norms can create a social order, or tradition, which can be instrumental in sharing certain, particularly tacit forms of, knowledge. Tradition may additionally be instrumental in prescribing sanctions concerning appropriate attitudes and behavioural

patterns (e.g. Johnson, 1994). In this fashion, it may enable people to foresee both the actions of others and the implied expectations on themselves (“the way we do things around here”), thereby possibly enhancing the sharing of knowledge (Sveiby, 1996; Polanyi, 1958). Often, the individual defines him/herself as someone by submitting to such tradition, which by design typically is relatively static over time. While tradition may have its positive effects on the sharing of knowledge, it may, through its inherently static nature, also inhibit progress and innovation. Polanyi does not problematise this inertia-aspect, as he essentially views tradition as something that is to be preserved. It would appear that his analysis should therefore be put in perspective to provide appropriate insights for the concept of KM.

While Polanyi’s analysis does not accommodate the tendency of knowledge nurtured and reinforced by corporate traditions to depreciate, it seems important to consider and appreciate this tendency in an organisational KM context. A cornerstone in the resource based approach to strategic management research is a duality of outward (e.g. product market, competitive environment, industry structure) and inward (e.g. firms specific competencies and knowledge portfolios) foci (see, e.g. Prahalad and Hamel, 1990; Hamel, 1991; Hamel and Prahalad, 1993; Barney, 1991). This duality is apparently designed, inter alia, to guard the organisation from a myopic inward focus, which could lead to incrementalism. More specifically, incrementalism might lead, for example, to an impaired congruence of individual knowledge assets nurtured in the corporation with the changing business environment, and seems particularly relevant in dynamic markets, where product life cycles are short, thereby demanding agility in innovative response and time-to-market. This seems to suggest that traditions would continuously need to be challenged. A number of scholars in the (resource-based paradigm of the) strategic management realm have already propounded theories to nurture dynamic capabilities (Teece, Pisano and Shuen, 1997), keep core capabilities from becoming core-rigidities (Leonard-Barton, 1992, 1995), thereby designing the learning organisation (Senge, 1990; Levitt and March, 1988; Moingeon and Edmondson, 1996; McGill, Slocum and Lei, 1992). Thus, the managerial challenge seems to involve taking advantage of organisational traditions, routines, and power structures without being hampered by their “dysfunctional flip side” (Leonard-Barton, 1995).

To summarise this far, the ambiguous nature of corporate traditions suggests that inherent in the evolution of organisations seems to be the paradoxical struggle to maintain, yet to renew tradition. It seems important to constantly renew relevant knowledge assets in the organisation. More specifically, it appears paramount to

scrutinise the relevancy of the knowledge created and nurtured by organisational traditions relative to the competitive environment in order to achieve and sustain congruence with the changing business environment (Hamel and Prahalad, 1993, 1994; von Krogh and Roos, 1995).

- A second insight into KM, which can be gained from the vantagepoint of Polanyi's tradition as applied to corporate environments, would be concerned with organisational traditions on a more micro-level. On this level, departmental traditions within organisations may hold implications for the ease of imparting knowledge among organisational departments. It would appear that while a discrete, functional and departmentalised division of labour may encourage local innovation (Grant, 1997), it would tend to encourage the formation of localised codes of conduct and procedures as well, thereby making sharing knowledge across functional boundaries difficult (O' Dell and Grayson, 1998, Brown and Duguid, 1998). In this view, the internal replication of knowledge can be handicapped by traditions of intra-organisational groupings, many of which may be tacitly present. This is noteworthy, as it seems to impair the transparency of internal knowledge practice.

The transparency of knowledge assets in the firm, or the lack thereof, seems to be a very topical concern in many companies (Romhardt, 1998; Nonaka and von Krogh, 1999). A possible reason for this interest seems to be that a lack of transparency may lead to redundancy of effort ("reinventing the wheel") and impaired internal transfer of best practices in the corporation (Romhardt, 1998). Likely outcomes of this inadequacy are described by two prominent corporate leaders: Jerry Junkins, the late CEO of Texas Instruments (TI) laments "If Texas Instruments only knew what Texas Instrument knows" (cited in O'Dell and Jackson Grayson, 1998: 154), this is echoed by Lew Platt, chairman of Hewlett Packard (HP), "if HP knew what we know, we would be three times as profitable" (cited in Despres and Chauvel, 1999: 6).

The lack of knowledge transparency, which seems to frustrate internal transfer of best practices, has attracted attention from a number of scholars. Schonberger, for instance, has alerted his readers that the functional groupings representing production and distribution may in fact be like castle walls: thick and resistant to interaction. For example, a communicative dysfunction between the supply/production castle and the marketing/distribution castle may often be leading causes of the same problems, including misguided product decisions, and poor service to the best customers (Schonberger, 1996). Similar arguments are put forward by Grant, who explains that

organisations need to permit individual employees to specialise in developing expertise, while establishing mechanisms through which individuals can co-ordinate their specialised knowledge bases (Grant, 1997).

To summarise this far, the basic insights into KM that can be gained from the Polanyian tradition would hold fundamental implications for the delineation, and orchestration of adequate processes for imparting relevant knowledge to appropriate circles of organisational influence. These insights have suggested two critical implications. The first implication, in line with the generic credo of the pool of properties that coalesced in the explicit/tacit continuum, relates to the transferability of the knowledge in question (chapter 2 provides an overview and critique of this process of coalescence). The second implication, however, seems to go beyond this credo in that the scope of analysis is widened to embrace the arena outside corporate boundaries. More specifically, it is suggested that corporate traditions, while instrumental in enhancing the transfer of (particularly tacit forms of) knowledge, can be counterproductive in view of their a priori static design. Particularly in dynamic environments, where agility in innovation and product development cycles is required, corporate traditions seem to have the tendency of obscuring or downplaying critical signals in the competitive environment of the corporation (Eisenstat and Beer, 1994). In fact, such corporate traditions could lead to incrementalism in corporations.

3.2.5 Dilemmas in knowledge management

The implications of Polanyi's analysis to corporate environments seem to be suggestive of two dilemmas in KM.

- Firstly, as was emphasised before, tacit knowledge may be of critical strategic importance, because it would be inherently more difficult to imitate than explicit knowledge (Nonaka and Takeuchi, 1995; Spender, 1996b). The very properties, however, that make tacit knowledge difficult to imitate often make it difficult to impart internally. Corporate practices and cultural patterns may engulf certain organisational knowledge assets, thereby making a delineation and mobilisation of these assets difficult (Cole, 1998). It would appear that the very properties that make knowledge valuable make it difficult to manage at the same time. These dynamics would be indicative of a dilemma in KM (Spender and Grant, 1996; Grant, 1997; Leibold, Gibbert, Kaes, 1999).

Differences in accessibility and mobility obviously matter. Some knowledge can be protected and immobilised, while some cannot and may readily be misappropriated by

others. As Teece (1998) observed, there appears to be a simple but powerful relationship between the codification of knowledge and the cost of its transfer. Simply stated, argues Teece, the more a given item of knowledge has been codified (i.e. made explicit), the more economically it can be transferred. Tacit knowledge on the other hand seems to be typically slow and costly to transmit. Residing in individuals and social relationships in the firm, revealing this tacit knowledge may require closer and more interactive relationships with the one possessing it, as speculated by Aadne, von Krogh, and Roos (1997). In fact, there is recent empirical evidence that ambiguities often abound in transferring such knowledge and can only be overcome when the communication takes place in face to face situations, i.e. when knowledge is transferred directly (Hallowell, 1999).

The nexus between tacitness and cost of transfer appears indicative not only of implications for the ease of intended and desirable knowledge transfers, but also for the ease of imitation of knowledge assets outside corporate boundaries (von Krogh and Roos, 1997). By implication, it would appear that the more explicit and codified knowledge is, the more economically it can be imitated, if proper intellectual property regimes are not in place. As Winter (1987) perceptfully phrases it, ease of disclosure is a decidedly ambiguous variable. It is obvious that knowledge assets like all assets matter strategically to the extent that they are difficult to imitate by competitors. They need to be "sticky" as some observers (Dunning, 1997; Porter, 1997; Brown and Duguid, 1998; Teece, 1998) comment. To the extent, however, that features encouraging voluntary transfer of knowledge exhibit the tendency to encourage involuntary transfers as well, knowledge is a resource that is decidedly difficult to manage. It may in fact not be "sticky" at all.

On the one hand, sustaining competitive dominance requires protection mechanisms to inhibit knowledge imitation by competitors, while on the other hand, effective value extraction from knowledge requires that the firm itself be capable of replicating it domestically and in strategic partnerships. There is, however, increasing speculation that, for the very same reasons that competitors cannot imitate a firm's knowledge, the firm itself may be unable to replicate and exploit it effectively within corporate boundaries and in knowledge sharing arrangements (Spender and Grant, 1996; Grant, 1997; Hamel, Doz, and Prahalad, 1989; Lippman and Rumelt, 1992; Teece, 1998). Apparently, factors that make imitation difficult, have the lamentable tendency to make replication difficult and vice versa, thereby indicating a dilemma situation. Spender and Grant (1996) suggest conceptualising this dilemma for KM as follows, for the same reasons that competitors might find the imitation of e.g. tacit knowledge difficult, so the company itself

may have difficulties in replicating it internally. To this extent, Polanyi's "we know more than we can tell" would assume a wider validity beyond the personal context for which it originally was conceived, as the quotes by HP and TI CEOs have suggested.

- A second dilemma in KM seems to emanate from the ambiguity of corporate traditions. While these traditions may be instrumental in sharing, particularly tacit forms of knowledge through creating a context of mutual understanding, they are inherently static and often not very susceptible to adaptations. It seems, however, intuitively apparent that companies survive on their ability to adapt when necessary, and in the turbulent business environments of the late 20th century, it would be increasingly necessary for them to do so, because technological discontinuities can enhance or destroy the validity of existing knowledge within the corporation. The tradition of knowledge could play an ambivalent role in this process of adaptation. On the one hand, as some authors suggest, competitive dominance may emanate from difficult to imitate knowledge assets and capabilities (e.g. Prahalad and Hamel, 1990; Teece, Pisano and Shuen, 1997; Barney, 1991) which are nurtured by corporate traditions. On the other hand, institutionalised capabilities may lead to "incumbent inertia" (Leonard-Barton, 1992, 1995) in the face of environmental changes, thereby inhibiting appropriate adaptation. To this extent, at any given point in a corporation's history, knowledge seems to be evolving and corporate survival can be seen as depending upon successfully managing that evolution. According to Leonard-Barton, new product and process development projects are obvious arenas for conflict between the need for innovation and retention of established knowledge bases in the corporation (Leonard-Barton, 1992). The challenge for KM may reside in taking advantage of organisational traditions, without being hampered by their dysfunctional flip-side.

In summary, it has been argued that some types of knowledge can be rather explicit, articulated and "packaged" and thus relatively easy to transfer within and between firms. Such knowledge would migrate in the business community, and be in principle accessible. However, some knowledge, particularly the tacit variety, can be very firm-specific and less diffusible across functional boundaries within the firm and across corporate boundaries in strategic alliances. This indisposition towards transfer need not necessarily be viewed as undesirable, because their idiosyncrasy seems to make tacit forms of knowledge inherently less prone to imitation. Precisely this idiosyncrasy, however, appears to have the tendency to detach knowledge nurtured in the company from critical scrutiny, thereby possibly inhibiting appropriate adaptation of the company in the face of environmental changes.

3 Knowledge agents in organisations

The emerging consolidation of thinking on knowledge in organisations has yielded the contention that the first and foremost property of knowledge could be the explicit/tacit distinction. Along with this awareness seems to have come the realisation that underlying this critical taxonomic dimension may be the additional complexity that knowledge carried by individuals only reaches its full potential to create economic value for the company if it is embodied in organisational routines. The second key property of knowledge in business is concerned with knowledge agents in the organisation. Within this area of focus, however, there appears to be dissent of views concerning the question whether knowledge may be possessed and created by the individual employee and/or the organisation.

This second focus in the literature investigates knowledge at various levels, (viz. individual, group, organisational) and strives to ultimately discern which represents the appropriate level of analysis. Hence, recent discussions of knowledge in organisations remain divided over whether individual knowledge, shared by corporate employees (Drucker, 1993; Grant, 1996; Roos and Roos, 1996), or whether organisational knowledge, embedded in organisational routines is meant (Nonaka and Takeuchi, 1995; Spender, 1996a).

It must briefly be emphasised that the pursuit for the appropriate unit of analysis, among such entities as organisation and individual, while certainly of merit, seems to downplay a much more fundamental phenomenon. Recalling from the previous analyses in the present study, it would appear that an underlying consensus in the KM realm seems to be to scale the investigation to the level of knowledge (see, e.g. Roos and Roos, 1997; Nonaka and Takeuchi, 1995). This suggests that, actually, knowledge as such represents the appropriate, and commonly agreed upon unit of analysis. Two important aspects of this conjecture deserve attention.

- Firstly, and most importantly, it seems that the preoccupation with delineating the appropriate unit of analysis among individual and organisation suggests that an important property of knowledge can be that the individual and/or the organisation can possess knowledge. This focus seems to obscure the properties of the very knowledge residing at the individual and/or organisational level. Thus, while the preoccupation in the literature seems well versed upon distinguishing between individual and organisational knowledge, it fails to describe the properties of each. Yet, underscoring these properties seems to be tremendously interesting, in view of the fact that organisations, which seem to be increasingly dependent on knowledge workers (Drucker, 1999a, 1999b; Quinn, Anderson and Finkelstein, 1998) would clearly need to know more about the properties of such

individual knowledge, in particular, how it can be transferred to, and ascertained at, the organisational level. This seems to suggest worthwhile areas for rigorous inquiries.

- The second important speculation to be made relates to an inappropriate mixture of units of analysis in current KM discourse. To the extent that current thought analyses KM on the level of knowledge, and simultaneously on the level of the individual and/or the organisation, it appears to be involving two different units of analysis.

The scope of the present study, however, precludes further inquiries into these details of individual versus organisational cognition (e.g. von Krogh and Vicari 1993, as well as von Krogh and Roos, 1995 provide a comprehensive review of the subject). Rather, the objective is to highlight the inherent benefits and fallacies in each school of thought. The idea of individual versus organisational knowledge appears to be relatively unproblematic at this general level. The contention of the individual as a cognitive entity is presented first; this is followed by a discussion concerning the possibility of viewing the organisation as a cognitive entity in its own right. Reviewing an attempt at synthesis of the two streams of thought concludes the present section.

3.3.1 The individual as the knowledge agent

Inquiries into individual cognition, often emanating from fields of study such as biology, psychology and sociology, rather than business management, are not a new phenomenon. Particularly research of the human brain appears to have influenced the study of the firm in that it provided a new understanding of the cognitive behaviour of the single employee. As von Krogh and Vicari explain, the research pioneered by Sperry (1968) indicated that the human brain consists of two separate hemispheres, i.e. the left and right brain, each of which seems to be different in character. While one part works in a rational and analytical manner, the other part works in an emotional and syncretical fashion (von Krogh and Vicari, 1993). This insight, explain von Krogh and Vicari, has been applied in the study of management behaviours, and can for instance be recognised in the works of Mintzberg (1976), Isenberg (1987), and Taggart and Robey (1981). With the recent surge in attention to knowledge related matters, investigations in this field have received new impetus. Observers in this area seek to establish reasons for the predominant importance of individual (Drucker, 1993; Grant, 1996), as opposed to organisational cognition as a suitable unit of analysis in KM (Spender, 1996a; Nonaka and Takeuchi, 1995).

Grant's analysis, for instance, is an eloquent apology for the individual as the unit of analysis. This author posits that only the individual should be considered as a knowledgeable entity. Similarly to Drucker (1994), Grant maintains that firms exist because they are instrumental in providing conditions under which multiple individuals can integrate their specialised knowledge. Firms, themselves, he contends, may not create or possess knowledge themselves. Firms to Grant have merely instrumental value. It is argued that this dispensing of the concept of organisational knowledge in favour of emphasising the role of the individual in creating and storing knowledge is motivated by Simon's (1991: 125) observation that "all learning takes place inside individual human heads, an organisation learns in only two ways: (a) by the learning of its members, or (b) by ingesting new members who have knowledge the organisation didn't previously have" (Grant, 1996).

Grant emphasises that his notion of knowledge in organisations allows him to analyse and understand organisational processes through which firms access and utilise the knowledge of their employees. The danger, he argues, inherent in the concept to organisational knowledge is that, by viewing the organisation as the entity, which creates, stores and deploys knowledge, the organisational processes through which individual employees engage in these activities may be obscured. In contrast, the dismissal of the concept of organisational knowledge in favour of emphasising individual knowledge is considered useful, as it may direct attention to mechanisms through which such organisational knowledge is created, namely through the interaction of individuals, claims Grant (1996).

Grant's ontology can be summarised by two main propositions: (1) knowledge creation is primarily an individual activity and that (2) the primary role of the firm is the application of existing knowledge to goods and services (Grant, 1996).

It would appear that the concept of organisational knowledge should not be dismissed so easily. It is obvious that, through a singular focus on individual knowledge, the very processes that turn the knowledge of individual employees into organisational knowledge cannot be conceptualised. In fact, Grant (1996) is quick to point out that his emphasis on the firm as an institution for knowledge application is not to deny the importance of organisational context in knowledge creation. With the Polanyian tradition in mind, it seems intuitively apparent that the firm, through the very interaction of individual employees may create a synergistic knowledge that might be termed organisational knowledge. This in turn may be seen as establishing the firm as a cognitive entity.

Such logic would not, however, dismiss the individual as a knowledge agent in its own right. In fact, it can be seen as accentuating the notion of the individual as a knowledge agent. For example, as the concept of a learning curve suggests, the individual organisational member may become better at resolving a task as time goes by. A common managerial response to this increasing proficiency often is to implement a set of work descriptions or other organisational routines and traditions that ensure the capturing and repetition of successful task resolution behaviour. Task perfection along these lines seems to require that the task presents itself to the organisational member as a set of recurrent assignments (von Krogh and Roos, 1995).

To the extent that organisational traditions and routines suggest the relevance of both, individual and organisational knowledge, it is decidedly difficult to establish which is more important. It is further very difficult to "say what is the chicken and what is the egg" (von Krogh and Roos, 1995: 69), probably because the question of whether "the hen is just a means for the egg to bring forth new eggs" (von Krogh and Roos, 1995: 87) is equally troublesome.

3.3.2 *The organisation as the knowledge agent*

Similarly to inquiries into individual cognition, attention to organisations as cognitive entities are well established in the management literature. In this line of thought, the organisation is understood not only as a collection of individual cognition, but also as a cognitive system in its own right. Different approaches to the organisation as a cognitive system have been suggested. Without pretensions of a full review, some examples of organisational knowledge and related matters include Smircich (1983), who argued that the firm resembles a cognitive system through its organisational culture. Following this argument, Draft and Weick (1984) proposed that organisational culture might be found in the shared "cognitive scripts" of organisational members. More recent contributions investigate the applicability of the theory of autopoiesis to the KM literature. (Autopoiesis is a word of Greek derivation, auto = self, poiesis = production, and has its roots in neurobiology where it is used to explain cognition in living systems; see, e.g. Maturana, 1958; Maturana and Varela, 1987.) It is argued that the firm should be understood as an autopoietic system (von Krogh and Roos, 1995; von Krogh and Roos, 1996; von Krogh, Roos and Slocum, 1993). Very briefly, the autopoiesis approach to organisational learning suggests that organisations, like living systems, are, or should be, self-organising, in the sense of being able to adapt to changes in the environment (for related arguments, see, e.g. de Geus, 1997; Cilliers, 1998).

Similarly to the foregoing debate concerned with the individual as a cognitive entity, an underlying concern in the discussion of the organisation as a cognitive system seems to be the quest for the identification of the appropriate unit of analysis. Von Krogh and Roos (1995) have admirably summarised the challenges residing in establishing the organisation as a knowledge agent in its own right:

“Suggesting a notion of ‘organisational knowledge’ is no longer a simple idea, and should produce even more difficult questions giving rise to even deeper bewilderment. Given that the knowledgeable individuals come together, does the organisation know? And how does it actually know? And what does it actually know? More or less than the individuals engaged in it know?” (von Krogh and Roos, 1995: 4).

Nonaka and Takeuchi, seem to be prominent proponents of this stream of thought. Unlike Grant (1996), these authors view the organisation as a knowledge creating entity, hence the title of their book, “The knowledge creating company.” The work of the two Japanese authors emphasises that organisations cannot know independently of their employees. It is contended however that the organisation can effectively create and possess knowledge. According to Nonaka and Takeuchi “organisational knowledge creation should be understood as a process that ‘organisationally’ amplifies the knowledge created by their individuals and crystallises it at the group level through dialogue, discussion, experience sharing, or observation” (Nonaka and Takeuchi, 1995: 239). Similar arguments are put forward in Nonaka’s other work (e.g. Nonaka, 1994; Nonaka and Konno, 1998).

Nonaka and Takeuchi share with Grant (1996), Drucker (1993), as well as von Krogh and Roos (1995) the view that the managerial challenge resides in supporting and stimulating the knowledge creating activities of their individual employees through providing an appropriate organisational context. But, unlike Grant, the Japanese scientists contend that the firm, in addition to its instrumental value has the capacity to create knowledge through synergistically integrating individual knowledge bases (Nonaka and Takeuchi, 1995).

The key difference between Nonaka and Takeuchi’s (1995) and Grant’s (1996) treatment lies in the former presuming that the organisation can, albeit not independently of its employees, create knowledge. Viewing both, the individual and the organisation as intellectually capable allows them to posit mechanisms through which organisational knowledge can be “detached” from its agent and transferred to the individual and vice versa. This would be an important

observation, to the extent that such internal replication, involving imparting and re-deploying knowledge from one setting to another, can be seen as a cornerstone in KM.

Grant's (1996) analysis, by default of a concept involving organisational knowledge, strictly speaking precludes this author from understanding mechanisms that feed organisationally amplified knowledge back into individual employees, thereby creating a synergistic process. In other words, Grant's theory could not explain how individuals acquire organisational knowledge from submitting themselves to the Polanyian tradition, quite simply because there is no organisational knowledge in Grant's analysis. Organisational employees, to Grant, can only learn from one another. This can be seen as seriously compromising the potential of Grant's analysis because it makes it impossible for this author to describe what may be seen as a major part of organisational KM.

3.3.3 A broader-gauged view on knowledge agents

Spender (1996a) emphasises that the individual should always be considered in the context of organisational processes that rely on individuals as active agents. Similarly to Nonaka and Takeuchi's (1995) earlier treatment, it is argued that both, individual and organisation can be knowledgeable entities, with the latter being incapable to developing knowledge independently of its employees. Moreover, like Nonaka and Takeuchi, this author seeks to discern tools and mechanisms through which knowledge can be detached from the knowing entity and transferred to other agents.

