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Measuring Readiness to Implement Systems that Create, Mobilise and Diffuse Knowledge

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Panel Member:	Dr. Chris Morgan

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I dedicate this work to Marie Mayang Sari, my spouse, and Benedict Chang, our son.

PUBLICATIONS

During the course of the research, presentation of the work and academic peer review took place through several channels. In the earlier stages of the research, during 2004, I presented the work to a Research Colloquium in the Cranfield School of Management.

The research and emergent findings were submitted to, accepted by, and presented through different academic conferences. A paper has been published in the Journal of Information and Knowledge Management in the September 2006 issue. Another paper has been accepted for publication in the Information Systems Journal.

Tanudjojo, S, Braganza, A (2003), 'Knowledge Management: Practice, Discipline or Hype?', *Academy of Management Conference 2003*, Seattle, USA.

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Tanudjojo, S, Braganza, A (2003), 'Intranet and Knowledge Management: Putting the cart before the horse?', *10th European Conference on Information Technology Evaluation*, Madrid, Spain.

Tanudjojo, S, Braganza, A (2004), 'Evidence-based attributes for effective Knowledge Management: A case study in an oilfield service company', *United Kingdom Association of Information System Conference 2004*, Scotland, UK.

Tanudjojo, S, Braganza, A (2004), 'Shaping knowledge management for business results: In search of the critical attributes that enable the creation, mobilization, and diffusion of knowledge', *Academy of Management Conference 2004*, New Orleans, USA.

Tanudjojo, S, Braganza, A (2004), 'Toward the Knowledge Management Readiness Model: Identifying a network of attributes', *British Academy of Management Conference 2004*, St. Andrews, UK.

Tanudjojo, S, Braganza, A (2005), 'Removing the clutters for efficient knowledge flow: evidence-based attributes enabling the creation, mobilization, and diffusion of knowledge', *38th Annual Hawaii International Conference on System Sciences,* Hawaii.

Tanudjojo, S, Braganza, A (2005), 'A Challenge for Innovation Exploitation: Developing Organizational Readiness for Managing Knowledge', *6th International CINet Conference*, Brighton, U.K.

Tanudjojo, S, Braganza, A (2005), 'Results from an Empirical Study for Assessing Knowledge Management System Implementation', *Academy of Management Conference 2005*, Hawaii.

Tanudjojo, S, Braganza, A (2005), 'Developing Organisational Readiness for Managing Knowledge', *British Academy of Management Conference 2005*, Oxford, UK.

Tanudjojo, S, Braganza, A (2006), 'Intranet and Knowledge Management: Putting the cart before the horse?', *Journal of Information and Knowledge Management*, Vol. 5, No. 3, September, pp. 1-10.

Braganza, A, Hackney, R, Tanudjojo, S, (Forthcoming), 'Organizational Knowledge Transfer through Creation, Mobilization and Diffusion: a case analysis of *InTouch* within Schlumberger', *Information Systems Journal.*

ABSTRACT

This thesis focuses on pre-conditions for organisations to implement knowledge management systems (KMS). Prior research suggests knowledge management (KM) is a capability and, as such, organisations need to know if they are ready to embark on KM initiatives that develop this capability. The findings of my research contend that measuring readiness is a prerequisite for implementing KMS holistically. I argue that effective KMS integrates the creation, mobilisation and diffusion stages of the knowledge life-cycle. Therefore, a system for gauging organisational readiness for KMS necessitates understanding the organisation's inclination to create, mobilise and diffuse knowledge. Drawing from Socio-Technical Systems (STS) Theory, this study uses three dimensions, Infrastructure, Knowledge Structure and Knowledge Culture, to gauge each stage of the knowledge life-cycle. This study develops an instrument – the Knowledge Implementation Assessment Tool (KIAT) – to assess an organisation's readiness for KMS. An organisation's readiness can be said to increase as the measure on each dimension increases. In addition, this study found that structurally diverse Communities For Performance are needed to leverage Communities Of Practice in delivering direct business results, and that the implementation of KMS must be governed within and by cross-functional business processes.

The knowledge-based theory of the firm and the knowledge life-cycle theory provide a conceptual understanding that managing the creation, mobilisation and diffusion of knowledge can yield competitive advantage. Based on these theories, an in-depth case study was conducted in Schlumberger's technical service delivery process. The study analysed the implementation and the use of InTouch, Schlumberger's KMS. The case study was conducted using an Abductive research strategy. The Means-End Chain approach and its laddering technique were used to collect and analyse data to establish 35 attributes vital for the implementation of an effective KMS – one that brings beneficial results. These attributes form the basis for creating the readiness assessment instrument – KIAT.

A KMS implementation affects the social and technical aspects of an organisation. This study categorised the attributes along the three STS dimensions. The basis of the categorisation was the fit between each attribute and an STS dimension. The result is an assessment instrument to measure organisational readiness. The instrument, KIAT, consists of 50 factors to measure organisational readiness along the three STS dimensions for the creation, mobilisation and diffusion of knowledge.

KIAT is operationalised in three organisational cases in different industries and processes. This allowed the instrument to be refined and led to the development of procedures to apply KIAT. The cases suggest that KIAT provides useful insights to discover or confirm KMS readiness where a cross-functional business process is the unit of analysis.

The research contributes to research methodology in the KM field, as it is the first to use the Means-End Chain approach into knowledge management research by representing a