Spender's analysis, however, transcends Nonaka and Takeuchi's (1995) treatment in that dispositions of individual employees, which may inhibit or enhance the replicability of individual knowledge within organisations, are emphasised. Unlike Nonaka and Takeuchi's individual, who, given a supportive infrastructure, is a priori disposed to replicate her knowledge in the organisation, Spender's (1996a) employee is characterised by an inherent indisposition to impart knowledge and learn. It can be speculated that a Japanese perspective on the commitment of individual employees and their predisposition to learn and impart knowledge could motivate Nonaka and Takeuchi's (1995) perception. In contrast, Spender claims that

"the social influence is clearly mediated by a an irreducible or random element of individuality. We must argue that organisations learn and have knowledge only to the extent that their members are malleable beings whose sense of self is influenced by the organisational evolving social entity. We argue for an organic or synergistic sense

of collective entity quite different from the mechanical sharing which treats the organisation's identity as a mere classificatory device in a way of identifying which individuals share a particular body of knowledge" (Spender, 1996a: 53).

Spender's (1996a) less idealistic contention of the individual may, arguably, more realistically capture the situation in many organisations. What his comprehensive analysis does not problematise, however, would be the propensity for knowledge replication and learning not only of the individual, but of the organisation as well.

For the purpose of this study, it seems useful to include the notion of organisational learning in the analysis. Two reasons guide this contention. Firstly, and most importantly, conceiving of organisations as knowledgeable entities, personifying them, so to say, allows one to deal with issues pertaining to inter-organisational settings. It would appear that the greatest fallacy of a singular focus on individuals as the only knowledge agents is that doing so renders an analysis of KM in an inter-organisational level logically impossible. Such a theory would be well suited for an analysis of knowledge among individual employees, i.e. within organisations, but precludes analyses of knowledge among organisations. This is important in view of chapters 5 and 6, where processes to impart knowledge both within and between organisations shall be discussed. In a similar vein, it would appear that an analysis of not only the disposition of individuals but also of organisations to accumulate and replicate knowledge could be at the heart of KM, which would seek, *inter alia*, to explain how these social systems adapt or process incoming stimuli (Aadne, von Krogh, and Roos, 1997). These outcomes can be attributed to organisational properties, policies and knowledge infrastructures, which would be obscured by a singular focus on individual properties as in Spender's (1996a) analysis.

The second reason for adopting the notion of organisational knowledge as a complement to individual knowledge is that it is well established, while often ill motivated, in the organisation science literature, where organisational learning is a central tenet and is believed to be conducive to competitive advantage (see, e.g. Senge, 1990; Moingeon and Edmondson, 1996). Moreover, the notion of organisations as cognitive entities is also well established in popular usage ("Our company knows a lot but we don't really know what we know," as von Krogh, 1999 explains).

To summarise this far, within the second property that crystallised in the literature, there appears to be an ongoing and unresolved debate in the literature as to who is intellectually capable, the organisation or its individual employees. In this debate, some authors propound

that only the individual is a knowing entity, whereas others maintain that the organisation is. For a third school of scholars, both are capable to learning and processing knowledge. In this school, however, a bias is evident towards traits that impact such knowledge processing only on the level of the individual employee. What would be neglected are characteristics inherent in organisational structures that may fundamentally impact the learning propensity of organisations. In view of the literature analysis, it seems a reasonable conjecture to assume that the organisation can and should be seen as something more global than an aggregate of individual cognition. A synstudy seems best suited to accommodate the divergent perspectives reviewed. In this study, it shall therefore be contended that individuals and organisations are both capable of creating and processing knowledge and the unit of analysis should certainly not be restricted to either.

3.4 Summary and key implications for knowledge management

3.4.1 Summary

Extant KM research seems to build on a fundamental premise. This premise suggests that the most important properties of knowledge are, firstly that knowledge in organisations can be tacit and/or explicit; and secondly, that it can be possessed by the individual organisational member or by the organisation itself. In recognition of the attention these two properties are devoted in current discourse, each has been discussed in some depth. Concomitant implications for KM have been provided subsequently in order to further sensitise the reader to the properties of knowledge and their ramifications.

Relevant sections of Polanyi's original theory of explicit/tacit knowledge have been illustrated first. For the purpose of enhancing an insight into the concept of KM, this seems a beneficial exercise, because although Polanyi's concept of tacit/explicit knowing seems to belong to common vocabulary today, Polanyi's underlying epistemology does not appear to be commonly known. An analysis of the benefits and fallacies of regarding the individual and/or the organisation as a cognitive entity has been provided subsequently. This seemed necessary in view of the prevailing dissent in current discourse, as to who actually can be seen as intellectually capable, the individual, the organisation, or both. It was concluded that both the individual employee as well as the organisation should be seen as capable of owning and processing knowledge. It has been argued that a major reason guiding this contention emanates from the fact that conceiving of only the individual as the cognitive entity makes analysis of KM on an inter-organisational level logically impossible. Similarly, adopting the organisation as the primary knowledge agent might obscure the processes through which individual organisational members acquire and disseminate knowledge.

3.4.2 Key implications for knowledge management

In view of the importance the two key properties are accorded in the development of extant KM models, it would be beneficial to appreciate their implications. The major implications for KM, which were discussed throughout the present chapter, are:

- (a) Typically, tacit knowledge, by virtue of its unique properties, does not travel as easily as explicit knowledge between companies. Tacit knowledge is usually implicitly grasped and embedded in organisational routines and traditions and is therefore not easily disclosed. As a result, it diffuses slowly and can only be transferred directly, i.e. through the transfer of people. This "stickiness" of tacit forms of knowledge need not necessarily be viewed as undesirable, because it can make the knowledge asset in question inherently more easy to protect than explicit knowledge. It would therefore be axiomatic for companies to be strategic about what to disclose and when to disclose it.

- (b) Companies often create and collect too much knowledge of which the less important compounds are likely to exhibit the tendency of overshadowing and/or downplaying the more important compounds. This may lead to a compromised transparency of internal knowledge practice, and by implication, to a redundancy of effort in the corporation ("reinventing the wheel"). Likely outcomes of this inadequacy are described by two prominent corporate leaders: Jerry Junkins, the late CEO of Texas Instruments laments "If Texas Instruments only knew what Texas Instrument knows" (cited in O'Dell and Jackson Grayson, 1998: 154), this is echoed by Lew Platt, chairman of Hewlett Packard, "if HP knew what we know, we would be three times as profitable" (cited in Despres and Chauvel, 1999: 6). Establishing, or enhancing the transparency of knowledge practice in the organisation appears to be an important aspect of corporate KM.

- (c) Corporate traditions and cultural patterns seem to be ambiguous phenomena. Such patterns, while important in their capacity to facilitate the dissemination of tacit knowledge, and tend to be structurally relatively stable over time, thus potentially obscuring the tendency of knowledge to depreciate. It would therefore be cardinal to scrutinise the relevancy of the knowledge created and nurtured by organisational traditions to the competitive environment. Inherent in the successful evolution of organisations could therefore be the paradoxical struggle to maintain, yet to renew such tradition. The managerial challenge seems to reside in taking advantage of organisational traditions and routines without being hampered by their dysfunctional

flip side. For this purpose, a self-critical awareness should be instilled in the corporation in order for such tradition and its ramifications to become conscious in the minds of the individual employee, and to ultimately “defy the old paradigms” (Nasser and Vivier, 1993) in a purposeful fashion.

- (d) Intra-organisational groupings (e.g. departments) through sharing the specialised knowledge of individual contributions may often create a form of synergistic knowledge that transcends the expertise of individual contributions. A fundamental question to be answered is who actually creates, bears and processes valuable knowledge in the organisation. This implication in turn should be assessed in the light of the question of how individual knowledge can best be imparted to be of value at the group level and vice versa. Ultimately, the individual employee, as well as the organisation as such should be appreciated as cognitive entities. This view would direct attention to processes through which knowledge diffusion and protection occurs not only within, but also between companies.

In conclusion it should be emphasised that the implications as presented throughout this chapter are designed to complement the analysis on the properties of knowledge and their ramifications for KM as provided in the foregoing chapter. Appropriate KM models would need to cater for these implications.

Part II: The concept of knowledge management

CHAPTER 4: A comparative analysis of extant knowledge management models and conceptual aids

4.1 Introduction

The increasing impact of knowledge as an organisational resource and factor input and its wide applicability to diverse industries emphasises the rising importance of appropriate KM approaches and conceptual aids to cover this reality. As KM is growing rapidly and seems to be gaining significant impetus, managers are advised to familiarise themselves with current KM approaches and corollary models in the literature. For this familiarisation, a deep understanding of eminent conceptual aids for KM, of their premises and assumptions, and of their relative strengths and weaknesses seems useful.

Integral to a comprehension of the concept of KM in the literature would be, firstly, a good grasp of the relative contributions of current KM models towards managing knowledge in organisations; secondly, an awareness concerning the appropriateness of an incumbent paradigm in which these models were conceived; and thirdly, an appreciation of the logicity and sophistication of the models themselves. For expository purposes, this analysis is divided in two chapters. While the present chapter is concerned with the first aspect, the ensuing chapter 6 explores the second and third area of investigation.

The purpose of this chapter is a comparative analysis of three major extant approaches, conceptual frameworks and techniques to aid KM in organisations, which have been chosen eclectically. This analysis shall serve as a background to the analysis in chapter 6. Particular emphasis is put on the delineation of the relative contributions of each model. The investigation is presented in four steps: firstly, opinions concerning the inherent propensity of knowledge to management are reviewed. This exercise is considered useful in view of putting the general merit of the approaches and models that are subsequently presented in perspective; predicated on the belief that knowledge can be managed, three major approaches which are used to build KM models are discussed in a second step; thirdly, the operationalisation of these approaches along with their relative benefits and contributions are analysed; finally, the main aspects of the present analysis are summarised.

4.2 The amenity of knowledge to management

The fundamental premise behind the delineation of KM approaches is that knowledge can in the first place be managed. Concerning the amenity of knowledge towards management, there is little consensus in the literature whether knowledge is susceptible to management at all. While a need to manage this resource seems to establish itself as common wisdom in the literature, it has been observed that a vocal chorus of observers proclaims that, in view of the complex properties of knowledge, it may be entirely inaccessible to managerial practice (Nonaka, 1998; Prusak, 1999). For the purpose of providing an improved understanding of the concept of KM, it seems useful to consider these “cynical detractors” (Prusak, 1999: 10) in order to sustain an unbiased perspective on the phenomenon under investigation.

Stehr, for instance, insists that knowledge cannot be managed in a business context. The reason for this inherent indisposition to systematised treatment in organisations is seen as lying in the intangibility of the concept in question (Stehr, private communication, March 19.1999). In a similar vein, Prusak has observed that due to its intangible character, knowledge may be unmanageable and “runs counter to the tendency of organisations to select projects that are based on some form of quantifiable benefit” (Prusak, 1999: 10). This author observes that it is often argued that knowledge, by virtue of its intangibility may be difficult, if not impossible to manage, because such management would presume a tangibility of benefit that will measurably improve organisational performance.

Other observers take a similarly sceptical stance. For example, Skyrme (1997) believes that knowledge is a resource that cannot be managed. Knowledge is perceived as a capacity of people and communities, which is continuously generated and renewed through interaction, but eschews management. Instead, what can be managed may be the context; i.e. an environment can be created that enhances such creation and sharing of knowledge, suggests Skyrme. Two Swedish students have insightfully commented that this argumentation is not cogent, as it implicitly assumes an inherent manageability of knowledge, albeit indirectly, through context. The authors ask, “would, maybe, ‘knowledge context management’ be a more suitable terminology to this author’s mind?” (Hiertzen and Toll, 1999: 43).

Scepticism concerning the manageability is epitomised by Nonaka, co-author of the path-breaking book “The knowledge creating company.” Consonant with Skyrme (1997), Nonaka contends that the creation of knowledge cannot be managed, because the notion of creating knowledge runs counter to what is referred to as “control mentality” of traditional

management science. "Given a certain context, knowledge emerges naturally. You will have to give your employees a lot of latitude, not try to control them," affirms Nonaka (1998: 8).

Nonaka further draws a sharp distinction between knowledge management and knowledge creation, as illustrated by the following episode. In naming the first chaired professorship dedicated to the study of knowledge and its impact on business, the Haas School of Business at the University of California, Berkeley, initially recommended the title "Xerox Distinguished Professorship of Knowledge Management." Nonaka inquired if the title could be altered to "Xerox Distinguished Professorship of Knowledge Creation." As a compromise, it was agreed to refer to his chair as "Xerox Distinguished Professorship in Knowledge" (Nonaka, 1998: 6). This episode is quite ironic, as Nonaka is often cited as one of the most prominent, if not the most prominent authority on knowledge *management*.

Notwithstanding the above-mentioned sceptical views on the propensity of knowledge to management, it will be contended in this study that knowledge in organisations can and should be managed. This conviction is in line with the general perception in the literature, where it is acknowledged that while knowledge may feature properties that render it less amenable to management than other resources, they do not render manageability impossible. Moreover, as prominent observers have predicted, competitive dominance may increasingly depend upon knowledge and its systematic management (see, e.g. Drucker, 1993, 1994; Toffler, 1970, 1990; Quinn, 1992; Reich, 1991). This suggests that failure to systematically tend to knowledge might lead to an important area of neglect in organisational value creation.

4.3 A comparative analysis of extant knowledge management models

As widespread importance for knowledge as an organisational resource to be managed was realised in the literature, a next logical step for scholars seems to be to learn more about the properties of knowledge that impact its manageability. After the two critical properties have been delineated, these properties apparently had to be configured in ways that render them manageable.

The resulting models can be interpreted as attempts to put the concept of knowledge in organisations as presented in chapters 2, and 3 into a manageable format. In this section, three KM models (Spender, 1996a; Hedlund, 1994, 1996b; Nonaka and Takeuchi, 1995) are comparatively analysed. While the majority of authors in the KM field builds arguments from the platform of the recent consolidation of thinking on the properties of knowledge (see, e.g.

Davenport and Prusak, 1998; von Krogh and Roos, 1995; Grant, 1996, 1997), the three models are chosen for illustrative purposes because they seem to exemplify the potential of the extant approach an conceptualisation of KM in the literature. The analysis is structured using two main areas of investigation, viz. firstly, the approaches used to built the three models are discussed; building on these insights, the models and their relative contributions are analysed comparatively.

4.3.1 The approach and conceptualisation

The consolidation of thinking on salient properties of knowledge in business as presented in chapter 2 seems to form the basic paradigm within which current approaches and conceptual aids to KM are designed. The basic argument in the literature seems to build on the premise that the management of knowledge in an organisational context revolves around two critical issues, viz. the interplay of tacit and explicit forms of knowing, and the purposeful disclosure of knowledge among individuals, organisational units and organisations themselves. It is generally consented that a conceptual framework building on this paradigm captures essential aspects of KM (see, e.g. Hedlund, 1994; Nonaka, 1998; Nonaka and Takeuchi, 1995; Spender, 1996a, 1996b). The configuration of this framework by three authors (Spender, Hedlund, and Nonaka) is the concern of the analysis in the present section.

4.3.1.1 Spender's approach to knowledge management

Spender's (1996a, 1996b) approach builds on earlier work (Spender, 1992, 1993). The primary objective behind Spender's KM model is to categorise knowledge in organisations and, through delineating strategies based on these categories of knowledge, to construct a knowledge based theory of the firm. Spender's approach is characterised by the configuration of the two key distinctions in knowledge properties as the dimensions of a matrix. Within this framework, the author differentiates between tacit and explicit forms of knowing (the former of which is referred to as "implicit" knowledge) on the vertical axis and between individual and social forms of knowledge on the horizontal axis. The resulting two by two matrix is illustrated in figure 4.1.

Figure 4.1: Spender's approach

	Individual	Social
Explicit		
Implicit		

Source: Adapted from Spender, 1996b: 64.

The dual epistemology differentiating between implicit and explicit knowledge in Spender's analysis draws on Polanyi's original distinction. It is unclear, however, why Spender chose to use the term "implicit" as opposed to "explicit," when there appears to be little difference between the terms and when the latter has already been relatively widespread in use.

As regards the individual/social dimension in figure 4.1, Spender distinguishes between the knowledge that has been developed by the individual and shared with others (individual knowledge) and that which is part of a social system (social knowledge). The notion of social knowledge represents a fundamental construct in Spender's theory of knowledge in organisations. It goes beyond a mere collection of individual cognition and suggests a "collective mind" (Spender, 1996b: 62) in its own right (the previous chapter provides a more comprehensive discussion of Spender's concept of collective knowledge). While Spender is very specific concerning what is meant with social knowledge, this author seems to be less clear concerning the level of organisational interaction (e.g. intra-organisational units, the single organisation, or inter-organisational configurations) on which this social knowledge resides.

In summary, Spender's (1996a, 1996b) approach to KM is characterised by a juxtaposition of the two principal properties of knowledge in a matrix format. His principal contribution seems to reside in collating the two fragmented constructs into an integrated theoretical perspective.

4.3.1.2 Hedlund's approach to knowledge management

Hedlund's (1994) primary objective is the elucidation and clarification of differences and similarities between Japanese approaches to tending to knowledge in organisations, as opposed to "Western" (a term the author uses to describe US/American firms) approaches, and builds on earlier work by this author (Hedlund, 1993; Hedlund and Rolander, 1990; Hedlund and Nonaka, 1994). Similarly to Spender (1996a, 1996b), Hedlund's approach to

KM revolves around the two properties of knowledge that emerged through the consolidation of thought on salient features of knowledge in organisations. Again, the two distinctions are conceptualised using a matrix format. With regard to the tacit/explicit distinction, Hedlund draws on Polanyi for the concept of tacit forms of knowing; and in line with Winter's (1987) analysis explicit knowledge is referred to as "articulated knowledge." Hedlund is not very specific as to what is meant with articulated knowledge and merely explains that "articulated knowledge is specified either verbally or in writing, computer programs, patents, drawings and the like" (Hedlund, 1994: 75). As with Spender's "implicit knowledge," it is unclear why Hedlund gave preference to the term "articulated knowledge" as opposed to "explicit knowledge," when there appears to be little difference between the terms and when the term "explicit knowledge" appears to be relatively popular, already.

Furthermore, very similar to Spender (1996a, 1996b), Hedlund suggests the adoption of the prevalent individual/social distinction. It is noteworthy however that Hedlund splits Spender's social form of knowing into three constituents, viz. "group," "organisation," and "inter-organisational domain." Thus, the essential contribution of Hedlund seems to be that he expounded in relative detail on the social form of knowledge in Spender's model, through the introduction of intermediate levels. The introduction of the "group" as an intermediate level should be welcomed, because as much of the literature on KM and organisational studies suggests, this could be where most communication, learning and knowledge transfer within the organisation actually takes place (Brown and Duguid, 1998; O'Dell and Grayson, 1998; Nonaka and Takeuchi, 1995).

Hedlund further complements Spender's analysis in that the scope of analysis is widened beyond the one-firm setting, through the introduction of knowledge on an inter-organisational level. This knowledge domain, according to Hedlund, captures suppliers, customers, subcontractors, and collaborating organisations. The introduction this inter-organisational level seems to further enhance the usefulness of Hedlund's model. For example, collaborative knowledge sharing arrangements among affiliated companies can be a convenient source of critical knowledge assets. This seems to assume increasing relevance in an environment where few firms can afford to develop internally all the knowledge that might confer a competitive advantage in the future. Thus, where internal knowledge development requires excessive time, money and risk, such collaborative arrangements would lend themselves as a natural alternative (Hamel, Doz and Prahalad, 1989; Lei and Slocum, 1992, Leibold and Slabbert, 1994). Therefore, particularly the introduction of an inter-organisational domain should be acclaimed, because it may be at this level that critical knowledge transfer takes place in the present business environment.

As in Spender's case, the distinctions between knowledge on various organisational levels on the one hand and between tacit and explicit knowledge on the other hand form the horizontal and vertical axis, respectively. The articulated and tacit forms of knowledge are claimed to exist at all four levels of organisational interaction. The resulting two by four matrix is presented in figure 4.2.

Figure 4.2: Hedlund's approach

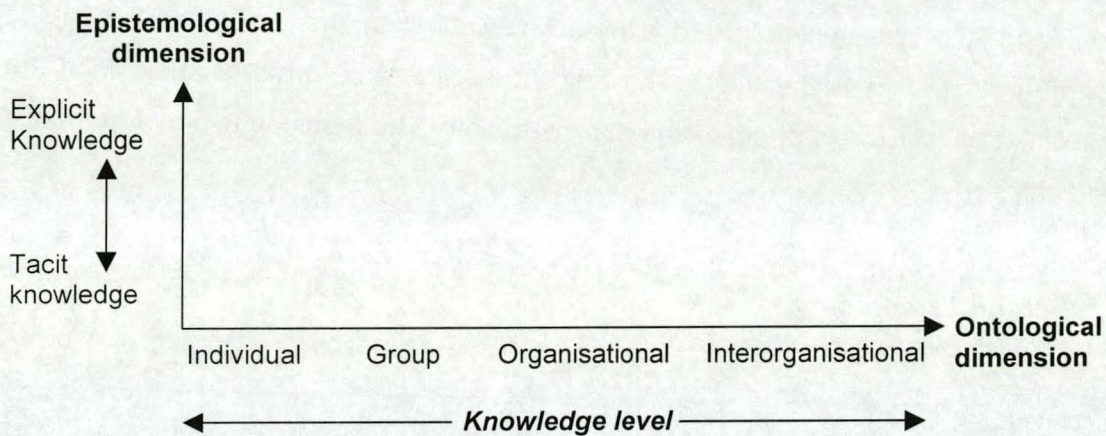
	Individual	Group	Organisation	Interorganisational Domain
Articulated Knowledge				
Tacit Knowledge				

Source: Adapted from Hedlund, 1994: 75.

To summarise this far, the essential contribution of Hedlund's approach seems to be the extent to which the somewhat amorphous concept of social knowledge as presented by Spender was expanded and systematised. The resulting interfaces, viz. knowledge at the group level and at the interorganisational level seem to capture critical loci of knowledge in the organisation and its environment. These loci would constitute an important area of neglect in Spender's approach, because it may be in these arenas that substantial KM input is needed.

4.3.1.3 Nonaka's approach to knowledge management

In line with Hedlund (1994) and Spender (1996a, 1996b), Nonaka's approach to KM is predicated on the belief that KM in corporate contexts revolves around two critical distinctions, which can be conceptualised using a two-dimensional matrix format. Nonaka refers to the explicit/tacit distinction as the "epistemological dimension" of tending to knowledge in organisations. The organisational level at which knowledge resides, viz. "individual," "group," "organisational" and "inter-organisation" constitutes the "ontological dimension" in Nonaka's approach to KM. Similar to Hedlund, Nonaka's approach usefully subsegments Spender's concept of knowledge at the social level (Nonaka, 1994, 1998; Nonaka and Takeuchi, 1995). The two dimensions of Nonaka's approach are illustrated in figure 4.3.

Figure 4.3: Nonaka's approach

Source: Adapted from Nonaka, 1994: 20.

In reviewing Nonaka's approach to tending to knowledge in organisations, it must again be appreciated that this author vehemently defends the contention that knowledge in organisations cannot be managed. Nonaka's theories, according to the author himself, are primarily concerned with investigating the creation of knowledge in organisations, not with KM. This preoccupation is reflected in the primary objective of this author, viz. to formalise a generic model of organisational knowledge creation (Nonaka and Takeuchi, 1995). As was emphasised before, this rationale stands in contrast with popular usage of Nonaka's theories as pertaining to KM. In fact, the author himself appears to be rather ambiguous in terminological matters, as the following quote illustrates:

"Organisational knowledge *creation* takes place when all four modes of knowledge creation are organisationally *managed* to form a continuous cycle" (Nonaka, 1994: 20, emphasis added).

In the present study and in line with academic discourse on knowledge related matters in general, Nonaka's approach shall be viewed as appertaining to KM. While this may not do justice to the original convictions of the author, it is considered appropriate for the purpose of this study. Referring to Nonaka's theories as KM would be useful for at least two reasons: first and foremost, the theories of this author are generally thought of as pertaining to KM in the literature; and secondly, an alternative effort would, through the merit of terminological precision possibly engender conceptual confusion and would therefore not contribute to an improved understanding of the concept of KM as such.

To summarise, Nonaka's approach to KM is structurally very similar to Hedlund's (1994). An important contribution that is made by Nonaka, however, does not reside in the approach used, but in its operationalisation, as shall be demonstrated in the following section.

In conclusion, the approaches, on which the three KM models reviewed in this study are building, seem to be conceptually rather homogenous. The two critical properties of knowledge are juxtaposed and systematically analysed in conjunction in the three approaches discussed. The format adopted for this juxtaposition seems to be the matrix, with each distinction forming a dimension in the framework thus created. With the general approach examined, the comparative analysis can now proceed with the operationalisation of the individual approaches.

4.3.2 The operationalisation

The operationalisation of the individual approaches seems to build on the platform of the above-mentioned juxtaposition of the two salient properties of knowledge in a matrix format. Through this juxtaposition, different categories of knowledge are attributable to the individual quadrants in the matrices. The relationships between these quadrants, i.e. the interactions between the different categories of knowledge form the basis of the delineation of KM models.

To this extent, the operationalisation of extant KM approaches would revolve around the delineation of appropriate knowledge categories and the conceptualisation of their interaction. This operationalisation of approaches can be interpreted as yielding the models themselves. The knowledge categories that result from the juxtaposition of relevant knowledge properties and the interrelationships between these categories are therefore fundamental to an understanding of the relative contributions of extant KM models, which are comparatively analysed in this section. The structure of the presentation is analogous to the previous discussion of approaches to KM.

4.3.2.1 The operationalisation of Spender's approach

The four quadrants in Spender's approach to KM suggest four categories of knowledge in organisations, viz. "conscious," "automatic," "objectified," and "collective." The matrix in figure 4.4 illustrates how these categories are displayed.

Figure 4.4: Knowledge categories in Spender's model

	Individual	Social
Explicit	Conscious (3)	Objectified (4)
Implicit	Automatic (1)	Collective (2)

Source: Adapted from Spender, 1996b: 64.

The individual types of knowledge (the conscious and the automatic) derive from two ways in which one may know as an isolated individual. The social types of knowledge (the objective and the collective) suggest other inventories of knowledge. Individuals may draw on these to add to or complement their knowledge, explains Spender (1996b).

Spender argues that effortlessness seems to be an important characteristic of implicit knowledge (i.e. this author's terminology for tacit knowledge). It is meant to indicate that the user may be unaware of the tacit knowledge being supplied. In the Matsushita case, for example, the master baker may not even have been aware of the critical kneading skill, himself. In view of the inherent lack of awareness that would characterise the individual application of Spender's implicit knowledge, this category is referred to as autonomic (Spender, 1996a, 1996b).

Spender's contention of conscious versus automatic knowledge seems structurally similar to Polanyi's (1958) distinction between focal and tacit knowledge, as presented earlier. Conscious knowledge in Spender's model refers to individual actions, which are pursued in a more rational and focussed manner. Similarly to Polanyi, Spender's two forms of individual knowledge complement each other in practice. Under this scenario, the individual may be able to switch attention between conscious and automatic forms of knowledge. In line with Polanyi, the automatic form is seen as being more fundamental and therefore conscious knowledge may in many instances only represent the tip of the iceberg of the total stock of knowledge the individual disposes of (Spender, 1996a).

The collective component of tacit knowledge in Spender's analysis in turn seems similar to the Polanyian tradition of knowledge. Collective knowledge is portrayed as a concept that transcends the sum of individual contributions and represents the "the vast store of complex knowledge which actually makes up the firm's technological and competitive capabilities"

(Spender, 1996a: 60). It is characterised by the same effortlessness as automatic knowledge on the individual level. Collective knowledge, similarly to the automatic form, is also seen as being characterised by an inherent unawareness during application. Just as automatic knowledge may often be inaccessible to the individual, so collective knowledge has the tendency to be engulfed by corporate routines and processes. Contrary to collective knowledge the objectified form of social knowledge refers to organisational knowledge bases that are typically professionally accessible because they are explicitly captured in patents, trade marks, product specifications, etc. (Spender, 1996a).

The contribution residing in Spender's operationalisation would be the deduction of appropriate strategies to deal with each of the four categories of knowledge in organisations in figure 4.4. Given several types of knowledge, suggests Spender, there may be different strategies for each quadrant in the matrix. A strategy based on conscious knowledge, it is argued, may depend on solving the agency problem, focusing on issues such as "how can creative R&D personnel, such as Sir James Black, the inventor of Tagamet be persuaded to contribute their discoveries to the firm's stakeholders?" (Spender, 1996a: 52). Because conscious knowledge is transferred with relative ease, if the crucial knowledge in the business is conscious, then secrecy, bonding or behavioural incentives may be required to ensure its purposeful disclosure, explains the author.

A strategy based on automatic knowledge may likewise depend on solving the agency problem, argues Spender, but "is clearly more psychological. The brilliant stock picker must be persuaded to stay in the company" (Spender, 1996a: 52). Appropriability is likely to be less problematic as opposed to conscious knowledge, because automatic knowledge may not be transferred as easily. The real difficulty, for a strategy based on automatic knowledge, however, would be to integrate individual specialised knowledge with the complementary processes and assets necessary to ultimately create value for the company.

Similarly, a strategy based on inherently immobile collective knowledge produced internally, "focuses more on processes of knowledge production than on its subsequent ownership and appropriability" (Spender, 1996a: 52). Conversely, if the desired strategy focuses on the more explicit forms of social knowledge (viz. objectified) successful strategy design is seen to involve effectively using institutional mechanisms, such as patents and registered designs, which enable essentially public knowledge to be privatised and protected, albeit temporarily. "We might dub this the corporate lawyer's theory of competitive advantage," suggests Spender (1996a: 52). In view of the above agenda, this author believes that collective

knowledge, which is typically generated and retained internally, may be the most secure and strategically significant form of knowledge.

To summarise this far, through the juxtaposition of the two primary distinctions in a four-dimensional matrix format, four different categories of knowledge in organisations emerge, viz. the conscious, objectified, automatic, and collective. Each category of knowledge seems suggestive of a particular strategy. To this extent, Spender's contribution essentially resides in deducing four strategies that are designed to accommodate the characteristics of the four categories of organisational knowledge. It must be emphasised, however, that Spender's model of KM does not delineate interrelationships between the four generic knowledge strategies so identified. This may limit the usefulness of his model, as shall subsequently be explained.

4.3.2.2 The operationalisation of Hedlund's approach

Analogously to Spender, the quadrants in Hedlund's approach to KM are indicative of different categories of knowledge in organisations. Hedlund's more detailed approach to knowledge at various organisational levels results in eight different categories of knowledge. These are illustrated in figure 4.5.

Figure 4.5: Knowledge categories in Hedlund's approach

	Individual	Group	Organisation	Interorganisational Domain
Articulated Knowledge	Knowing calculus	Quality circle's documented analysis of its performance	Organisation chart	Suppliers' patents and documented practices
Tacit Knowledge	Cross-cultural negotiation skills	Team co-ordination in complex work	Corporate culture	Customers' attitudes to products and expectations

Source: Adapted from Hedlund, 1995: 77.

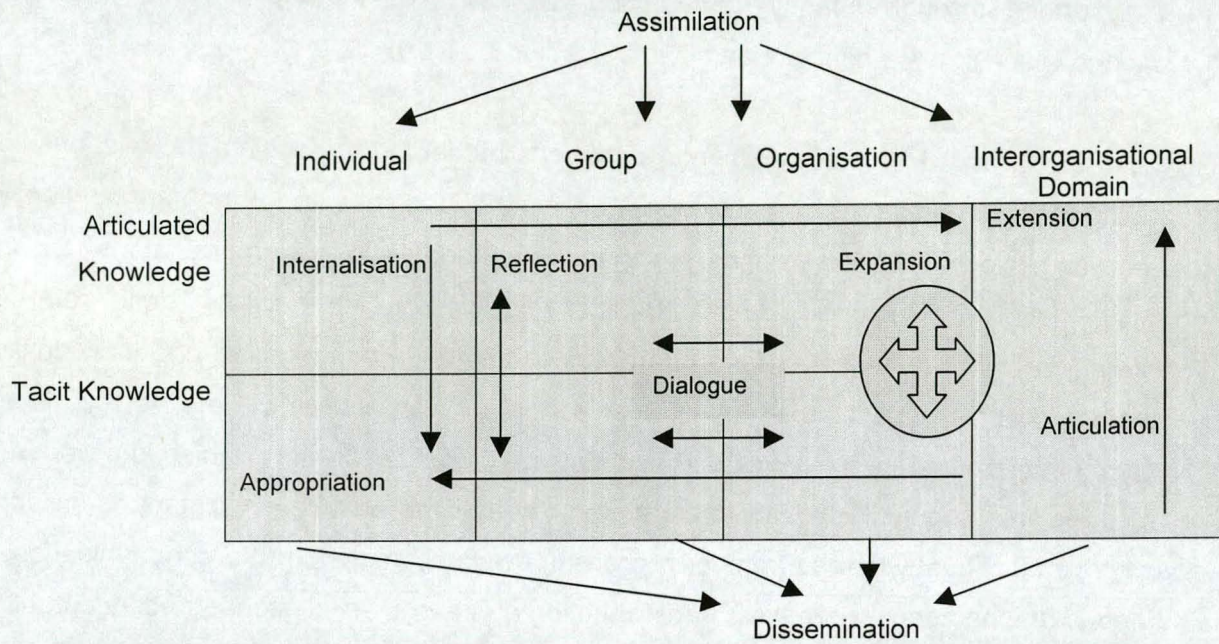
An in-depth investigation of each of the eight categories of knowledge in figure 4.5 is beyond the immediate scope of the present chapter. It may nevertheless be useful to appreciate an illustrative example. The notion of articulated knowledge at the group level, for instance, can best be illustrated by the documented performance of quality circles. This documented (i.e. articulated or explicit) knowledge may have been generated through team co-ordination

during the complex assignments in the quality circle. Here, tacit components can be brought to the surface through intensive interaction allowing transfer and expansion also of knowledge which may be difficult to articulate (Hedlund, 1994).

It would appear that Hedlund transcends Spender's model by introducing interrelationships between the eight categories of knowledge. This contribution shall be the primary concern of this section. Two primary distinctions are made in introducing these interrelations. On the horizontal level of Hedlund's model, transfer modes are introduced. These refer to knowledge being communicated from one agent to another, such as from one individual to another, or from groups to the entire organisation, or vice versa. On the vertical level, transformation modes are introduced. These indicate processes through which knowledge is restructured, recontextualised and reinterpreted through the articulation of tacit knowledge and vice versa. Thus, whereas transfer processes are concerned with the communication of knowledge among cognitive entities, transformation processes are designed to conceptualise the interplay of tacit and explicit forms of knowledge. It must be appreciated that through transformation processes, new knowledge would be generated, explains Hedlund (1994). Within the framework of these two main distinctions, additional, more detailed processes of knowledge transfer and transformation are defined. According to the author, there are four main sets of concepts (figure 4.6 illustrates these concepts).

- Articulation and internalisation, the interplay of which is termed reflection (these processes are depicted as vertical arrows in figure 4.6);
- Extension and appropriation, with dialogue as a result of interaction (horizontal arrows in figure 4.6);
- Assimilation and dissemination, referring to imports and exports of knowledge from the extra-organisational environment; and
- Expansion, indicating additions or changes of knowledge within a cell in the model.

Figure 4.6: Transfer and transformation processes in Hedlund's model



Source: Adapted from Hedlund, 1994: 77.

- Articulation refers to tacit knowledge being articulated. It can occur at all agency levels, not only at the individual. For example, an organisation might make its corporate culture explicit by rules of conduct and ethical principles, thus transforming it from tacit knowledge to articulated knowledge. When articulated knowledge becomes tacit, Hedlund speaks of internalisation, again at all levels of analysis (Hedlund, 1994).
- For the purpose of effective internalisation, explains Hedlund, an organisation, may develop routines, which it unconsciously follows, in order to relieve, or at least with the effect of relieving, its analytical and synthetic capabilities. Although the author does not explicitly refer to the Polanyian tradition, Hedlund's analysis seems in line with Polanyi's. It is important to note however that Hedlund, unlike Polanyi, seems to be aware of the ambivalent character of such routines. Hedlund clearly emphasises that routines may also have a negative side. Internalisation, it is argued, can withdraw knowledge from open, critical scrutiny and may thus hinder later adaptation to new circumstances (Hedlund, 1994).
- To capture the dynamics of articulated and tacit knowledge transformation, a third term is introduced. This is the principle of reflection, which is meant to imply a dialectic between tacit and articulated forms of knowledge. Again, this process takes place at all levels of the model. The process of successively specifying and improving ideas through

articulating it in writing, reassessing it, and rewriting it is an example of such dialectic reflection (Hedlund, 1994).

- Extension refers to transfer of knowledge from left to right in figure 4.6. (i.e. from a lower level to a higher organisational level). For example, when an individual tells her colleagues, or an entire group, what she knows, or when a company teaches a subcontractor. Extension, elucidates Hedlund, usually takes place at the articulated level, but not exclusively so. For example, though observation, imitation, and emulation knowledge can spread without being articulated (Hedlund, 1994).
- Appropriation denotes the transfer of knowledge from right to left in figure 4.6, i.e. when knowledge of higher agency levels is accepted at lower ones. For example, when new employees are indoctrinated to the corporate culture. It also is designed to capture the situation when a component supplier teaches the company about its technology. As in the case of the tacit/articulate interaction, a third category is introduced to signify the interplay between the two modes of knowledge transfer. Hedlund refers to dialogue as communication between units at a given level and between levels. For instance, product concepts are discussed between groups; specific individuals are consulted; the established product assortment of the organisation is taken into account; subcontractors' views are ascertained, etc. Communication typically takes place at the articulate level, but not always so. As an example, consulting skills may be learnt to a large extent through tacit dialogue (Hedlund, 1994).
- On a still higher level of organisational interaction, viz. with the corporate extra-organisational environment, operate the two processes assimilation and dissemination. The former refers to imports of knowledge from the environment. This must not be confused with the input from related organisations, which is referred to as appropriation. Analogous reasoning leads Hedlund to suggest dissemination as the process through which knowledge reaches the environment from the organisation. (Hedlund, 1994). The introduction of processes of knowledge transfer with the wider, social and political environment should be welcomed as it further refines and systematises Spender's (1996a, 1996b) domain of "social knowledge" as discussed earlier.
- The last process in Hedlund's model refers to knowledge transformation within a cell of figure 4.6, such as when a group, through discussions and trial and error learns how to design its own work process for optimal results. Expansion involves tacit and explicit modes of interaction simultaneously.

To summarise the operationalisation of Hedlund's approach to KM, it should clearly be emphasised that Hedlund's operationalisation would go one step further than Spender's. A noteworthy transcendation of Spender's model seems to reside in the introduction of processes that capture important aspects of the interaction between the different categories of knowledge identified. An important preliminary observation to be made in this context is that among these processes, transformation modes, conceptualising the interplay between tacit and explicit forms of knowledge in organisations seem to be at the root cause for the generation of new knowledge in the corporation. This seems to be a cardinal aspect, because the creation of new knowledge can be seen as the root-cause for innovation (see, e.g. Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998), which in turn seems to be conducive to sustained competitive advantage, particularly in dynamic environments (see, e.g. Rumelt, Schendel, and Teece, 1994; Teece, Pisano, and Shuen, 1997). A further essential contribution that deserves attention would come from widening the scope of analysis beyond corporate boundaries to embrace the inter-organisational and wider social environments of the organisation.

4.3.2.3 The operationalisation of Nonaka's approach

In order to understand the operationalisation of Nonaka's approach and his theory of organisational knowledge creation, it is first useful to appreciate the processes through which such creation evolves. To recall the previous chapter, Hedlund's approach to KM is characterised by a framework involving "epistemological" and "ontological" dimensions. Similarly to Hedlund (1994), Nonaka contends that through the interplay of tacit and explicit forms of knowledge along the epistemological dimension, new knowledge can be created. "Interplay," however is conceived rather narrowly in Hedlund's model, as opposed to Nonaka's treatment, viz. as a movement either up or down along the vertical dimension in figure 4.6 (i.e. either from tacit to explicit or vice versa). By contrast, the interplay between tacit and explicit forms of knowledge receives much more elaborate attention in Nonaka's model, when compared to Hedlund's model.

This interplay plays a pivotal role in Nonaka's theory and is conceptualised in a matrix format with the explicit/tacit distinction constituting vertical and horizontal dimension. In this fashion, two additional patterns of interaction can be described, viz. firstly, the interplay of tacit forms of knowledge; and secondly, the interplay among explicit forms of knowledge. This wider interpretation of "interplay" allows this author to postulate four different modes of knowledge conversion between tacit and explicit forms of knowledge, viz. firstly, from tacit to tacit

knowledge, secondly from tacit to explicit knowledge, thirdly, from explicit to explicit, and finally, back from explicit to tacit. Figure 4.7 illustrates these four modes of knowledge conversion.

Figure 4.7: Four modes of knowledge conversion

	Tacit knowledge	Explicit knowledge
Tacit knowledge	Socialisation (Sympathised Knowledge)	Externalisation (Conceptual Knowledge)
Explicit knowledge	Internalisation (Operational Knowledge)	Combination (Systemic Knowledge)

Source: Nonaka and Takeuchi, 1995: 62.

In Nonaka's theory of knowledge creation, socialisation involves the sharing of tacit knowledge between individuals. Tacit knowledge is exchanged through joint activities, such as being together, spending time, living in the same environment. The author emphasises that the mobilisation of tacit knowledge need not necessarily involve language. Apprentices, for example, often work with their mentors and learn craftsmanship not through language, but by observation, imitation, and practice. In a business setting, on-the-job-training uses the same principle, explains Nonaka (1994). Socialisation yields what is referred to as sympathised knowledge. As in Polanyi's (1958) treatment, the sharing of knowledge on the tacit level presumes physical proximity, because tacit knowledge may only be transferred directly, i.e. through the direct contact of individuals.

Externalisation requires the expression of tacit knowledge and its translation into comprehensible forms that can be understood by others. This articulation of tacit knowledge into explicit concepts is seen as a quintessential knowledge creation process and outputs conceptual knowledge. Externalisation often takes the form of analogies, metaphors, narratives and models, and outputs conceptual knowledge, illustrates Nonaka (1994; Nonaka and Konno, 1998; Nonaka and Takeuchi, 1995).

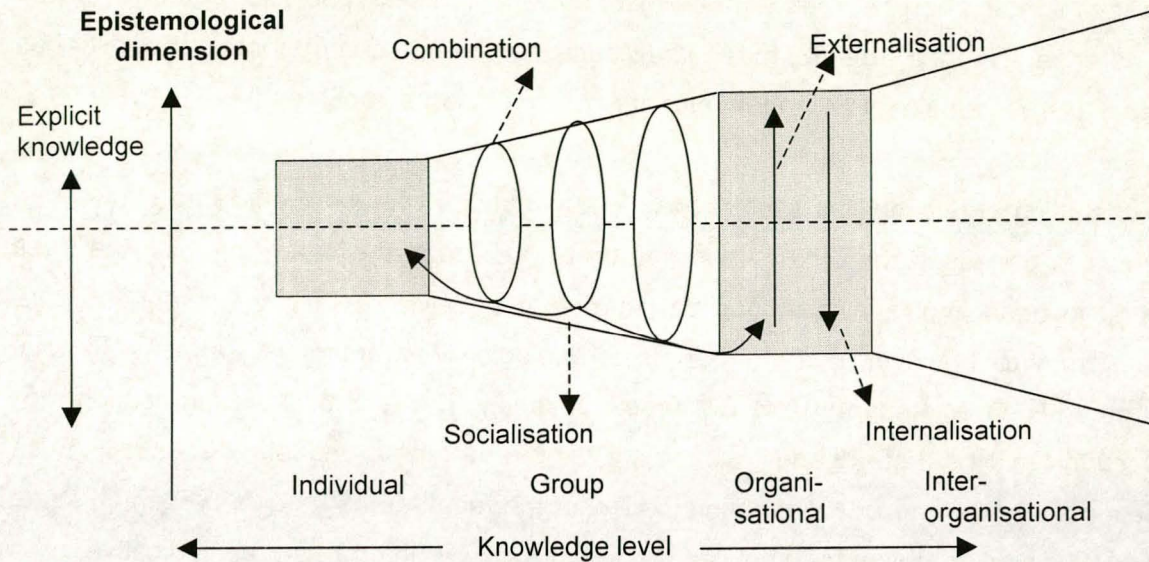
Combination involves the conversion of explicit forms of knowledge into more complex forms of explicit knowledge. This pattern of knowledge interaction gives rise to systemic

knowledge, such as prototypes or new component technologies. The combination of different bodies of explicit knowledge can involve direct as well as indirect exchange mechanisms, such as meetings or telephone conversation, respectively (Nonaka and Konno, 1998).

Internalisation, the final conversion process, refers to the conversion of explicit knowledge into tacit knowledge. Through the process of embodying explicit knowledge into tacit forms, experiences and knowledge from the other three conversion modes may be internalised into individual's tacit knowledge bases, where they could become valuable assets. Internalisation produces operational knowledge, which can be useful in project management, production processes, new product usage and policy implementation (Nonaka and Takeuchi, 1995).

A question that remained unanswered so far concerns the role of the ontological dimension in Nonaka's model. An important aspect in this respect involves the respective level in the organisation where each the four patterns of knowledge conversion operates, i.e. on which levels of the ontological dimension the conversion modes are administered. To recall Hedlund's model, the interplay of tacit and explicit knowledge may work at all levels, viz. the individual, group, organisational, and inter-organisational. Nonaka, however, uses a more concrete approach to the delineation of the province of these conversion processes. In Nonaka's model, each of the four patterns of knowledge conversion is seen as operating within the boundaries of a clearly defined domain along the ontological dimension. It seems to be precisely at the ontological dimension, however, where a fundamental weakness of Nonaka's model resides, as shall be demonstrated in the subsequent chapter (i.e. chapter 6).

Another important feature of Nonaka's model is that the four modes are put in a sequence. While Hedlund merely indicates that a movement upward or downward the vertical dimension in the model in figure 4.6 is conducive to knowledge generation, Nonaka uses a sequence of the four conversion patterns to explain the phenomenon of knowledge creation. In this fashion, the four conversion processes become four steps that, each individually and all four in conjunction, could create knowledge. This sequence is a cornerstone in his theory and is conceptualised as a "spiral" of knowledge creation (Nonaka, 1994, Nonaka and Takeuchi, 1995, Nonaka and Konno, 1998). Figure 4.8 illustrates this spiral of knowledge creation.

Figure 4.8: A spiral of organisational knowledge creation

Source: Nonaka and Takeuchi, 1995: 73.

Underlying the spiral of knowledge creation in Nonaka's model seems to be the contention that although knowledge might be formed in the minds of individuals, interaction between these individuals plays a critical role in developing knowledge. To Nonaka, this suggests that "communities of interaction" contribute to the amplification and development of new knowledge. According to the author,

"while these communities might span departmental or indeed organisational boundaries, the point to note is that they define a further dimension to organisational knowledge creation, which is associated with the extent of social interaction between individuals that share and develop knowledge" (Nonaka, 1994: 15).

To summarise, the "spiral" as evident from figure 4.8 is designed to show the relationship between epistemological and ontological dimension. This relationship is characterised by the sequenced juxtaposition of the four patterns of knowledge conversion. The sequence in turn allows Nonaka to postulate that the spiral of knowledge creation permits the organisation to mobilise tacit knowledge created and accumulated at the individual level. The mobilised tacit knowledge is then "organisationally" amplified through the four modes of knowledge creation and crystallised at higher ontological levels" (Nonaka and Takeuchi, 1995: 72).

To this extent, the operationalisation of Nonaka's approach would introduce a very powerful framework to conceptualise the creation of organisational knowledge. The major contribution of this author seems to reside in the delineation of the four patterns of knowledge conversion

and their illustration in a phased sequence in a spiral format. From the analysis, it is evident that Nonaka's model can be seen as the most sophisticated and theoretically refined of the three. Moreover, Nonaka's model, to the knowledge of the author, is the only one, which has received extensive empirical validation, primarily among Japanese companies.

On a concluding note, analysis of the relative contributions of each model has shown that one seems to transcend the other. As it may be obvious from the order, in which the three models have been analysed, they can be interpreted as phylogenetically subsequent. It is interesting to note, however, that the order is chronologically reversed. This appears to point to a fragmentation of thought in the KM research realm. The lack of cross-fertilisation may also account for the heterogeneity in objectives of the three models discussed. Such speculation seems even more interesting in view of the fact that the models presented share a structurally similar notion of knowledge, which can be interpreted as indicative of a relatively high level of co-ordination in KM research. It is not the point here to reconcile this interesting contradiction, but, instead, to observe that Nonaka's model can be seen as the most advanced of the three.

4.4 Summary

A fundamental building block of an understanding of KM as it is presented in the current literature would be an appreciation of the relative contributions of extant approaches to, and models of, KM. An important premise in this respect is that knowledge can be managed in the first place. Some recent contributions suggest that, in view of the complexity of the resource to be tended to, knowledge may in fact eschew management. A brief overview of these skeptical opinions has been provided at the beginning of this chapter. This exercise seems useful in order to provide an unbiased perspective on the phenomenon under investigation. It has been concluded that despite the alleged inherent indisposition of knowledge towards management, ignoring its systematic management might contribute to a critical source of organisational value creation. Hence, the contention in the present study that knowledge can and should be managed.

Predicated on the belief that knowledge can be managed, three extant KM models have been systematically analysed in a comparative manner. Structurally, the systematisation of this analysis involved, firstly, a discussion of the approach employed to build the models; and secondly, a comparative analysis of the operationalisation of these approaches. The analysis of the approach used to build the models has revealed that current models generally seem to be constructed on the platform of an anatomically very similar notion of the resource to be

tended to. This anatomy involves the two key properties of knowledge, whose emergence can be attributed to a consolidation of thought (chapter 3 has attempted to trace and discuss this consolidation). The coalescence in recent thought seems to form the conceptual frame of reference for the development of current KM approaches. Characteristic of recent KM approaches further appears to be the illustrative format adopted, viz. the juxtaposition of the two key properties in a matrix. Contemporary KM approaches can thus be seen as attempts to conceptualise knowledge in order to bring it into a manageable format in view of the recent consolidation in salient features of knowledge.

In a subsequent step, the operationalisation of these approaches was discussed. Particular emphasis was given on their relative contributions towards the management of corporate knowledge assets. Analysis suggested that the three models discussed, while presented in reversed chronological order, could be interpreted as phylogenetically subsequent, with Nonaka's model being the most advanced of the three.

CHAPTER 5: A critical analysis of extant knowledge management approaches and conceptual aids

5.1 Introduction

In chapter 4, a comparative analysis of extant KM approaches and models was attempted. To serve as a background, the three models presented were not primarily discussed according to their degree of sophistication in catering for the properties of knowledge as presented in part I. In this chapter, the level of sophistication in dealing with these properties will be more specifically highlighted. This is deemed expedient, because augmenting an understanding of the concept of KM would not only involve a comparative analysis of the relative contributions of extant models and conceptual aids, but would require a critique that considers the approach that was used to build these models. In a subsequent step, it would further be enlightening to scrutinise the respective logicity and sophistication in catering for knowledge of the individual models themselves.

Integral to an encompassing understanding of the sophistication of current models for the management of knowledge would be a sensitivity for the unique nature and concept of this important resource. This suggests that the analysis in this chapter is best conducted relative to the properties of knowledge and their implications for KM as presented in chapters 2 and 3. Administering the analysis in this fashion would allow an examination of the level of sophistication of current KM models that would go beyond a study of relative contributions of individual tools as evident from a comparative analysis. Thus, whereas chapter 4 has primarily been concerned with establishing the contributions of each model relative to one another, the present chapter attempts to investigate the contributions in the literature relative to the analysis in part I. This approach permits both a critical analysis of an incumbent paradigm in which extant KM models seem to be conceived, as well as a scrutiny of the current level of sophistication of individual models in catering for salient knowledge properties with the concomitant implications.

The objective of the present chapter is to expand an understanding of the concept of KM beyond the boundaries of a comparative analysis of extant KM models, by providing, firstly, an examination of the appropriateness of an incumbent paradigm in which these models were established; and, secondly, a scrutiny of the logicity and sophistication of the individual models themselves. In view of the widespread acceptance and influence of Nonaka's model in KM theory, this particular model will receive a fairly strong emphasis. The objective of this chapter would point to the following structure: firstly, a critical analysis of a

prevailing paradigm in KM research is presented; this is followed by a critical analysis of the models presented in the previous chapter; finally, the main conclusions of this analysis are summarised.

5.2 A critique of an incumbent paradigm

A critique of an incumbent paradigm within which the three discussed KM models appear to be conceived would be essential for the purpose of this study. In view of the complexity of knowledge as the resource to be managed, the design of KM models is likely to be difficult. As outlined in chapter 2, a reaction to this difficulty seems to have been a consolidation of thought through which two key properties of knowledge were extrapolated. As evident from the foregoing chapter, this coalescence of research efforts appears to form the conceptual frame of reference for the development of some of the most prominent KM approaches. These approaches would be characterised by the conceptualisation of the two key properties of knowledge in a matrix format. Since this conceptualisation seems to be a characteristic feature of the KM models reviewed in the present study, it can be argued that these models would be conceived in a particular paradigm. Analysis suggests that this incumbent paradigm would comprise two fundamental building blocks. Firstly, as could be demonstrated in chapter 5, the design of the three approaches seems predicated on a structurally very similar notion of knowledge in an organisational context. This structure apparently revolves around the two key properties of knowledge, viz. "tacit/explicit," and "individual/social." Secondly, as evident from the previous chapter, the prominent illustrative format utilised for juxtaposing these two properties appears to be the matrix. Integral to an understanding of current KM models would therefore be a good grasp of the appropriateness of this incumbent paradigm. For the purpose of this study, a critical task would thus be to scrutinise the relevance and usefulness of such a paradigm.

It would be fundamental for a first assessment of the paradigm, within which the three approaches were conceived, to scrutinise the appropriateness of the individual assumptions and premises on which the paradigm was built. These assumptions would be inherently linked to the consolidation of thinking that led to the two key properties. In a following step it may then be useful to investigate the usefulness of the matrix format of presentation which is adopted to conceptualise the alleged two-dimensionality of knowledge.

5.2.1 *The appropriateness of the assumptions*

An important assumption on which the three KM models reviewed seem to build would be that the two key properties adequately capture the complexity of knowledge as the resource

to be managed. It must be remembered from chapter 2 however that the appropriateness of these assumptions would be linked to the sophistication of the process that led to the consolidation of thought, which eventually yielded these two key properties of knowledge. As was suggested in chapter 2, the prominent two-dimensionality may not capture authentically all taxonomic dimensions and the concomitant implications that crystallised in the explicit/tacit continuum. To the extent that this conjecture materialises, any paradigm that uses the two key properties as a platform for further investigations could be impaired by the potential negligence of properties that may have fundamental implications for KM. For example, a particularly noteworthy area of neglect that was highlighted in the course of chapter 2 would be the implications for organisational design, which could be neglected and/or downplayed in the incumbent conceptualisation.

It must clearly be appreciated that to the extent that knowledge as an organisational resource can be seen as a complex phenomenon, a model for managing this resource would need to be an adequate reflection of this complexity. This seems to suggest that to be useful, KM models would have to capture salient properties of knowledge as explicitly and as authentically as possible. The potential hazards possibly arising from an incommensurate treatment of knowledge and its properties by the incumbent paradigm may be indicative of alternative, more ambitious and comprehensive approaches to treating such properties within the established matrix framework. Two generic approaches would come to mind. Firstly, in order to better conserve the richness of properties and their implications, a matrix could be devised that accords explicit attention to more than two properties. For example, the important property "autonomous/systemic" could additionally be included as a third dimension besides "explicit/tacit," and "individual/social," thereby forming a three dimensional matrix. This would have the potential benefit of alerting corporate leaders to the critical implications for organisational design, as they were described in chapter 2.

Predicated on the belief that the dominant paradigm could contribute to the neglect of important aspects of knowledge as a resource to be managed, a second approach could be employed. Depending on the operative environment where the matrices are to be deployed, it may be useful to substitute the super-ordinate explicit/tacit dimension with constituent subordinate categories as appropriate. This exercise may have the merit of illuminating the fact that the explicit/tacit continuum is representative of a rich variety of underlying properties. For example, if protectability of the knowledge asset in question is of prime concern, the explicit/tacit dimension could be substituted by "protectable/unprotectable," thereby yielding a matrix in which there are protectable as well as unprotectable knowledge assets on various organisational levels. This refocused KM matrix, through introducing a grid

where each dimension is attributable to a specific scenario in corporate knowledge protection, would allow corporate leaders to map individual components of the firm's knowledge portfolio and thereby obtain an improved grasp of their firm's intellectual property protection situation and options.

Thus, whereas the first approach would add additional dimensions to the matrix, thereby creating multidimensional models, the second would put particular emphases and foci as required within a two dimensional matrix. In both cases, such less restrictive and more ambitious practice could have the potential merit of a more authentic representation of the complexity of the resource under investigation.

The pitfalls of these approaches, particularly of the second one, must not be overlooked. As Cilliers insightfully comments, to be truly accurate, a model of a complex system would need to be at least as complex as the system itself, and may therefore not result in any simplification of the system modelled (Cilliers, 1998). Similarly, an analysis in this more ambitious fashion would dramatically increase the complexity of illustrative format. Assuming that the matrix format would be sustained, each additional property that gets accorded a matrix dimension would increase the format of presentation exponentially. The practical appeal of such multidimensional KM frameworks could clearly be frustrated. This suggests that a balance or compromise should be sought between sacrifice in content on the one hand and a comprehensible mode of presentation on the other.

It would appear that the prevailing practice in KM approaches achieves this balance to a large extent. It has been emphasised before that due to the complexity of the phenomenon under investigation, any attempt at conceptualisation would necessarily lead to some (over-) simplification. This should not necessarily be seen as undesirable because it can be seen as a useful first step in developing a preliminary view of knowledge that makes a meaningful discussion about its management possible. It should be remembered, however, that the pragmatic mode of presentation might have the tendency to obscure the fact that the number of fundamental properties of knowledge crystallised in the explicit/tacit continuum. It must not be overlooked that behind the superordinate explicit/tacit category on the vertical axis of KM matrices would reside a rich variety of subordinate taxonomic dimensions. It must therefore be appreciated that underlying this vertical dimension in the matrices appears to be a wealth of taxonomic dimensions with corollary implications that, while theoretically captured, may practically be obscured through the pragmatic conceptualisation.

An important second constituent of this pragmatic conceptualisation seems to be the matrix format. Analysis will now proceed to investigate the appropriateness of this particular approach to illustrative format.

5.2.2 The format of presentation

The foregoing section has investigated some of the limitations associated with the pragmatic conceptualisation without challenging the illustrative format as such. This section will devote attention to the format of presentation used to conceptualise KM. As evident from the analysis in chapter 4, the preferred format of presentation seems to be the matrix. None of the reviewed scholars indicates a rationale for this choice, and it may duly be asked why this form was preferred over others.

It would appear that, due to the complexity of the phenomenon to be conceptualised, alternative illustrative techniques could also be appropriate. This seems particularly relevant to the extent that capturing additional properties in a matrix format would exponentially increase the dimensionality of the matrix, as was indicated in the previous section. It may therefore be useful to highlight the potential of methodologically more sophisticated approaches to perform the role of conceptualising KM. It is conceivable, for instance, that a fishbone diagram or a format in the spirit of Du Pont's ROI conceptualisation would do the rich intricacies of knowledge in organisational environments more justice than the prevailing matrix format. More generally, a major advancement of research may be the delineation of appropriate, possibly more analytical approaches to illustrative format.

A fundamental question which arises in this respect would clearly be whether highly detailed, analytical methodologies to the presentation of KM approaches could produce better results than other, more pragmatic approaches. It is clear that in the quest to conserve the complex properties of knowledge in KM models, major trade-offs would need to be considered. On the one hand, the sophistication of a given model in dealing with these properties is important, while on the other hand, a comprehensible and practical mode of presentation would be needed. In view of possible trade-offs in pragmatism of presentational format and the corollary sacrifice in content, it would appear that a refinement of methodology in presentation much beyond the level of practical applicability would be fruitless. Research indicating whether more detailed approaches may in fact result in superior performance in terms of illustrative sophistication are still uncharted territory in the KM research realm, indicating worthwhile future research avenues.

To summarise, analysis of the three KM models discussed in the present study suggests that the approaches on which these models build seem to be built within a paradigm. The three KM approaches reviewed can be seen as attempts to conceptualise knowledge in order to bring it into a manageable format in view of the recent consolidation in salient features of knowledge. It could be demonstrated that at the heart of this paradigm may reside a fundamental limitation shared by the three models. An important limitation could be a biased treatment of knowledge properties, i.e. some properties could be inadequately emphasised at the expense of perhaps more important ones. Particularly noteworthy in this respect are the complex properties of knowledge and the concomitant implications that might be obscured and/or neglected by the consolidation of thought that led to the crystallisation of properties on the “explicit/tacit” continuum. This is an important observation, because it would appear that the sophistication of the individual models could be predicated on the appropriateness of the paradigm within which they are built. This must be kept in mind when analysing the respective levels of sophistication of the individual models in managing knowledge.

5.3 A critical analysis of the individual knowledge management models

Beyond a scrutiny of the appropriateness of the incumbent paradigm within which current KM models are conceived, the logicity and sophistication of the models themselves should be analysed, in order to further enhance an understanding of the concept of KM. This analysis would develop insights into the concept of KM that could transcend an understanding based on the relative advantages and disadvantages as evident from the comparative analysis in chapter 5. The structure of the examination follows the flow of the previous chapter. A fairly good emphasis, however, is given to a critical review of Nonaka's KM model. For the purpose of this study, this exercise seems necessary in view of the popularity and influence Nonaka's model enjoys in current discourse.

5.3.1 A critique of Spender's model

As evident from the analysis in chapter 5, Spender's contribution seems to reside in developing a view of knowledge in organisations that makes the deduction of appropriate strategies for the individual categories of knowledge possible. The model, however, appears to be characterised by a major limitation viz. the absence of modes and processes that describe how the categories of knowledge in organisations and the concomitant strategies interact. While Spender's model does not suggest any interrelationships within the four types of knowledge in figure 5.4 of the previous chapter, it would be misleading to state that the identified categorisations of knowledge are independent of each other and constitute

separate idiosyncratic bodies of knowledge. Rather, it would appear that the dynamics of knowledge would involve continuous movements, exchanges and transformations of one type of knowledge into another (see, e.g. Nonaka and Takeuchi, 1995; von Krogh and Roos, 1995).

The author acknowledges this limitation and admits that “the matrix’s weakness is that it tells us little how the various types of knowledge interact and thus little about how the firm becomes an context especially favourable to the interaction of knowledge creation and knowledge application processes” (Spender, 1996a: 51). Several areas of neglect, which seem to follow from this inadequacy deserve attention.

One problem would be that the model could not conceptualise the interaction of tacit and explicit forms of knowledge. Yet, to recall Nonaka’s comprehensive analysis interactive patterns involving tacit and explicit knowledge may be the root cause of knowledge creation, which may in turn be conducive to innovation (see, e.g. Nonaka and Takeuchi, 1995; Nonaka, 1994, 1998). Apparently as a result of this general lack of attention to knowledge creation, the model would be characterised by a “static” approach to knowledge in organisations. It would be static to the extent that knowledge is perceived as a datum. The model seems primarily be concerned with mapping the various existing types of knowledge relevant to the firm, but could not elucidate how these are generated. Business organisations, however, would clearly not merely “possess” knowledge, but would need to create it as well (Nonaka and Takeuchi, 1995). The paucity of cognisance to knowledge creation inherent in Spender’s static model would be indicative of a major limitation.

In a similar vein, due to the lack of attention to interactive patterns between knowledge categories, Spender’s model does not seem well versed upon conceptualising how knowledge is disseminated in organisations, i.e. from the social level to the individual and vice versa. This neglect of knowledge diffusion is quite ironic, if one recalls from chapter 4 that Spender is a vocal proponent of conceiving of both the individual and the organisation as cognitive entities, precisely because doing so has the potential merit of conceptualising the disclosure of knowledge from one organisational level to the other. His model, however, devoid of concentration on the dissemination of knowledge within the horizontal dimension in figure 5.4 would not accommodate this important conjecture.

An additional area of neglect that would follow from the lack of attention to the interaction of the categories of knowledge concerns the generic knowledge strategies that Spender deducts from these categories. To recall from the foregoing chapter, this author associates a

specific strategy with each of the quadrants in figure 5.4. This seems to suggest that, by default of interrelations between the four strategies, a change in strategic direction of a company could not be conceptualised in Spender's model. For example, if a company's knowledge assets were primarily objectified (i.e. in quadrant 4 of figure 5.4), a "corporate lawyers" theory would be indicated. Obtaining broad legal protection of explicit knowledge, and especially on a global level, however, could be a time-consuming and expensive exercise (von Seidel, 1998). Furthermore, to recall from the implications in chapter 2, not all components of the corporate knowledge portfolio may qualify for such lawful protection. A company may therefore wish to change strategic course and may want to move to a strategy based on the more tacit collective category (i.e. to quadrant 2 of figure 5.4), which is perceived as the most secure and strategically significant form of knowledge in Spender's model. The model, however, could not explain this change in strategic course. The dearth of attention to change in strategic direction can be seen as limiting the relevance of the present model in the current turbulent business environment, which would demand a continuous delineation of appropriate strategic alternatives (e.g. Lyles, 1994) in order to sustain competitive dominance.

In summary, Spender's model can be criticised on various accounts, all of which would be related to the negligence of interactive processes between the categories of knowledge. The first area of neglect concerns the interaction of tacit and explicit forms of knowledge in the organisation. This should be lamented because there is increasing empirical research evidence that it may be at the heart of this interaction that knowledge creation takes place (Nonaka and Takeuchi, 1995; von Krogh 1999). Additionally, Spender's model, by default of interaction between individual and social loci of knowledge, seems ill-versed upon conceptualising the transfer of knowledge from one agent in the organisation to another. The third inadequacy seems to be the observed lack of attention to changes in strategic direction in Spender's model.

5.3.2 A critique of Hedlund's model

As evident from the foregoing chapter, Hedlund's model, unlike Spender's, exhibits processes through which knowledge categories interact horizontally and vertically with one another. The former indicates the mobilisation of knowledge between cognitive entities, and the latter explains the transformation of tacit to explicit knowledge and vice versa.

Through the transformation of knowledge (which embraces the two processes articulation and internalisation), the author suggests, new knowledge is created. In contrast to Spender's

analysis, knowledge is not simply perceived as a datum but as something that is continuously generated through the interaction of tacit and explicit knowledge. This would be an important observation, to the extent that such knowledge generation can be seen as the momentum of innovation (Nonaka and Takeuchi, 1995). Thus, it should be appreciated that Hedlund accords a more dynamic view to knowledge in organisations.

It should further be emphasised that Hedlund's introduction of transfer processes (assimilation and dissemination) with the extra-organisational environment would widen the scope of analysis beyond the inter-organisational agency level and thereby directing attention to the purposeful management of knowledge in the social and political environment. Widening the scope of analysis beyond the immediate corporate inter-organisational environment should be welcomed as a useful additional facet in corporate KM practice in an era of uncompromising public observance of business practice, as evident, for example in Nestle's famous milk powder scandal and Exxon's "Brent Spar." Such management of organisational influences in extra-organisational domains can be critical in building and sustaining a corporate competitive advantage (Mahon, Bigelow and Fahey, 1994). To this extent, "political" KM practice could assume increasing importance in an age of public disclosure and world-wide scrutiny of the ethical soundness of business conduct and can be instrumental in building brand image (Roddick, 1992). Properly managed, this organisational interface could secure a position of advantage and influence over other actors in the process, and may be critical to the success of organisations' strategies as an increasing amount of recent research proclaims (see, e.g. Wartick and Wood, 1998; Kanter, 1999).

It must also be appreciated that Hedlund acknowledges the tendency of organisational traditions to be, on the one hand, instrumental in communicating tacit forms of knowledge in organisations, but on the other hand to withdraw knowledge from open, critical scrutiny. As was suggested in chapter 4, the ambivalent nature of organisational traditions should be well understood.

What Hedlund does not problematise, however, is the tendency and impact of traditions on a departmental level, to inhibit the flow of knowledge among functional units in the organisation. To Hedlund, traditions in organisations, while ambiguous in their tendency to obscure the depreciation of knowledge nurtured in the organisation seem to be inherently useful in communicating knowledge. As was outlined in chapter 4, such departmental traditions within organisations may hold implications for the ease of imparting knowledge among organisational units. While a discrete, functional, division of labour in departmental units may encourage local innovation, it tends to encourage the formation of localised codes

of conduct and procedures as well, thereby making sharing knowledge across departmental boundaries difficult (Schonberger, 1996; Grant, 1997; Tidd, Bessant, and Pavitt, 1997). In fact, research indicates that some sources of competitive advantage may be so complex that the firm itself may not understand them (Lippman and Rumelt, 1992; Teece, 1998). An important implication to be recalled from chapter 3 would be Polanyi's (1966: 4) observation that "we know more than we can tell." This would suggest that there seems to be an inherent difficulty involved in mobilising and re-deploying knowledge, particularly tacit forms of knowledge. Typically, the communication of tacit knowledge occurs directly, i.e. it can only be transferred directly from sender to receiver. Fully explicit knowledge on the other hand may be communicable between processor and receiver indirectly, i.e. through media such as electronic mail, fax, telephone, etc. Yet, due to the tacit component that seems to underlie all knowledge (Polanyi, 1958), even knowledge that can be transferred indirectly is prone to misunderstandings and ambiguities, as recent research evidence suggests (Hallowell, 1999). These important aspects of corporate traditions on a departmental level do not seem to be explicitly recognised in Hedlund's model.

A further area of neglect in Hedlund's model would be the protection of critical knowledge assets and the dilemma that arises from the interplay of the managed disclosure of knowledge within the corporation and partners in strategic alliances and its purposeful protection. As the analysis in chapter 3 has attempted to demonstrate, there may be a trade-off relationship between the purposeful disclosure of knowledge within the corporation and the protection of these outside corporate boundaries. This dilemma, as has been suggested, seems to emanate from that features restraining involuntary transfer tend to inhibit voluntary transfer. Likewise, the very properties that make knowledge difficult to imitate externally often make it difficult to impart internally (Spender and Grant, 1996; Cole, 1998; Despres and Chauvel, 1999). Reconceptualising this dilemma in ways that render it manageable would constitute a major area for further research.

To summarise the critique of Hedlund's KM model, it seems that this author provides a preliminary framework for the creation of knowledge, utilises a wide scope of analysis on knowledge agents, embracing even the extra-organisational environment, and also acknowledges the ambiguous nature of corporate traditions, several inadequacies have been found. A major area of neglect seems to be the lack of attention to issues pertaining to the interplay of knowledge transfer and protection within and beyond corporate boundaries.

5.3.3 A critique of Nonaka's model

In view of the widespread acceptance that Nonaka's KM model enjoys in current discourse on knowledge in organisations, it can safely be assumed as the most influential approach to KM. This suggests that adequate attention be devoted to its critical discussion. Four areas of investigation have been chosen to structure this examination, viz. firstly, an apparently incoherent conceptualisation of Nonaka's spiral model; secondly, the robustness of the model in different cultural environments; thirdly, an observed incremental pattern that seems to characterise Nonaka's knowledge creation process; and finally, the primary objective behind the theory of this author.

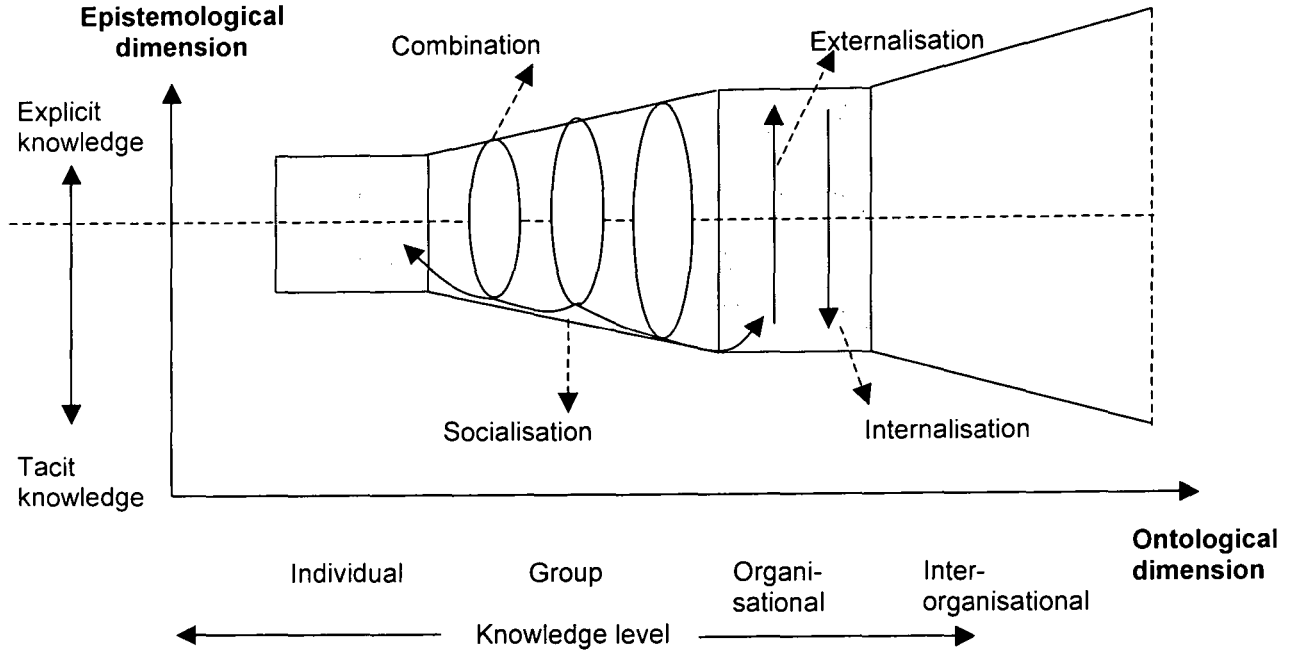
5.3.3.1 A critique of Nonaka's spiral of knowledge creation

This spiralling process of interactions between tacit and explicit knowledge; which has been explained in more detail in the previous chapter, is fundamental to an understanding to Nonaka's theory. Such understanding, however, seems impaired by an apparently incoherent conceptualisation of the spiral model itself. Furthermore, it seems important to realise the implications of this inadequacy in Nonaka's model for its practical operationalisation.

5.3.3.1.1 The incoherent nature of the knowledge creation spiral

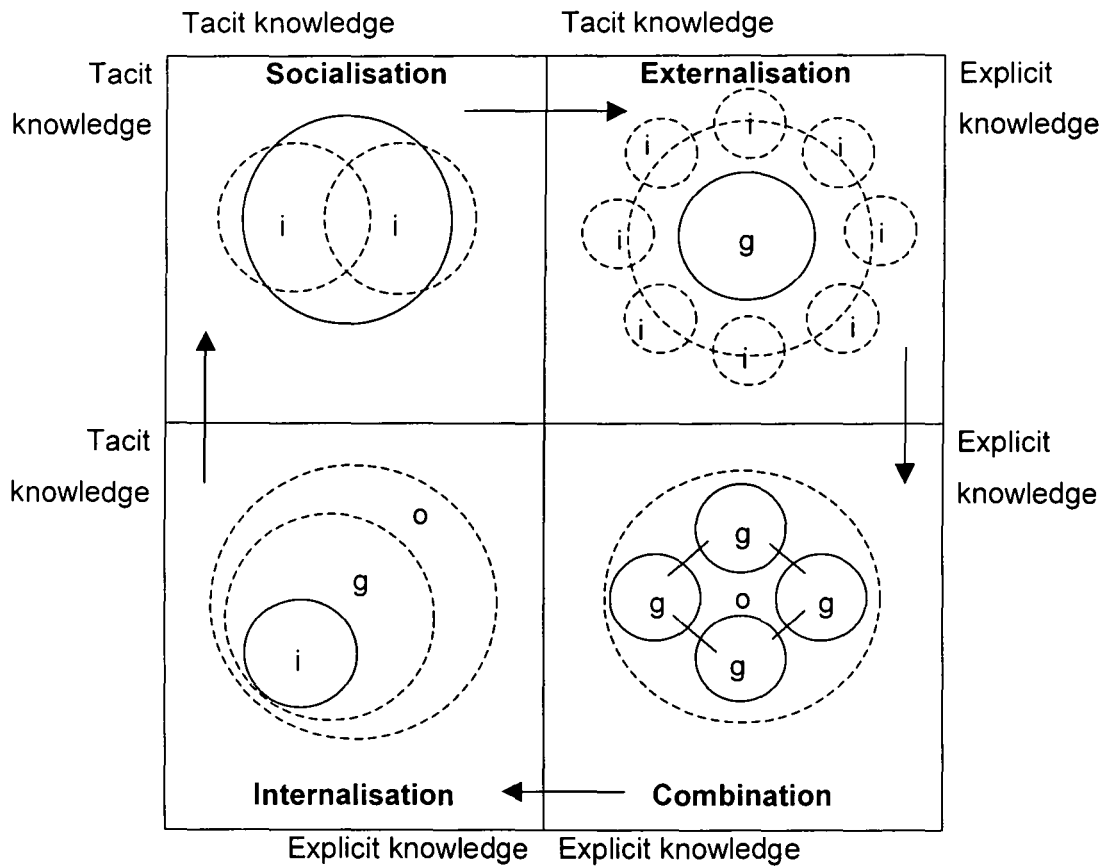
The incoherent nature of Nonaka's knowledge creating spiral is best illustrated by comparing the two figures below. Figure 5.1 is identical to figure 5.8, and is taken from Nonaka and Takeuchi (1995). Figure 5.2 is an alternative, and newer way of illustrating the spiralling process, and is taken from Nonaka and Konno (1998).

Figure 5.1: A spiral of organisational knowledge creation



Source: Nonaka and Takeuchi, 1995: 73.

Figure 5.2: A spiral evolution of knowledge conversion and creation



Source: Nonaka and Konno 1998: 48.

As evident from figures 5.1 and 5.2, Nonaka's model juxtaposes the epistemological and ontological dimensions of knowledge creation to form a spiral model for sequencing the conversion modes involved. While the sequence of steps that constitute the spiral seem intuitively plausible, the delineation of the domain where the respective steps evolve would be less cogent. In figure 5.2, the knowledge creation spiral apparently starts with the socialisation mode. This pattern of interaction involves the sharing of tacit knowledge between individuals (i), who through their interaction, would form a group (g). Consistent with this conjecture, figure 5.1 suggests that the socialisation mode evolve primarily on the group level of the ontological dimension.

The next step in the knowledge creation spiral involves the articulation of tacit knowledge into more explicit forms through externalisation. Figure 5.2 indicates that the realm of the externalisation mode again involves a group of individuals. Figure 5.1 however reveals to the confusion of the observer that the externalisation mode is now perceived to operate at the highest level of the ontological dimension, i.e. at the inter-organisational level.

Nonaka's treatment of the third step in of the knowledge-creating spiral, viz. combination is even more confusing. In figure 5.2, the combination mode operates on the group/organisational level (o). Recalling that according to the author's definition, combination involves the conversion of explicit forms of knowledge into more complex forms of explicit knowledge, the ontological level as proposed in figure 5.2 seems intuitively appealing. The proposition that explicit knowledge is conversed from the lower ontological level "group" to the higher level "organisation," and is entrenched at this higher level, appears cogent and straightforward. Surprisingly, however, in figure 5.1, combination is located at an even lower organisational level than the initial process, i.e. socialisation.

Finally, internalisation in Nonaka's definition involves the absorption of explicit forms of knowledge that may reside at higher ontological levels by lower organisational levels, e.g. the group internalises explicit forms of knowledge, and stores these as tacit knowledge bases in the form of mental models in figure 5.2. Figure 5.1, however, demonstrates that internalisation takes place at the inter-organisational level.

The foregoing analysis suggests that the sequence of steps in the knowledge creation spiral may be coherent and logically appealing. Comparison of figures 5.1, and 5.2, however, revealed that Nonaka's treatment of the respective ontological level at which individual conversion modes evolve, seems less coherent and could detrimentally affect an

understanding of the model as such. The practical implications possibly arising from this incoherent treatment would additionally need to be appreciated.

5.3.3.1.2 *Practical implications of an incoherent nature of the knowledge creation spiral*
Nonaka's incoherent argumentation concerning the respective ontological levels where the knowledge conversion patterns can be sustained should be lamented mainly for two reasons.

- Firstly, because this incoherence could make an understanding of Nonaka's concept of KM difficult; and secondly because it could introduce hazards to the operationalisation of the model in practice. This would raise implications in at least two areas, viz. firstly, the protection of valuable knowledge resources in strategic alliances; and secondly, the allocation of resources among competing areas of knowledge production. With regard to the former, Hamel, Doz and Prahalad point out the importance of "gatekeepers" in limiting unintended transfers of knowledge from one partner to another (Hamel, Doz and Prahalad, 1989). Similarly, Badaracco argues that the management of organisational boundaries would be integral to KM (Badaracco, 1991). Without a clear understanding of such boundaries and the locus of critical knowledge asset development and dissemination, the role of the gatekeeper in controlling the flow of knowledge in an alliance could be severely frustrated.
- Secondly, as it is not clear where the patterns of knowledge creation operate, no conjecture could be made as to where to allocate appropriate resources to foster innovation. The transparency of internal knowledge practice, however, may be fundamental in delineating the arenas of resource allocation and leverage (see, e.g. Hamel and Prahalad, 1993; Romhardt, 1998). This suggests that an important building block of KM seems to be the management of internal knowledge transparency (Romhardt, 1997; Grant, 1996; Spender, 1996). Clearly, a prerequisite for such transparency would be an understanding of where in the organisation valuable knowledge can be retrieved. A helpful construct in this respect seem to be "knowledge inventories," that are capable of enhancing a timely identification of the scope and depth of knowledge assets present in the organisation and the extent to which additional knowledge assets would be needed in the future (Romhardt, 1998).

To summarise this section, notwithstanding that Nonaka's model can be seen as a powerful framework for exploring knowledge creation through the interplay of tacit and explicit forms of knowledge, the theories of this author appear to be less coherent with regard the locus of

such patterns of interaction. It has been found that the incoherent treatment of the respective levels of the ontological dimension in Nonaka's spiral model could potentially impair an understanding of Nonaka's theory. This inadequacy suggests implications for the operationalisation of the model in practice. The first implication relates to the impaired role of gatekeepers in the process of limiting or controlling unintended knowledge transfers, particularly in strategic alliances. The incoherent conceptualisation of the respective loci of knowledge creation also appears to make a purposeful allocation of appropriate resources to enhance such knowledge creation difficult.

5.3.3.2 A critique of the robustness of Nonaka's model in different cultural environments

A major criterion to judge the usefulness of any model seems to be its robustness, i.e. its capability to perform the same way under different conditions (Cilliers, 1998). Particularly from a constructivist perspective, it appears that localised conditions and codes of conduct may interact differently with individual aspects of a model, because partners in a knowledge exchange process might construct "their own version" of the knowledge to be transferred. Hence, it would be important to consider how such localised conditions impact the performance of Nonaka's KM model. Especially relevant in the current global business environment would be a possible sensitivity of Nonaka's model to cultural influences. In fact, studies on intercultural issues in global business in general have attracted great interest in recent years (see, e.g. Hofstede, 1993; Mueller, 1993). A first step in examining the robustness of Nonaka's model would be to investigate a possible sensitivity to cultural variables of KM models in general. Analysis could then proceed to establish the existence of a cultural bias in the work of this author. Based on these insights, the appropriateness of a possible cultural bias in Nonaka's model would need to be scrutinised.

5.3.3.2.1 The sensitivity of KM approaches to cultural variables in general

It would firstly need to be established whether KM models in general are actually sensitive to cultural variables. Recent research evidence suggests that KM approaches and models are in fact quite sensitive to cultural variables. For example, the primary objective of Hedlund's (1994) model to KM, viz. the provision of a framework for the illumination of different approaches in KM practice between Japanese and "Western" companies would indicate that KM practice is not culturally neutral. Hedlund's empirical analysis has shown that there are significant differences in general KM approach between Japanese and Western KM within the framework presented in chapter 4. Similarly, during the University of California at

Berkeley's forum on "knowledge and the firm," there emerged diverse, apparently culturally motivated assumptions about how can knowledge effectively be developed and utilised.

"The most striking contrast [during the UC Berkeley forum on knowledge and the firm] was the mainly *American* emphasis on distribution and re-use of explicit knowledge, and the mainly *Japanese* focus on establishing conditions that encourage new knowledge creation through the direct social sharing of tacit knowledge" (Cohen, 1998: 23; emphases added).

It is ironic that Cohen's (1998) observation of the typically Japanese preoccupation with tacit knowledge actually represents a preoccupation with a Western construct. (Polanyi emigrated from Hungary to the USA.) Cohen speculates that the reasons for the striking contrasts in cross-cultural KM practice could be ascribed to the collectivist mindset that seems to be characteristic of the Japanese KM approach. The Japanese view on knowledge creation is seen as being very "human," with a strong emphasis on tacit knowledge and based on socialisation. This may often be in stark contrast to the more individualist "Western" approach to KM, which seems to be epitomised by the "lonely scientists" (Cohen, 1998). These findings would be suggestive of a cultural influence on KM practice in general. To the extent that KM practice in general would be sensitive to cultural variables, a strong Japanese orientation, i.e. a cultural bias in Nonaka's work could limit its relevance to Western business environments.

5.3.3.2.2 *The existence of a cultural bias in Nonaka's model*

The very first sentences in the book of Nonaka and Takeuchi (1995) already seem to be revealing a strong Japanese orientation, or bias in the work by these authors. The Japanese scientists explain that their idea of establishing a theory of knowledge creation was initially motivated by an investigation conducted for Harvard Business School in 1983 on the unique features of the new product development processes within Japanese companies (see, e.g. Imai, Nonaka, and Takeuchi, 1985 for some of the results of this investigation). As a matter of fact, Nonaka (in Nonaka and Takeuchi, 1995) draws exclusively on Japanese companies to illustrate the merits of his model. This can be seen as a factor further validating the contention of a cultural bias in the work of this author, because the application of his theories to non-Japanese environments could lead to dramatically different results. Nonaka himself, however, denies a cultural bias and explains that

"neither the Japanese nor the Western methodology of knowledge creation provides the complete solution. We need to integrate the merits of both the Japanese and the Western methodologies to develop a *universal* model of organisational knowledge creation. And since knowledge creation is at the heart of management in today's knowledge society, that model will serve as the universal model for management at large" (Nonaka and Takeuchi, 1995:226; emphasis added).

Nonaka's somewhat bold statement apparently reflects the primary rationale behind his model, viz. to establish a generic theory of organisational knowledge creation. The envisaged generic character of his theory, however, is yet to be established, it seems. Especially the fact that Nonaka's KM theory has evolved from the desire to understand how Japanese and Western new product development processes differ seems to suggest that his KM model could be characterised by a cultural bias. For the purpose of this study, the appropriateness of a Japanese bias in Nonaka's work would need to be scrutinised.

5.3.3.2.3 *The appropriateness of a cultural bias in Nonaka's model*

To the extent that KM in general would be sensitive to cultural variables, a strong Japanese orientation could limit the relevance of Nonaka's model to non-Japanese environments. Notwithstanding the pitfalls of a possible cultural bias in Nonaka's model, it must be appreciated that the contribution of his theory to non-Japanese business environments shall not be dismissed in the present analysis. Indeed, it seems that a number of inherently Japanese management approaches have, in principle proven to be very applicable to the Western context (e.g. Kan Ban and total quality management), possibly precisely because of their Japanese bias. Indeed, one can speculate whether Nonaka's theory will be the next in a series of Japanese contributions to Western management practice.

It should briefly be emphasised that it is not the purpose here to conclusively establish the existence and effect of a cultural bias in Nonaka's theory. Perhaps doing so would miss the point, because such an analysis could be just as culturally biased. Rather, it must be realised that these debates can be seen as indicative of a more fundamental problem, viz. the possible sensitivity of KM to cultural variables. To the extent that KM is "a social function" (Drucker, 1994) and has to deal with the "human moment at work" (Hallowell, 1999), KM could be subject to the same cultural influences as are individual employees. The notion that KM is culturally neutral appears to be naïve. It would follow that the robustness of KM models in general, and Nonaka's in particular, to diverse cultural settings should be scrutinised

empirically. It may thus be useful for this theory to proceed apace with empirical validation across cultures, which may further offer theory-building insights.

In conclusion, close scrutiny of Nonaka's theory suggests a strong Japanese inspiration, despite the central role tacit knowledge, as an essentially Western construct, is assigned in Nonaka's theory. It has not been the purpose here to deny the applicability of Nonaka's model as an inherently Japanese management approach to corporate practice in the West. There seems to be ample empirical evidence to refute the idea that a Japanese bias in management theory results in a limited applicability to the Western context. In fact, in many ways, it is imaginable that Nonaka's theory, possibly precisely because of its inherently Japanese orientation could develop into yet another Japanese contribution to Western management approaches. To this extent, Nonaka's model could in fact be very robust under different cultural environments.

5.3.3.3 A critique of incrementalism in Nonaka's model

Nonaka can be criticised for the preoccupation of his model with knowledge creation as an essentially incremental process. In order to substantiate this speculation, the burden of argument in this section would firstly be to demonstrate the existence of such incrementalism in Nonaka's knowledge creation process. Analysis could then proceed to discuss the appropriateness of such an incremental pattern by reference to its inherent benefits and fallacies.

5.3.3.3.1 The existence of incrementalism in Nonaka's model

The existence of incremental patterns in the knowledge creation process as presented by Nonaka seems evident from two areas of examination. Firstly, it would appear that tacit knowledge could be an inherently incremental construct. In the course of chapter 4, attention has been drawn to the characteristically "personal" element of tacit knowledge, and the role, which "tradition" appears to play in the development of tacit forms of knowledge, which seems to substantiate the incremental nature of tacit knowledge. This would suggest that to the extent that a KM model would accord a fundamental role to tacit knowledge, it could potentially be affected by such incrementalism. In fact, as was emphasised at various occasions throughout the text, the concept of tacit knowledge seems to play a fundamental role in Nonaka's model. For example, as evident from figures 5.1, and 5.2, the knowledge creation spiral is triggered by an interplay between purely tacit forms of knowledge in the socialisation stage. Additionally, the externalisation and internalisation stages of the knowledge creation spiral, both seem to involve tacit knowledge. This would imply that three

of the four stages in the knowledge creation spiral entail tacit knowledge. Due to the explicit emphasis in Nonaka's model on tacit forms of knowledge, it would appear that the model itself could be subject to the same incrementalism as tacit knowledge itself.

Secondly, Nonaka's KM model does not seem to accord sufficient attention to the external environment, or "business battleground" (Graham and Pizzo, 1996) of the firm. In order to guard the company against incrementalism, an understanding of this "business battleground" and its evolution and reconfiguration could represent a logical starting point for the orchestration of KM initiatives inside the company. This business battleground would comprise for example, competitors, customers, shareholders, and the wider social and political environment of the organisation on a global basis (see, e.g. Wartick and Wood, 1998; Mahon, Bigelow, and Fahey, 1994; Hamel, and Prahalad, 1994). In Nonaka's earlier model (figure 5.1), explicit recognition of the corporate environment seems to be given to an "inter-organisational domain," which denotes "communities of interaction, that span the link between customers, suppliers, distributors, and even competitors, for example through the formation of alliances or outsourcing" (Nonaka, 1994: 17). This statement seems to suggest that fairly comprehensive attention is given to the external environment. However, closer scrutiny of the work of this author (figure 5.2) reveals that the attention accorded to this inter-organisational domain apparently fades over time. This seems evident from comparing figure 5.1, which is based on a conceptualisation in 1995, with figure 5.2 (Nonaka and Konno, 1998), where the inter-organisational domain is discarded completely. This seems to indicate Nonaka's KM model does not accord sufficient attention to the external environment of the firm. Thus, close examination of the reasoning behind Nonaka's model reveals that his view on KM could be imbued with an inherent incrementalism as regards knowledge creation. For the purpose of this study, the benefits and fallacies of the incremental nature the knowledge creating process in Nonaka's model should be scrutinised.

5.3.3.3.2 *Benefits of incremental knowledge creation*

It should not be overlooked that incremental knowledge creation can be a good practice. No organisation would function efficiently if it were to constantly adapt to, and assimilate all knowledge from its environment through radically defying existing practices. This seems to be particularly true in the current, increasingly complex business environments. A possible incoherence and fragmentation of knowledge could result through such "chameleonlike" responses (Leonard-Barton, 1995; Lissack and Roos, 1999). Rather, successful adaptation would involve the purposeful redirection of existing skills and competencies so that currently prevailing expertise is reconfigured into future-capabilities (Leonard-Barton, 1992, 1995;

Hamel and Prahalad, 1993; Cohen and Levinthal, 1990). Thus, while companies do sometimes require a dramatic shift in priorities and/or leadership (Hart, 1994), the important conjecture appears to be that purposeful adaptation can be seen as building from where the organisation is at a given point in time.

Incremental knowledge generation can therefore be interpreted as a valuable adaptive response to a continually changing and complex environment. At their most beneficial, difficult to imitate core assumptions nurtured by organisational traditions could encapsulate the unique and special knowledge bases of an organisation and may promote competitive advantage (Eisenstat and Beer, 1994). The success stories of Japanese companies, which seem to be notorious for their incremental management practices (Hofstede, 1993) can be interpreted as paying witness to the merits of this approach (see, e.g. Nonaka and Takeuchi, 1995, for a number of examples).

5.3.3.3 *Fallacies of incremental knowledge creation*

Excessive adherence to the incremental pattern in knowledge creation as in Nonaka's model, however, may not always be beneficial to corporate success. In effect, in Nonaka's model accumulation of past knowledge could mould current and future knowledge creation. This may be attributed to the "dysfunctional flip side" of the Polanyian tradition. As was suggested in chapter four, such idiosyncratic traditions may by design be relatively stable over time. While integral to an exchange of knowledge, particularly at the tacit level, tradition may be the product of long-held beliefs and assumptions in the organisation. Such corporate mindsets are often shared by organisational members, and can tacitly define an organisation's view of itself and its environment. Unfortunately, this tradition has the tendency to obscure or downplay the significance of signals from the marketplace. When faced with crucial signals of changes in the external environment, managers are likely to interpret them consistent with the organisation's existing tradition (e.g. Eisenstat and Beer, 1994; Johnson, 1994). As Davenport and Prusak have alerted their readers, "if knowledge stops evolving, it turns into a dogma" (Davenport and Prusak, 1998: 10).

Due to the inherently complacent nature of corporate traditions, firms often create new knowledge to fit anachronistic traditions. This can be disastrous in view of the tendency of knowledge assets in the corporation to depreciate. As a number of observers has emphasised, to the extent that such reapplication of anachronist concepts and knowledge bases materialises, the organisation may gradually and usually imperceptibly lose its focus on the demands of the environment (see, e.g. Johnson, 1994; Tidd, Bessant and Pavitt,

1997). With regard to Nonaka's model, ways should be devised to critically examine the merits and dangers of such tradition. More generally, in KM, great sensitivity should prevail to managing this tradition. KM is unlikely to cope with inertial forces of organisational traditions unless such forces and "cultural artefacts" are considered and systematically addressed (Johnson, 1994; Jordan and Jones, 1997; Burgelman, Maidique, and Wheelwright, 1996).

To conclude this section, the incremental nature of Nonaka's knowledge creation process lends itself to criticism. It must be emphasised, however, that such incremental patterns need not necessarily be viewed as undesirable. In fact, because of their inherently static and idiosyncratic nature, corporate traditions often represent difficult-to-imitate knowledge assets. Herein, however, seems to lie the rub. Precisely because of their complacency and idiosyncrasy corporate traditions seem to be inherently indisposed towards adaptation. This tendency should closely be scrutinised particularly in turbulent environments, where innovation cycles are short, thereby demanding agile adaptation of corporations and their traditions: to the extent that a firm incrementally creates new knowledge to fit anachronistic traditions, its competitive position can be eroded.

5.3.3.4 A critique of the primary objective of Nonaka's model

On a higher level of analysis, it would be enlightening for the purpose of the present study to revisit and critically discuss the primary objective of this author, viz. to formalise a generic model of knowledge creation. This objective seems appropriate when the creation of new knowledge is interpreted as a prerequisite for innovation, which may in turn be conducive towards competitive advantage. On the other hand, the observable emphasis on knowledge creation by this author could contribute to the neglect of alternative approaches and foci. An important area of neglect seems to be knowledge leverage, i.e. the (re-) deployment of existing knowledge from within and/or without corporate boundaries. The potential of knowledge leverage can be demonstrated by reference of at least three areas of investigation, viz. firstly, protection of the organisation against "re-inventing the wheel;" secondly, the availability of knowledge through network channels; and thirdly, reduced research and development expenditure.

5.3.3.4.1 Guarding the organisation against "re-inventing the wheel"

Relentless knowledge creation suggests, *ceteris paribus*, that increasing amounts of, possibly redundant, knowledge be created within the company. To use a common analogy, there seems to be a danger of re-inventing the wheel over and over again. Indeed, there is increasing empirical evidence that, as a result of the rife "knowledge hysteria" (Nonaka and

von Krogh, 1999) a tendency emerges to hoard knowledge in corporations (KPMG, 1999; KnowledgeSource, 1999). As a possible result of this lamentable tendency, critical knowledge may become engulfed by less relevant knowledge resources in the corporation (e.g. O'Dell and Jackson Grayson, 1998; Despres and Chauvel, 1999), probably because too much knowledge is created just in case and too little just in time (Hjertzen and Toll, 1999). This has even led some observers to comment that, paradoxically, "in the knowledge economy, the scarce resource is ignorance" (Stewart, 1998: 172). These observations seem to suggest that companies often create and collect too much knowledge of which the less important compounds are likely to exhibit the tendency of overshadowing and hiding the more important ones. This could detrimentally affect the transparency of knowledge practice, analogously to Polanyi's (1966: 4) "we know more than we can tell."

5.3.3.4.2 *The availability of knowledge through network channels*

The above considerations seem to become even more important in contemporary business environments, where few companies can afford to develop internally all the knowledge and expertise that might provide an advantage in the future (Chesbrough and Teece, 1996). Often, such internal development may require excessive time, energy, money, and risk (Leibold and Slabbert, 1994), suggesting collaborative partnerships as a natural alternative.

Particularly in technologically advanced fields, such as biotechnology, (e.g. Powell, 1998), or in the semiconductor and electronics field (e.g. Grindley and Teece, 1997) knowledge typically migrates relatively freely between the parties involved. Such knowledge migration often is a reciprocal process, with organisations feeding into one another (e.g. Kogut, 1988; Hamel, 1991; Inkpen, 1996) and are sometimes referred to as "knowledge ecologies" (Brown and Duguid, 1998; Hargadon, 1998). Knowledge migration under these circumstances may, however, also be hampered by serious perils concerning the protection of respective knowledge contributions (Hamel, Doz, and Prahalad, 1989; Lei and Slocum, 1992; McGill, Slocum, and Lei, 1992). The challenge of plugging the leaks of knowledge percolation is likely to be significant, because cutting off the outflow may also cut off the inflow of knowledge (Brown and Duguid, 1998), hence the term "knowledge ecologies."

Notwithstanding potential challenges and pitfalls in building and sustaining co-operative knowledge strategies, it would appear that while critical knowledge needs to be created and nurtured internally, other, less critical knowledge can be obtained from convenient sources, e.g. through partnerships, alliances, and licenses (see, e.g. Contractor and Lorange, 1988; Lorange and Roos, 1992; Roos, 1994; Badaracco, 1991). In fact, several researchers have

argued for the pursuit of co-operative strategies as a means of creating new knowledge or gaining access to knowledge and skills outside the firm's boundaries (see, e.g. Wathne, Roos, and von Krogh, 1997, for a review of these authors). It should be emphasised that these suggestions would best be investigated in the light of the implications for organisational structure of the knowledge asset that forms the rationale for such arrangements (e.g. whether systemic or autonomous), as presented in chapter 2.

5.3.3.4.3 *Reduced research and development expenditure*

R&D expenditure may be the root cause for the above. The distinctive features of R&D expenditure and of knowledge generation in general become evident as one considers the implications of the law of diminishing returns, which seems lose its relevance as a cornerstone in strategy formulation in many industries (Roos, Roos, Edvinsson, and Dragonetti, 1998). Research indicates that traditional industries typically function according to this law of diminishing returns, which, very briefly, states that the more a given resource is used, the smaller the incremental returns are. By contrast, knowledge intensive industries exhibit the tendency to be driven by increasing returns. The economist Brian Arthur ascribes this tendency to the fact that the production of knowledge intensive products is characterised by "up-front costs," i.e. the costs of product development (i.e. knowledge creation costs) are very high relative to marginal production costs (i.e. knowledge leverage costs), which are generally low (Arthur, 1996). Yet, in view of the difficulty of delineating such knowledge intensive industries, as demonstrated in chapter 2, the law of diminishing returns seems to have wider applicability.

In a similar vein, Hebler and van Doren, proclaim that "knowledge assets require early, high, fixed costs as an aggregation of data collection, assimilation, analysis and synstudy" (Hebler and van Doren, 1997: 4). Obviously, each product sale contributes to reduce the amount of fixed costs and as the market expands, production leverage of knowledge assets greatly increases. Most knowledge seems to be subject to economies of scale and scope. It follows that knowledge, once created, can be deployed at low marginal cost (Grant, 1997). It should also be appreciated that further leverage can be gained by deploying knowledge gained in the creation process to a variety of different end products or services (see, e.g. Hamel and Prahalad, 1990; Coombs, 1996). These facts seem to indicate that a singular focus on knowledge creation may be suboptimal in view of fully exploiting the law of increasing returns which seems to be characteristic of many contemporary corporate environments.

To conclude the critique of the primary objective behind Nonaka's model, the implications of the above seem to indicate that knowledge as a corporate resource appears to be remarkably susceptible to leverage, i.e. the (re-) deployment of existing knowledge assets from within or without corporate boundaries. This would suggest that the relatively strong focus on the creation of new knowledge in Nonaka's model might not be fully appropriate. A strong emphasis on knowledge creation is likely to obscure the merits of a complementary view on knowledge in organisations assigning a central role to knowledge leverage. The benefit of such knowledge re-deployment and leverage may be in one or more of several areas: enhanced value capturing of existing knowledge assets through avoidance of "re-inventing the wheel," the availability of knowledge through network channels, and decreased R&D expenditure.

5.4 Summary

An important building block of an understanding of the concept of KM is a good grasp of extant KM approaches and conceptual aids. It would therefore be critical for managers to familiarise themselves with current KM approaches and corollary models. Such familiarisation, it would appear, could only come from a deep understanding of these frameworks, of their premises and assumptions, and of their strengths and weaknesses. For this purpose, the analysis in the present chapter has been concerned with, firstly, an in-depth investigation of the incumbent paradigm within which current KM approaches are conceived; and, secondly a critical analysis of the logicity and sophistication of the individual models within this paradigm. The aim of this chapter has been to enhance an understanding of current KM models through an examination of their current level of sophistication in catering for the unique properties of the resource to be managed.

Building on the insights from the analyses in chapter 2, 4, and 5, the present chapter has critically analysed the observation that current KM approaches seem to centre on a paradigmatic two-dimensional conceptualisation of knowledge. The two dimensions of this conceptualisation involve, firstly, the differentiation between tacit and explicit knowledge; and secondly, the locus of knowledge on various organisational levels. It was found that the level of sophistication of contemporary KM models would be contingent on the appropriateness of this paradigm. Analysis suggested that the usefulness of the KM models analysed may be seriously compromised, because the paradigm on which these models seem to be built may not capture authentically all properties of knowledge that impact KM in organisations. It seems that current KM models are not sufficiently sensitive towards the complex properties of knowledge in organisations. In view of potential hazards arising from an inadequate

treatment of knowledge properties, the paradigm has been challenged through the provision of alternative approaches.

Beyond the appropriateness of the shared paradigm, the logicity and sophistication of the individual models themselves has been scrutinised. Table 6.1 draws together the most salient conclusions as revealed by this scrutiny.

Table 6.1: Current KM models

	PRIMARY RATIONALE	ADVANTAGES	DISADVANTAGES
SPENDER	<ul style="list-style-type: none"> • categorisation of knowledge in organisations • delineation of strategies based on the categories • construction of knowledge-based theory of the firm 	<ul style="list-style-type: none"> • gives strategic implications based on categories of knowledge • appealing through conceptual pragmatism 	<ul style="list-style-type: none"> • no interaction between knowledge categories • amorphous social domain, no conceptualisation of knowledge at group or inter-organisational level • static conceptualisation of strategies • no strategic alternatives • static view of knowledge as a datum
HEDLUND	<ul style="list-style-type: none"> • illustration of differences and similarities between Japanese and Western KM approaches 	<ul style="list-style-type: none"> • conceptualisation of knowledge transfer and transformation processes well conceived • comprehensive view on arenas for KM • dynamic view on knowledge • culturally sensitive • sees limits of "tradition" 	<ul style="list-style-type: none"> • superficial conceptualisation of knowledge creation • implications of interdepartmental traditions for knowledge transfer not captured • dilemma between protection and dissemination of knowledge in strategic alliances not recognised
NONAKA	<ul style="list-style-type: none"> • formalisation of a generic model of organisational knowledge creation 	<ul style="list-style-type: none"> • very comprehensive description of knowledge creation • powerful model describing organisational knowledge creation • model operationalised and validated in Japanese companies 	<ul style="list-style-type: none"> • singular focus on knowledge creation • knowledge creation as an incremental process • negligence of competitive environment • ambiguity of "tradition" not captured • culturally biased

In conclusion, current KM approaches and conceptual aids can be interpreted as drawing on a homogenous conceptualisation of knowledge in organisations. In view of the possible inappropriateness of this conceptualisation, in more general terms, appropriate KM approaches should be seen as comprehensive frameworks designed in view of the complex properties of knowledge for the purpose of bringing KM into accommodation with the complexity of this organisational resource.

Part III: Summary, concluding observations and recommendations

CHAPTER 6: Summary, conclusions and recommendations

6.1 Introduction

The purpose of this study, as indicated in chapter 1, was to contribute to an enhanced understanding of the concept of KM, especially with regard to the current level of sophistication of extant approaches and conceptual aids to KM. This was done by way of investigation of the concept of knowledge as an organisational resource, and the provision of critical analyses of current approaches and conceptual aids to KM. Theoretical investigations involving a comprehensive study of international research, both popular and academic, on all possible aspects pertaining to KM were conducted in view of this purpose.

Throughout this study, and particularly at the end of each individual chapter, it was customary to provide brief summaries of the most salient aspects in terms of their relevancy to an improved understanding of the concept of KM. In line with this practice, the present concluding chapter recapitulates in a condensed format the principal thoughts that were put forward in the course of the entire investigation, in order to achieve an encompassing view of the field. For this purpose, in chapter sequence, an abridged version of the total analysis is firstly provided; this is followed by a statement of the major conclusions which were made throughout the inquiry; thirdly, a number of relevant recommendations are forwarded; finally, implications for research and the advancement of thought are discussed and prioritised.

6.2 Summary

6.2.1 Introduction (chapter 1)

Chapter 1 provided the background to the study from which the problem statement followed. This in turn inspired the objectives of the investigation. In view of the broad spectrum of ramifications in investigating knowledge-related subjects, particular attention was devoted to an appropriate delimitation of the scope covered by the present study. The methodology utilised was subsequently introduced, the rationale for its adoption motivated, and a significant methodological limitation was stated. Ultimately, in order to guide the reader through the ensuing chapters, the first chapter illustrated an overview of the overall structure of the study. The envisaged individual contributions of each chapter to an enhanced understanding of the concept of KM were also articulated.

6.2.2 A review of the literature on the properties of knowledge (chapter 2)

Chapter 2 emphasised the importance of being familiar with the unique properties of knowledge and their implications for KM. The assumption was made that the management of knowledge differs both in general approach and conceptual apparatus needed from the management of more traditional resources (e.g. land, labour, and capital). It was strongly emphasised that KM demands consideration of the complex properties of knowledge as an organisational resource and factor input. A review of these properties and the concomitant implications for KM, as evident from the literature, was presented in order to sensitise the reader to this important organisational resource.

The literature review revealed that current thinking on the complex properties of knowledge seems to undergo a consolidation, through which two key aspects are crystallising, viz. the interplay of tacit and explicit forms of knowledge and the purposeful disclosure of knowledge between agents of knowledge on various organisational levels (e.g. the individual, group, organisational, inter-organisational level). The consolidation in thinking on the properties of knowledge was critically analysed in view of its potential as a platform for the establishment of KM approaches and conceptual aids. This investigation was analytically structured, using two main areas of investigation. Firstly, a scrutiny of the explanatory logic that led to the consolidation of thought was undertaken. Secondly, an examination of the comprehensiveness of the pool of properties from which this consolidation evolved, was made. Using these two areas of investigation, it could be demonstrated that the consolidated view on knowledge properties does not encapsulate all the pertinent aspects of this complex organisational resource. In view of this inappropriateness, the potential of the consolidation in knowledge properties as a platform for the establishment of KM approaches could be impaired.

6.2.3 Two pivotal properties of knowledge (chapter 3)

Chapter 3 investigated in greater depth the two pivotal properties of knowledge as they emerged from chapter 2. The analysis in chapter 3 was intended to further sensitise the reader to the pertinent properties of knowledge and their ramifications for KM. The first pivotal property, viz. the explicit/tacit distinction was examined, drawing on Polanyi's (1958, 1966) work. Relevant implications for KM were deducted from Polanyi's epistemology. Polanyi's original analysis was chosen as a starting point because, although the concept of tacit knowledge seems to belong to common vocabulary today, the underlying epistemology does not seem to be commonly known and understood. In a subsequent step, attention was drawn to the second key property of knowledge, viz. the managed diffusion of knowledge

between organisational levels and among organisations. The current literature on this property appears to be characterised by dissent concerning the question whether knowledge may be possessed and created by the individual employee and/or the organisation. This dissension would additionally impair an understanding of KM. To alleviate this inadequacy, chapter 3 reviewed the relative merits of different schools of thought concerning knowledge agents in terms of their respective contributions to the management of knowledge in organisations.

As in chapter 2, a strong emphasis was given to the delineation of relevant implications for KM practice, thereby further alerting the reader to the nature and concept of the resource to be managed through KM. It was emphasised that appropriate KM models would need to be sufficiently attuned to this concept of knowledge and its implications. The combined theoretical analyses of chapters 2 and 3 were therefore designed as a benchmark for the evaluation of the relative level of sophistication of current KM approaches and conceptual aids, which followed in chapter 4 and especially in chapter 5.

6.2.4 A comparative analysis of extant knowledge management approaches and conceptual aids (chapter 4)

Chapter 4 highlighted the importance of a thorough cognisance of current approaches and conceptual aids for KM, for the purpose of building an improved understanding of the KM concept as such. It should be realised that integral to such understanding would be the development of a good grasp of the premises, assumptions, and of the relative strengths and weaknesses of these models. For this purpose, a critical investigation of three major conceptual aids for KM in terms of their sophistication in accommodating the nature and concept of knowledge, as it was discussed in chapters 2 and 3, was made. For expository purposes, this analysis was divided in two chapters, viz. chapters 4 and 5.

Chapter 4 detailed the relative contributions of three approaches to, and models of, KM by means of a comparative analysis. Analysis revealed that the models studied seem to be constructed on the platform of a structurally very similar notion of the resource to be tended to. This structure involves the two key properties of knowledge, viz. firstly, tacit/explicit knowledge; and secondly, the locus of knowledge on different organisational levels. It was argued that these two key properties of knowledge, whose emergence can be attributed to the consolidation of thought as illustrated in chapter 2, seem to form the conceptual frame of reference for the development of current KM approaches and models. Furthermore, it was speculated that because the consolidation in thinking on the properties of knowledge might

not capture all aspects pertinent to KM, the potential of current KM approaches could be compromised. It was therefore emphasised that the very similar overall structure of the KM models studied would need to be scrutinised, in order to enhance an understanding of the concept of KM. Thus, the comparative analysis in chapter 4 served as a background to, and complemented, the more exhaustive examination of the level of sophistication of individual models in catering for the concept of knowledge, which followed in chapter 5.

6.2.5 A critical analysis of extant knowledge management approaches and conceptual aids (chapter 5)

Building on the insight that current KM models appear to be structurally very similar, chapter 5 critically analysed the level of sophistication of the individual models in dealing with the properties of knowledge and their implications for KM. It was emphasised that integral to an understanding of the sophistication of current KM models, would be sensitivity for the unique nature and concept of this important resource. As two prominent authors have suggested: "the way you conceive of knowledge influences the way you manage it" (von Krogh and Roos, 1996: 343). Therefore, the examination in chapter 5 was conducted relative to the properties of knowledge and their implications for KM as analysed in chapters 2 and 3. Conducting the analysis in this manner allowed an examination of the potential of current KM models beyond the confines of the comparative analysis in chapter 4, thereby further enhancing an understanding of the concept of KM in general, and of the potential of current KM approaches and models in particular.

The very similar, and apparently paradigmatic, structure that characterises the individual models was critically analysed. The analysis unveiled that the potential of contemporary KM models would first and foremost depend on the appropriateness of the paradigmatic structure on which they are based. It was suggested that the usefulness of the three KM models analysed may be seriously compromised, because the paradigm on which these models seem to be built is simplistic, i.e. it does not capture authentically all properties of knowledge that impact KM in organisations. Further examination of the individual approaches in chapter 5 revealed that, possibly as a result of the simplistic paradigm on which they are built, current KM models are not sufficiently sensitive towards the complex properties of knowledge in organisations. Various areas of neglect were identified and discussed. It was strongly emphasised that the potential of KM models would be contingent on their refinement in terms of accommodating the complex properties of knowledge. Given the simplistic character of the traditional approach and conceptualisation, the need for a new approach in structuring KM models was postulated.

6.2.6 Summary, conclusions and recommendations (chapter 6)

Chapter 6 draws together the most salient aspects of this study. It entails, firstly, an abridged version of the entire analysis, in order to outline its envisaged contribution to an enhanced understanding of the concept of KM. An overview of the major conclusions that could be made in the course of the analysis, is subsequently provided. This is followed by recommendations for an improved understanding of KM. Ultimately, extensive attention is devoted to the identification and prioritisation of further avenues for research in the KM realm.

6.3 Conclusions

The problems, which motivated this study are indicated in chapter 1. The most pertinent conclusions that could be made on the basis of these problems include the following:

- (a) First and foremost, it should be realised that the KM models and conceptual aids analysed in this study seem not sufficiently sensitive to the complex properties of knowledge. Hence, the potential of extant KM approaches and conceptual aids could be impaired.
- (b) The potential of KM models is contingent on their sophistication in catering for the resource to be managed, viz. knowledge. This suggests that useful KM models would need to be sufficiently attuned to the complex properties of knowledge that impact its manageability. By implication, conceptualising knowledge in terms of the properties that impact its manageability, becomes a highly consequential step.
- (c) In fact, literature analysis revealed that the conceptualisation of knowledge in organisations is based on a simplistic consolidation of thought regarding the properties of knowledge and reveals important deficiencies, viz.:
 - (i) the explanatory logic that led to the notion that the consolidation of thought captures extant properties of knowledge, seems to be built on the false premise that individual taxonomic dimensions are not mutually exclusive;
 - (ii) to the degree that some of these taxonomic dimensions actually are mutually exclusive, the consolidation of thought would be impaired by an incommensurate treatment of the properties of knowledge and their implications;

- (iii) the discussion that led to the crystallisation of the tacit/explicit continuum seems to be far from exhaustive with respect to the dimensions along which key aspects of knowledge can be identified, thereby possibly further neglecting important knowledge properties.
- (d) Current KM models generally seem to be constructed on the platform of a structurally very similar notion of the resource to be tended to, which is based on the above-mentioned consolidation of thought. At the heart of this conceptual homogeneity may reside a fundamental shared limitation. To the extent that the conceptualisation of the resource to be tended to is deficient, models building on this conceptualisation would share these inadequacies.
- (e) The deficiencies associated with the extant conceptualisation of knowledge in the current literature, appear to limit the potential of current KM models. The potential of such models would directly depend on the appropriateness of the conceptualisation of the resource that they seek to manage, i.e. the field of complexity theory and coherence management could be integrated into KM research efforts. Analysis of three extant KM models revealed important deficiencies in catering for knowledge, viz.
 - (i) inadequate attention to traditions, i.e. corporate routines, on corporate and departmental levels;
 - (ii) an incremental pattern in the creation of knowledge in the corporation; and
 - (iii) a bias towards knowledge creation as a primary focus in KM;
 - (iv) considerable ambiguous treatment of knowledge agents in organisations.

6.4 Recommendations

6.4.1 *Recommendations for an enhanced understanding of the concept*

The following recommendations, based on the results of the study, are proposed in order to enhance an understanding of KM concept:

- (a) Contemporary KM approaches and models are best understood as preliminary attempts to conceptualise knowledge in order to bring it into a manageable format in view of a recent trend towards consolidating the salient features of knowledge.

- (b) In view of the shortcomings involved in the conceptualisation of knowledge and its management in the literature, in more general terms, appropriate KM approaches and models should be understood as comprehensive frameworks. Such frameworks would need to be designed on the platform of an adequate conceptualisation of knowledge, for the purpose of bringing internal business practice into accommodation with the complexity of this important organisational resource.
- (c) It should be appreciated that KM approaches and conceptual models should be seen as a means to an end, and not as ends in themselves. Their usefulness in achieving such ends would be contingent on the respective levels of sophistication in catering for the unique properties of the resource they seek to manage. In view of possible trade-offs in pragmatism of conceptualisation and the concomitant sacrifice in sensitivity to the properties of knowledge, it would appear that a refinement much beyond the level of practical applicability would be fruitless.

6.4.2 Recommendations for further research

The analysis in this study suggests several areas for further research investigation. These can be grouped in two generic categories, viz. firstly, implications for enhanced business applications, and secondly, implications for further theory advancement. The recommendations in each category are grouped in descending order of priority.

6.4.2.1 Recommendations for the advancement of business applications

- (a) While the generic importance of knowledge across industries or even sectors of the economy and society at large is generally acknowledged (see, e.g. Drucker, 1969, 1994; Toffler, 1970, 1990; Reich, 1991; Quinn, 1980), a number of scholars have recently emphasised that the importance of knowledge may vary in degree with regard to industries (see, e.g. Sadler, 1988; Bonara and Revang, 1993; Sveiby and Lloyd, 1987; Stewart, 1998). An excellent advancement of KM business applications would therefore be to establish the degree to which knowledge appertains to various industries at a given point in time (very ambitious investigations could include organisations in the non-profit or public sector). Scrutinising this impact would be a fundamental step in view of establishing the urgency of engaging in KM efforts for individual firms in a given industry. Taking into account the constant state of flux that characterises industry boundaries (see, e.g. Collis and Ghemawat, 1994; Evans and Wurster, 1997; Bonara and Revang, 1993) this exercise would clearly need to be

6.2.2 A review of the literature on the properties of knowledge (chapter 2)

Chapter 2 emphasised the importance of being familiar with the unique properties of knowledge and their implications for KM. The assumption was made that the management of knowledge differs both in general approach and conceptual apparatus needed from the management of more traditional resources (e.g. land, labour, and capital). It was strongly emphasised that KM demands consideration of the complex properties of knowledge as an organisational resource and factor input. A review of these properties and the concomitant implications for KM, as evident from the literature, was presented in order to sensitise the reader to this important organisational resource.

The literature review revealed that current thinking on the complex properties of knowledge seems to undergo a consolidation, through which two key aspects are crystallising, viz. the interplay of tacit and explicit forms of knowledge and the purposeful disclosure of knowledge between agents of knowledge on various organisational levels (e.g. the individual, group, organisational, inter-organisational level). The consolidation in thinking on the properties of knowledge was critically analysed in view of its potential as a platform for the establishment of KM approaches and conceptual aids. This investigation was analytically structured, using two main areas of investigation. Firstly, a scrutiny of the explanatory logic that led to the consolidation of thought was undertaken. Secondly, an examination of the comprehensiveness of the pool of properties from which this consolidation evolved, was made. Using these two areas of investigation, it could be demonstrated that the consolidated view on knowledge properties does not encapsulate all the pertinent aspects of this complex organisational resource. In view of this inappropriateness, the potential of the consolidation in knowledge properties as a platform for the establishment of KM approaches could be impaired.

6.2.3 Two pivotal properties of knowledge (chapter 3)

Chapter 3 investigated in greater depth the two pivotal properties of knowledge as they emerged from chapter 2. The analysis in chapter 3 was intended to further sensitise the reader to the pertinent properties of knowledge and their ramifications for KM. The first pivotal property, viz. the explicit/tacit distinction was examined, drawing on Polanyi's (1958, 1966) work. Relevant implications for KM were deduced from Polanyi's epistemology. Polanyi's original analysis was chosen as a starting point because, although the concept of tacit knowledge seems to belong to common vocabulary today, the underlying epistemology does not seem to be commonly known and understood. In a subsequent step, attention was drawn to the second key property of knowledge, viz. the managed diffusion of knowledge

between organisational levels and among organisations. The current literature on this property appears to be characterised by dissent concerning the question whether knowledge may be possessed and created by the individual employee and/or the organisation. This dissension would additionally impair an understanding of KM. To alleviate this inadequacy, chapter 3 reviewed the relative merits of different schools of thought concerning knowledge agents in terms of their respective contributions to the management of knowledge in organisations.

As in chapter 2, a strong emphasis was given to the delineation of relevant implications for KM practice, thereby further alerting the reader to the nature and concept of the resource to be managed through KM. It was emphasised that appropriate KM models would need to be sufficiently attuned to this concept of knowledge and its implications. The combined theoretical analyses of chapters 2 and 3 were therefore designed as a benchmark for the evaluation of the relative level of sophistication of current KM approaches and conceptual aids, which followed in chapter 4 and especially in chapter 5.

6.2.4 A comparative analysis of extant knowledge management approaches and conceptual aids (chapter 4)

Chapter 4 highlighted the importance of a thorough cognisance of current approaches and conceptual aids for KM, for the purpose of building an improved understanding of the KM concept as such. It should be realised that integral to such understanding would be the development of a good grasp of the premises, assumptions, and of the relative strengths and weaknesses of these models. For this purpose, a critical investigation of three major conceptual aids for KM in terms of their sophistication in accommodating the nature and concept of knowledge, as it was discussed in chapters 2 and 3, was made. For expository purposes, this analysis was divided in two chapters, viz. chapters 4 and 5.

Chapter 4 detailed the relative contributions of three approaches to, and models of, KM by means of a comparative analysis. Analysis revealed that the models studied seem to be constructed on the platform of a structurally very similar notion of the resource to be tended to. This structure involves the two key properties of knowledge, viz. firstly, tacit/explicit knowledge; and secondly, the locus of knowledge on different organisational levels. It was argued that these two key properties of knowledge, whose emergence can be attributed to the consolidation of thought as illustrated in chapter 2, seem to form the conceptual frame of reference for the development of current KM approaches and models. Furthermore, it was speculated that because the consolidation in thinking on the properties of knowledge might

not capture all aspects pertinent to KM, the potential of current KM approaches could be compromised. It was therefore emphasised that the very similar overall structure of the KM models studied would need to be scrutinised, in order to enhance an understanding of the concept of KM. Thus, the comparative analysis in chapter 4 served as a background to, and complemented, the more exhaustive examination of the level of sophistication of individual models in catering for the concept of knowledge, which followed in chapter 5.

6.2.5 A critical analysis of extant knowledge management approaches and conceptual aids (chapter 5)

Building on the insight that current KM models appear to be structurally very similar, chapter 5 critically analysed the level of sophistication of the individual models in dealing with the properties of knowledge and their implications for KM. It was emphasised that integral to an understanding of the sophistication of current KM models, would be sensitivity for the unique nature and concept of this important resource. As two prominent authors have suggested: "the way you conceive of knowledge influences the way you manage it" (von Krogh and Roos, 1996: 343). Therefore, the examination in chapter 5 was conducted relative to the properties of knowledge and their implications for KM as analysed in chapters 2 and 3. Conducting the analysis in this manner allowed an examination of the potential of current KM models beyond the confines of the comparative analysis in chapter 4, thereby further enhancing an understanding of the concept of KM in general, and of the potential of current KM approaches and models in particular.

The very similar, and apparently paradigmatic, structure that characterises the individual models was critically analysed. The analysis unveiled that the potential of contemporary KM models would first and foremost depend on the appropriateness of the paradigmatic structure on which they are based. It was suggested that the usefulness of the three KM models analysed may be seriously compromised, because the paradigm on which these models seem to be built is simplistic, i.e. it does not capture authentically all properties of knowledge that impact KM in organisations. Further examination of the individual approaches in chapter 5 revealed that, possibly as a result of the simplistic paradigm on which they are built, current KM models are not sufficiently sensitive towards the complex properties of knowledge in organisations. Various areas of neglect were identified and discussed. It was strongly emphasised that the potential of KM models would be contingent on their refinement in terms of accommodating the complex properties of knowledge. Given the simplistic character of the traditional approach and conceptualisation, the need for a new approach in structuring KM models was postulated.

6.2.6 Summary, conclusions and recommendations (chapter 6)

Chapter 6 draws together the most salient aspects of this study. It entails, firstly, an abridged version of the entire analysis, in order to outline its envisaged contribution to an enhanced understanding of the concept of KM. An overview of the major conclusions that could be made in the course of the analysis, is subsequently provided. This is followed by recommendations for an improved understanding of KM. Ultimately, extensive attention is devoted to the identification and prioritisation of further avenues for research in the KM realm.

6.3 Conclusions

The problems, which motivated this study are indicated in chapter 1. The most pertinent conclusions that could be made on the basis of these problems include the following:

- (a) First and foremost, it should be realised that the KM models and conceptual aids analysed in this study seem not sufficiently sensitive to the complex properties of knowledge. Hence, the potential of extant KM approaches and conceptual aids could be impaired.
- (b) The potential of KM models is contingent on their sophistication in catering for the resource to be managed, viz. knowledge. This suggests that useful KM models would need to be sufficiently attuned to the complex properties of knowledge that impact its manageability. By implication, conceptualising knowledge in terms of the properties that impact its manageability, becomes a highly consequential step.
- (c) In fact, literature analysis revealed that the conceptualisation of knowledge in organisations is based on a simplistic consolidation of thought regarding the properties of knowledge and reveals important deficiencies, viz.:
 - (i) the explanatory logic that led to the notion that the consolidation of thought captures extant properties of knowledge, seems to be built on the false premise that individual taxonomic dimensions are not mutually exclusive;
 - (ii) to the degree that some of these taxonomic dimensions actually are mutually exclusive, the consolidation of thought would be impaired by an incommensurate treatment of the properties of knowledge and their implications;

- (iii) the discussion that led to the crystallisation of the tacit/explicit continuum seems to be far from exhaustive with respect to the dimensions along which key aspects of knowledge can be identified, thereby possibly further neglecting important knowledge properties.
- (d) Current KM models generally seem to be constructed on the platform of a structurally very similar notion of the resource to be tended to, which is based on the above-mentioned consolidation of thought. At the heart of this conceptual homogeneity may reside a fundamental shared limitation. To the extent that the conceptualisation of the resource to be tended to is deficient, models building on this conceptualisation would share these inadequacies.
- (e) The deficiencies associated with the extant conceptualisation of knowledge in the current literature, appear to limit the potential of current KM models. The potential of such models would directly depend on the appropriateness of the conceptualisation of the resource that they seek to manage, i.e. the field of complexity theory and coherence management could be integrated into KM research efforts. Analysis of three extant KM models revealed important deficiencies in catering for knowledge, viz.
 - (i) inadequate attention to traditions, i.e. corporate routines, on corporate and departmental levels;
 - (ii) an incremental pattern in the creation of knowledge in the corporation; and
 - (iii) a bias towards knowledge creation as a primary focus in KM;
 - (iv) considerable ambiguous treatment of knowledge agents in organisations.

6.4 Recommendations

6.4.1 Recommendations for an enhanced understanding of the concept

The following recommendations, based on the results of the study, are proposed in order to enhance an understanding of KM concept:

- (a) Contemporary KM approaches and models are best understood as preliminary attempts to conceptualise knowledge in order to bring it into a manageable format in view of a recent trend towards consolidating the salient features of knowledge.

- (b) In view of the shortcomings involved in the conceptualisation of knowledge and its management in the literature, in more general terms, appropriate KM approaches and models should be understood as comprehensive frameworks. Such frameworks would need to be designed on the platform of an adequate conceptualisation of knowledge, for the purpose of bringing internal business practice into accommodation with the complexity of this important organisational resource.
- (c) It should be appreciated that KM approaches and conceptual models should be seen as a means to an end, and not as ends in themselves. Their usefulness in achieving such ends would be contingent on the respective levels of sophistication in catering for the unique properties of the resource they seek to manage. In view of possible trade-offs in pragmatism of conceptualisation and the concomitant sacrifice in sensitivity to the properties of knowledge, it would appear that a refinement much beyond the level of practical applicability would be fruitless.

6.4.2 Recommendations for further research

The analysis in this study suggests several areas for further research investigation. These can be grouped in two generic categories, viz. firstly, implications for enhanced business applications, and secondly, implications for further theory advancement. The recommendations in each category are grouped in descending order of priority.

6.4.2.1 Recommendations for the advancement of business applications

- (a) While the generic importance of knowledge across industries or even sectors of the economy and society at large is generally acknowledged (see, e.g. Drucker, 1969, 1994; Toffler, 1970, 1990; Reich, 1991; Quinn, 1980), a number of scholars have recently emphasised that the importance of knowledge may vary in degree with regard to industries (see, e.g. Sadler, 1988; Bonara and Revang, 1993; Sveiby and Lloyd, 1987; Stewart, 1998). An excellent advancement of KM business applications would therefore be to establish the degree to which knowledge appertains to various industries at a given point in time (very ambitious investigations could include organisations in the non-profit or public sector). Scrutinising this impact would be a fundamental step in view of establishing the urgency of engaging in KM efforts for individual firms in a given industry. Taking into account the constant state of flux that characterises industry boundaries (see, e.g. Collis and Ghemawat, 1994; Evans and Wurster, 1997; Bonara and Revang, 1993) this exercise would clearly need to be

conducted on an ongoing basis, in order to stay abreast with current industry reconfigurations, i.e. cross-sectional and longitudinal studies would be necessary.

- (b) Upon establishing the urgency of initiating KM efforts in a given industry, a major contribution would be suggestions as to how to implement KM initiatives in companies. Probably the single-most important barrier to be overcome is a reluctance of the staff to implement yet another "management fad" (Probst, personal communication, October 6.1999). This reaction seems understandable, if one considers the vogue of total quality management, re-engineering, outsourcing and lean management. In fact, a vocal chorus of academic commentators has recently argued that despite, or because of, the proliferation of academic and popular attention to knowledge and its management, KM may be nothing more than an ephemeral management "fad" (Despres and Chauvel, 1999; Prusak, 1999). Criticism concerning the sustainability and relevance of KM seems to suggest that the concept need not be taken too seriously and could even be dismissed as a "knowledge hysteria" (Nonaka and von Krogh, 1999). Thus, it would be essential to devise strategies as to how to convince employees of the necessity to foster the implementation of KM initiatives and to actively engage in KM efforts (Trillitzsch, personal communication, October 1.1999).
- (c) Variables of national culture that impact KM would need to be considered in the present, global knowledge economy. To advance possible business applications of the concept of KM across cultures, investigations of the robustness of current models should be conducted. The fundamental problem of a possible sensitivity of KM models to cultural variables, does not seem to have been adequately addressed so far. While there has been some attention to culturally motivated differences in generic KM practice (see, e.g. Hedlund and Nonaka, 1993; Imai, Nonaka, and Takeuchi, 1985), a lack of empirical validation of the robustness of KM models across cultures seems evident. This dearth of research evidence is quite ironic in the present economy, which suggests a global arena for KM, e.g. in the form of international strategic alliances. The notion that KM is culturally neutral appears to be naïve. It would follow that the robustness of KM models in general to diverse cultural settings should, be scrutinised empirically; and it should be useful for theory to proceed apace with empirical validation across cultures, thereby possibly offering additional theory-building insights.

(d) Investigations into business applications of KM beyond the scope of the present analysis could include the non-profit and public sectors. While the focus on the corporate environment in the present study does not preclude a general applicability of the analysis and its propositions to the non-profit or public sector environments, the scope of present analysis has not included the investigation of such relevance. It seems that especially non-profit organisations thrive on their mastery at managing the knowledge contributions of their volunteers, and the satisfaction of external knowledge requirements by a number of stakeholders with sometimes conflicting views and expectancies (see, e.g. Olson and Slater, 1997; Lovelock and Weinberg, 1984; Kotler and Andreasen, 1996). Similarly, in the public sector, universities, for example, could develop KM processes to systematically identify localised clusters of knowledge, thereby developing synergistic fusion of existing knowledge. For example, the typical divisions between research communities, while encouraging local innovation, may also encourage local isolation of knowledge on a university campus where departmental boundaries tend to isolate highly productive communities from one another. Through these insights, a practical, broader-gauged relevance of the concept KM becomes evident, and it should be fruitful to conduct research investigations into a possible wider applicability of the propositions forwarded in this study.

6.4.2.2 Recommendations for further theory development

- (a) In general, it would appear that in view of the limitations of established KM approaches, which seem to be characterised by the adoption of the deductive framework, more inductive and action-oriented ventures using, e.g. collaborative experiential inquiry methods, are very much needed in order to advance the theoretical foundations of the concept. This seems to be particularly relevant at the present stage of research development in the emerging field of KM, where naturally much time and effort should go into defining areas of investigation and the development of a conceptual apparatus. In fact, as the analysis in the present study has attempted to demonstrate, a consolidation at this early stage of elaboration in the field could be premature. Appropriate, if not obvious, methodologies for such studies could include some of the relatively new constructs from the action paradigm of doing research (e.g. Reason and Rowan, 1981; Heron, 1992; Reason, 1988, 1995).
- (b) A major research output for the promotion of theory would be a compilation of further, or different, properties of knowledge and their implications for KM practice. Based on

such insights, then, the research programme should proceed to empirically verify the relative importance of each property in terms of its impact on the management of knowledge (see, e.g. Cilliers, 1998 for a much-acclaimed philosophical perspective on the problem of modeling). On the platform of such empirically validated properties, alternative and more appropriate KM approaches and models could be constructed, and their relative merits to traditional models validated empirically.

- (c) As with all studies of conceptual nature, the findings and conclusions in the present analysis need to be investigated by way of empirical investigations in order to achieve wider validity and applicability for the propositions presented. A particularly convenient methodological approach in this respect seems to be action research, and particularly co-operative approaches within the action research paradigm. Such co-operative models are based on an emancipatory worldview in which research is done with people, rather than on them, and where the traditional divisions between research object and subject are systematically blurred (see, e.g. Reason and Rowan, 1981; Reason, 1988). Under this scenario, both the researcher and the manager would spend considerable time together in order to develop and formulate research questions, to eventually jointly endeavour to answer them. This approach, through the direct contact it envisages, could contribute to the flow of (particularly tacit forms of) knowledge between the researcher subject and object. It must be realised, however, that these methodologies would raise profound questions of validity (see, e.g. Heron, 1988; Smaling, 1989; Reason and Lincoln, 1996), precisely due to the direct contact (and the resulting possible bias), which they prescribe and would clearly need to be scrutinised in this respect.
- (d) It has been suggested that with the strategic context well understood, managerial attention can focus on core knowledge assets needed to maximise value for customers, shareholders, employees, and stakeholders. With this knowledge, a company may decide how to best dovetail its core knowledge assets with the industry "knowledge chain." In a subsequent step it may be indicated to turn to the purposeful orchestration of internal processes to create and impart knowledge, as in the models discussed. To this extent it seems evident that some KM models as analysed in this study, would focus on what may be a limited area of corporate KM, viz. on imparting knowledge, and not on the systematic alignment of internal knowledge assets with the strategic context. While this is understandable at the current stage of research in the emerging field of KM research, it clearly seems indicative of further investigations of a broader gauged arena for KM. Such studies could represent excellent

contributions to the development of KM research. They would need to delineate additional points on an agenda for KM, in order to go beyond the narrow focus of many current contemporary studies, including the present one.

Reference List

- Aadne, J.H., von Krogh, G., & Roos, J. (1997). Representationism: the traditional approach to co-operative strategies. In von Krogh, G. & Roos, J. (Eds.) Managing knowledge: perspectives on co-operation and competition (pp. 9-31). London: Sage.
- Achrol, R.S. (1991). Evolution of the marketing organisation: New forms for turbulent environments. Journal of Marketing, October, 77-93.
- Allee, V. (1997). The knowledge evolution. Oxford: Butterworth-Heinemann.
- Arthur, W. B. (1996). Increasing returns and the new world of business. Harvard Business Review, July-August, 100-109.
- Badaracco, J. (1991). The knowledge link: how firms compete through strategic alliances. Boston, MA: Harvard Business School Press.
- Barney, J. (1991). Types of competition and the theory of strategy: towards an integrative framework. Academy of Management Review, 11(4), 791-800.
- Bateson, G. (1973). Steps to an ecology of mind. London: MacMillan.
- Bonara, E.A., & Revang, O. (1993). A framework for analysing the storage and protection of knowledge in organisations: strategic implications and structural arrangements. In Lorange, P., Chakarvarthy, B., Roos, J., & de Ven, A. (Eds.) Implementing strategic processes: change, learning and co-operation (pp. 190-215). Oxford: Blackwell.
- Bontis, N., Dragonetti, N., Jacobsen, K., & Roos, G. (1999). The knowledge toolbox: a review of the tools available to measure and manage intangible resources. European Management Journal, 17(4), 391-401.
- Brown, J., & Duguid, P. (1998). Organising knowledge. California Management Review, (40)3, 90-111.
- Burgelman, R. A., Maidique, M. A., & Wheelwright, C. (1996). Strategic management of technology and innovation. Boston, MA: Irwin.

- Buys, A. (1999). Innovation and technology management. Unpublished manuscript, University of Pretoria, Institute for Technological Innovation, Pretoria.
- Chesbrough, H. W., & Teece, D. (1996). When is virtual virtuous? organising for innovation. In Klein D. A. (Ed.) The strategic management of intellectual capital (pp. 27-39). Woburn, MA: Butterworth-Heinemann.
- Cilliers, P. (1998). Complexity and postmodernism. Routledge: London.
- Cohen, D. (1997). Toward a knowledge context. California Management Review, (40)3, 23-39.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: a new perspective on learning and innovation. Administrative Science Quarterly, 35, 128-152.
- Cole, R. E. (1998). Introduction to the special issue on knowledge management. California Management Review, (40)3, 15-21.
- Collis, D. & Ghemawat, P. (1994). Industry analysis: understanding industry structure and dynamics. In Fahey L., & Randall R. M. (Eds.) The portable MBA in strategy (pp. 171-194). New York, NY: John Wiley.
- Contractor, F. J., & Lorange, P. (1988). Why should firms cooperate: the strategy and economic basis for cooperative ventures. In Contractor F. J., & Lorange, P. (Eds.) Cooperative strategies in international business (pp. 3-28). Lexington, MA: D. C. Heath.
- Coombs, R. (1996). Core competencies and the strategic management of R&D. R&D Management, 26 (4), 345-355.
- Cravens, D. W., Shipp, S. H., & Cravens, S. (1994). Reforming the traditional organisation: the mandate for developing networks. Business Horizons, July-August, 19-28.
- Davenport, T. H., & Prusak, L. (1998). Working knowledge. Boston, MA: Harvard Business School Press.

Davenport, T. H., Eccles, R. G., & Prusak, L. (1998). Information politics. In Klein, D. A. (Ed.) The strategic management of intellectual capital (pp. 101-120). Woburn, MA: Butterworth-Heinemann.

Davis, S., & Botkin, J. (1994). The coming of knowledge based business. Harvard Business Review, September-October, 165-70.

de Geus, A. (1997). The living company. London: Nicholas Brealy.

Demarest, M. (1997). Understanding knowledge management. Long Range Planning, 30(3), 392-398.

Despres, C., & Chauvel, D. (1999). How to map knowledge management. Financial Times, March 8, 4-6.

Draft, R., & Weick, K. (1984). Towards a model of organisations as interpretation systems. Academy of Management Review, 9, 284-295.

Dretske, F. (1981). Knowledge and the flow of information. Cambridge, MA: MIT Press.

Drucker, P. (1969). The age of discontinuity. New York, NY: Harper & Row.

Drucker, P. (1993). Post capitalist society. Oxford: Butterworth-Heinemann.

Drucker, P. (1994). The age of social transformation. The Atlantic Monthly, 274(5), 53-80.

Drucker, P. (1999a). Managing oneself. Harvard Business Review, March-April, 65-74.

Drucker, P. (1999b). Knowledge worker productivity: the biggest challenge. California Management Review, 41(2), 79-95.

Dunning, J. (1997). Knowledge capitalism: Competitiveness re-evaluated. a macro-organisational viewpoint. In Das, M., & Tallman, S. (Eds.) Proceedings of the symposium on knowledge capitalism (pp. 18-29). Symposium conducted at the meeting of the Academy of Management, Boston, MA.

- Edvinsson, L. (1997). Developing intellectual capital at Skandia. Long Range Planning, 30(3), 366-373.
- Edvinsson, L. & Malone, M. (1997). Intellectual capital: realising your company's true value by finding its hidden brainpower. New York: Harper Collins.
- Eisenstat, R. A., & Beer, M. (1994). Strategic change: realigning the organisation to implement strategy. In Fahey, L., & Randall R. M. (Eds.) The portable MBA in strategy (pp.321-357). New York, NY: John Wiley.
- Evans, P. B., & Wurster, T. S. (1997). Strategy and the new economics of information. Harvard Business Review, September–October, 71-82.
- Foss, N. J. (1996a). Knowledge based approaches on the firm: some critical comments. Organisation Science, 7(5), 470-476.
- Foss, N. J. (1996b). More critical comments on knowledge based theories of the firm. Organisation Science, 7(5), 519-524.
- Fuller, S. (1988). Social epistemology. Bloomington, IN: Indiana University Press.
- Graham, A. B., & Pizzo, V. G. (1996). A question of balance: case studies in knowledge management. European Management Journal, 14(4), 338-346.
- Grant, R. (1996). Toward a knowledge based theory of the firm. Strategic Management Journal, 17, 109-123.
- Grant, R. (1997). The knowledge-based view of the firm: implications for management practice. Long Range Planning, 30(3), 450-455.
- Grindley P. C., & Teece, D. J. (1997). Managing intellectual capital: licensing and cross-licensing in semiconductors and electronics. California Management Review, 39(2), 8-39.
- Hallowell, E.M. (1999). The human moment at work. Harvard Business Review, January-February, 58-67.

Hamel, G. (1991). Competition for competence and inter-partner learning within international strategic alliances. Strategic Management Journal, 12, 83-103.

Hamel, G., & Prahalad, C. K. (1993). Strategy as stretch and leverage, Harvard Business Review, March-April, 75-84.

Hamel, G., & Prahalad, C. K. (1994). Seeing the future first. Fortune, September, 65-68.

Hamel, G, Doz, Y., & Prahalad, C. K. (1989). Collaborate with your competitors and win. Harvard Business Review, January - February, 133-139.

Hart, E. (1994). Strategic change: reconfiguring operational processes to implement strategy. In Fahey, L., & Randall, R. M. (Eds.) The portable MBA in strategy (pp.359-388). New York, NY: John Wiley.

Hargadon, A. (1998). Firms as knowledge brokers. California Management Review, (40)3, 209-228.

Hebeler, J., & Van Doren, D. (1997). Unfettered leverage: the ascendance of knowledge rich products and processes. Business Horizons, July-August, 2-10.

Hedlund, G. (1993). Assumptions of hierarchy and heterarchy: an application to the multinational corporation. In Goshal, S., & Westney, E. (Eds.) Organisation Theory and the multinational corporation (pp. 211-236). London: MacMillan.

Hedlund, G. (1994). A model for knowledge management and the N-form corporation. Strategic Management Journal, 15, 73-90.

Hedlund, G., & Nonaka, I. (1993). Models of knowledge management in the West and in Japan. In Lorange, P., Chakarvarthy, B., Roos, J., & de Ven, A. (Eds.) Implementing strategic processes: change, learning and co-operation (pp. 117-144). Oxford: Blackwell.

Hedlund, G., & Rolander, D. (1990). Action in heterarchies: new approaches to managing the multinational corporation. In Bartlett, C. A., Doz, Y., & Hedlund, G. (Eds.) Managing the global firm (pp. 15-46). London: Routledge.

Heron, J. (1988). Validity in co-operative inquiry. In P. Reason (Ed.). Human inquiry in action (pp. 40-59). London: Sage.

Heron, J. (1992). Feeling and personhood. London: Sage.

Hiertzen, E., & Toll, J. (1999). Measuring knowledge management at Cap Gemini AB. Unpublished master's thesis. Linköpings Universitet: Sweden.

Hofstede, G. (1993). Interkulturelle Zusammenarbeit: Kulturen, Organisationen, Management Wiesbaden: Gabler

Huber, G. (1991). Organisational learning: the contributing processes and the literature. Organisation Science, 2(1), 88-115.

Hu-Yoa-Su (1995). The international transferability of the firms advantages. California Management Review, 37(4), 33-85.

Imai, K., Nonaka, I., & Takeuchi, H. (1985). Managing the new product development process: how Japanese companies learn and unlearn. In Clark, K. B., Hayes, R. H., & Lorenz, C. (Eds.) The uneasy alliance: managing the productivity-technology dilemma (pp. 337-382). Boston, MA: Harvard Business School Press.

Isenberg, D. (1987). How senior managers think. In Bell, D. Raiffa, H., & Isenberg, D. (Eds.) Decision making (pp. 41-65). Cambridge, MA: Cambridge University Press.

Johnson, G. (1994). Strategic change: managing cultural processes. In Fahey, L., & Randall, R. M. (Eds.) The portable MBA in strategy (pp.410-438). New York, NY: John Wiley.

Jordan, J., & Jones, P. (1997). Assessing your company's knowledge management style. Long Range Planning, 30(3), 374-384.

Kanter, R.M. (1999). From spare change to real change. Harvard Business Review, May-June, 122-133.

Kogut, (1988). Joint ventures: theoretical and empirical perspectives. Strategic Management Journal, 9, 319-332.

Kogut, B., & Zander, U. (1996). What firms do? co-ordination, identity, and learning. Organisation Science, 7(5), 502-519.

Kotler, P., & Andreasen, A. R. (1996). Strategic marketing for non-profit organisations. Upper Saddle River, NJ: Prentice Hall.

KPMG. (1999). Knowledge management research report.

Lank, E. (1997). Leveraging invisible assets: the human factor. Long Range Planning, 30(3), 406-412.

Lei, D., & Slocum, J. (1992). Global strategy, competence building and strategic alliances. California Management Review, 35(1), 81-97.

Leibold, M., Gibbert, M., & Kaes, B. (1999). The knowledge management dilemma in corporate strategic alliances: a review of current theory and a reconceptualisation to guide future research. In the review process for *International Business Review*, July 1999.

Leibold, M., & Slabbert, N. J. (1994). Key political-economy pointers for designing and managing strategic alliances in regional business environments. Paper presented at the 3rd Annual World Business Congress. Penang, Malaysia.

Levitt, B., & March, J. (1988). Organisational learning. Annual Review of Sociology, 14, 319-340.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: a paradox in managing new product development. Strategic Management Journal, 13, 111-125.

Leonard-Barton, D. (1995). Wellsprings of knowledge. Boston, MA: Harvard Business School Press.

Lippmann, S. A., & Rumelt, R. P. (1992). Demand uncertainty and investment in industry-specific capital. Industrial and Corporate Change, 1(1), 235-261.

Lissack, M., & Roos, J. (1999). The next common sense: mastering complexity through coherence. London: Nicholas Brealey.

Lorange, P., & Roos, J. (1992). Strategic alliances: formation, implementation, and evolution. London: Blackwell.

Lovelock, C., & Weinberg, C. (1984). Marketing for public and non-profit managers. New York, NY: John Wiley.

Lyles, M. A. (1994). Identifying and developing strategic alternatives. In Fahey, L., & Randall, R. M. (Eds.) The portable MBA in strategy (pp.273-295) New York, NY: John Wiley.

Lyles, M. A., & Salk, J. E. (1996). Knowledge acquisition from foreign parents in international joint ventures: an empirical examination in the Hungarian context. Journal of International Business Studies, 27(5), 877-904.

Machlup, F. (1983). Semantic quirks in the study of information. In Machlup, F. & Mansfield, U. (Eds.) The study of information (pp. 3-56). New York, NY: Wiley.

Mahon, J., Bigelow, B., & Fahey, L. (1994). Political Strategy: Managing the Social and Political Environment. In Fahey, L., & Randall R. M. (Eds.) The portable MBA in strategy (pp.142-170). New York, NY: John Wiley.

Maturana, H. (1958). Efferent fibres in the optic nerve of the toad. Journal of anatomy, 92, 92-121.

Maturana, H., & Varela, F. (1987) The tree of knowledge. Copenhagen: Ask.

McGill, M. E., Slocum, J. W., & Lei, D. (1992). Management practices in learning organisations. Organisational Dynamics, 21(1), 5-17.

McNiff, J., Lomax, P., & Whitehead, J. (1996). You and your action research project. London: Routledge.

Mintzberg, H. (1976). Planning the left side, and managing on the right. Harvard Business Review, May-June, 49-58.

Moingeon, B., & Edmondson, A. (1996). When to learn and when to learn why: appropriate organisational learning processes as a source of competitive advantage. In Moingeon, B. &

- Edmondson, A. (Eds.) Organisational learning and competitive advantage (pp. 17-37). London: Sage.
- Mueller, B. D. (1993). Grundpositionen einer interkulturellen Didaktik des Deutschen als Fremdsprache. In Mueller, B. D. (Ed.) Bedeutungserwerb. Ein Lernprozess in Etappen (pp.278-312). Tuebingen: Gabler.
- Nasser, M. E., & Vivier, F. J. (1993). Mindset for the New Generation Organisation. Mindset for the new generation organisation: how learning SA companies create counter-trend performance despite turbulence. Cape Town: Juta.
- Nelson, R., & Winter, S. (1982). An evolutionary theory of economic change. Cambridge, MA: Belknap Press.
- Nonaka, I., & Konno, N. (1998). The concept of Ba. California Management Review, (40)3, 40-54.
- Nonaka, I., & Takeuchi, H. (1995). The knowledge creating company. New York: Oxford University Press.
- Nonaka, I., & von Krogh, G. (1999). Wissenshysterie. Manager Magazin, April, 164.
- O'Dell, C., & Grayson, C. J. (1998). If only we knew what we know: identification and transfer of internal best practices. California Management Review, 40(3), 154-174.
- Olson, E., & Slater, S. (1997). Focusing service management efforts: a model for non-profit organisations. Journal of Non-profit & Public Sector Marketing, 5(1), 25-43.
- Plotkin, H. (1994). Darwin machines and the nature of knowledge. Cambridge, MA: Harvard University Press.
- Polanyi, M. (1958). Personal knowledge. Chicago, IL: University of Chicago Press.
- Polanyi, M. (1966). The tacit dimension. London: Routledge & Keegan Paul.

Porter, M. (1997). Location, knowledge creation and competitiveness. In Das, M., & Tallman, S. (Eds.) Proceedings of the symposium on knowledge capitalism (pp. 10-17). Symposium conducted at the meeting of the Academy of Management, Boston.

Porter, M. (1998). On competition. Boston, MA: Harvard Business School Press.

Powell, W. W. (1998). Learning from collaboration: knowledge and networks in the biotechnology and pharmaceutical industries. California Management Review, 40(3), 228-240.

Prahalad, C., & Hamel, G. (1990). The core competence of the corporation. Harvard Business Review, May-June, 79-91.

Prusak, L. (1999). Making knowledge visible. Financial Times, March 8, 10-11.

Quinn, J. P. (1980). Intelligent enterprise: a knowledge- and service-based paradigm for industry. New York, NY: The Free Press.

Reason, P. (1988). Human inquiry in action. London: Sage.

Reason, P. (1995). Participation in human inquiry. London: Sage.

Reason, P., & Lincoln, Y. S. (1996). Special issue: quality in human inquiry. Qualitative Inquiry, 2(1), 5-136.

Reason, P., & Rowan, J. (1981). Human inquiry: a sourcebook for new paradigm research. Chichester: John Wiley.

Reich, R.B. (1991). The work of nations. New York, NY: Alfred A. Knopf.

Roddick, A. (1991). Body and soul. London: Random Century.

Romhardt, K. (1997). Process of knowledge preservation: away from a technology dominated approach. (Cahier de recherche). Geneva: University of Geneva, Geneva Knowledge Group.

Romhardt, K. (1998). Die Organisation aus der Wissensperspektive – Moeglichkeiten und Grenzen der Intervention in die organisatorische Wissensbasis. Wiesbaden: Gabler.

Roos, J. (1994). European casebook on co-operative strategies. London: Prentice Hall.

Roos, J., & Roos, G. (1997). Measuring your company's intellectual performance. Long Range Planning, 30(3), 413-426.

Roos, J., Roos, G., Edvinsson, L., & Dragonetti, N. (1998). Intellectual capital: navigating in the new business landscape. New York: NY: New York University Press.

Rumelt, R. P., Schendel, D., & Teece, D. (1994). Fundamental issues in strategy. In Rumelt, R. P., Schendel, D., & Teece, D. Fundamental issues in strategy: a research agenda (pp. 9-53). Boston, MA: Harvard Business Press.

Sadler, P. (1988). Managerial leadership in the post-industrial society. Aldershot: Gower Publishing Company.

Schonberger, R. (1996). Strategic collaboration: breaching the castle walls. Business Horizons, March-April, 20-28.

Schumpeter, J. A. (1942). Capitalism, socialism, and democracy. New York, NY: Harper and Row.

Senge, P. (1990). The fifth dimension. New York: Doubleday.

Simon, H. (1993). Strategy and organisational evolution. Strategic Management Journal, 14, 131-142.

Smaling, A. (1989). Muenchhausen-objectivity: a bootstrap-conception of objectivity as a methodological norm. In Baker, W. J., Hyland, M. E., Hezewijk, R., & Terwee, S. (Eds.) Recent trends in theoretical psychology (pp. 155-165). New York, NY: Springer-Verlag.

Smircich, L. (1983). Concepts of culture and organisational analysis. Administrative Science Quarterly, 28, 339-358.

Spender, J. (1992). Strategy theorising: expanding the agenda. In Shrivastava, P., Huff, A., & Dutton, J. (Eds.) Advances in strategic management (pp. 3-32). Greenwich, CT: JAI Press.

Spender, J. (1993). Competitive advantage from tacit knowledge? unpacking the concept and its strategic implications. Academy of Management Best Paper Proceedings, 37-41.

Spender, J. (1996a). Making knowledge the basis of a dynamic theory of the firm. Strategic Management Journal, 17, 45-62.

Spender, J. (1996b). Competitive advantage from tacit knowledge? In Moingeon, B., & Edmondson, A. (Eds.) Organisational learning and competitive advantage (pp.56-73). London: Sage.

Spender, J., & Grant, R. (1996). Knowledge and the firm. Strategic Management Journal, 17, 5-9.

Sperry, R. W. (1968). Hemisphere de-connection annuity in conscious awareness. American Psychologist, 23, 723-733.

Stehr, N. (1994). Knowledge Societies. London: Sage.

Steward, T. (1998). Intellectual capital: the new wealth of organisations. New York, NY: Doubleday.

Sullivan, P. (1998). Profiting from Intellectual capital. New York, NY: Wiley.

Sveiby, K. E. (1986). The know-how company. Malmoe: Liber.

Sveiby, K. E. (1989). The invisible balance sheet. Stockholm: Affaersvalden/Lederskap.

Sveiby, K. E. (1996). Transfer of knowledge and the information processing professions. European Management Journal, 14(4), 379-389.

Sveiby, K. E. (1997). The new organisational wealth. San Francisco, CA: Berrett Koehler.

Sveiby, K. E., & Lloyd, T. (1987). Managing know-how. London: Bloomsbury.

Taggart, W., & Robey, D. (1981). Minds and managers: on the dual nature of human information processing and management. Academy of Management Review, 6, 187-196.

Teece, D. (1998). Capturing value from knowledge assets: the new economy, markets for know-how and intangible assets. California Management Review, (40)3, 55-79.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18, 509-33.

Tidd, J., Bessant, J., & Pavitt, K. (1997). Managing innovation. Chichester: Wiley.

Toffler, A. (1970). Future shock. New York, NY: Random House.

Toffler, A. (1990). Powershift. New York, NY: Bantam Books.

von Krogh (1998). Care in knowledge creation. California Management Review, 40(3), 133-153.

von Krogh, G. & Roos, J. (1995). Organisational epistemology. London: MacMillan.

von Krogh, G., & Roos, J. (1996). The epistemological challenge: managing knowledge and intellectual capital. European Management Journal, 14(4), 333-337.

von Krogh, G., & Roos, J. (1997). Imitation of knowledge: a sociology of knowledge perspective. In von Krogh, G., & Roos, J. (Eds.) Managing knowledge: perspectives on cooperation and competition (pp. 32-54). London: Sage.

von Krogh, G., & Vicari, S. (1993). An autopoiesis approach to experimental strategic learning. In Lorange, P., Chakarvarthy, B., Roos, J., & de Ven, A. (Eds.) Implementing strategic processes: change, learning and co-operation (pp.394-410). Oxford: Blackwell.

von Krogh, G., Roos, J., & Hoerem, T. (1997). Avoiding the phantom limb effect. In von Krogh, G., & Roos, J. (Eds.) Managing knowledge: perspectives on cooperation and competition (pp. 137-154). London: Sage.

von Krogh, G., Roos, J., & Slocum, R. (1994). An essay on corporate epistemology. Strategic Management Journal, 14, 53-71.

von Seidel, M. (1998). Intellectual property. Johannesburg: Jonathan Ball.

Wartick, S. L., & Wood, D. (1998). International business and society. Oxford: Blackwell.

Wathne, K., Roos, J., & von Krogh, G. (1997). Towards a theory of knowledge transfer in a co-operative context. In von Krogh, G., & Roos, J. (Eds.) Managing knowledge: perspectives on co-operation and competition (pp. 55-81). London: Sage.

Whitaker, J. (1998). Managing context in enterprise knowledge processes. In Klein, D. A. (Ed.) The strategic management of intellectual capital (pp. 73-86). Woburn, MA: Butterworth-Heinemann.

Wiig, K. M. (1997). Integrating intellectual capital and knowledge management. Long Range Planning, 30(3), 399-405.

Winter, S. (1987). Knowledge and competence as strategic assets. In D. Teece. (Ed.) The competitive challenge (pp. 159-184). Cambridge, MA: Ballinger.

Zander, U., & Kogut, B. (1995). Knowledge and the speed of the transfer and imitation of organisational capabilities, Organisation Science, 6(1), 76-92.

Zuboff, S. (1988) In the age of the smart machine: the future of work and power. New York, NY.: Basic Books.

Internet Sources

KnowledgeSource, 1999. Mission statement.

<http://KnowledgeSource.projects.unisg.ch/index.html>

Nonaka, I. (1998). Beyond knowledge management: lessons from Japan.

<http://www.sveiby.com.au./LessonsJapan.htm>

Skyrme, D.J. (1997) From information management to knowledge management: are you prepared? <http://www.skyrme.com/pubs/on97full.htm>

von Krogh, G. (1999) Vision statement of the competence Centre "KnowledgeSource," HSG, St. Gallen, Switzerland, <http://www.knowledgesource.org/home/home.htm>

Primary Sources

Jarillo, C. University of Geneva, Haute Ecole des Commerce. October 7.1999.

Probst, G. University of Geneva, Haute Ecole des Commerce. October 6.1999.

Stehr, N. University of Stellenbosch, Centre for Interdisciplinary Studies. March 19.1999.

Tirlitzsch, U. Siemens AG Muenchen, ICN VD. October 1. 1999.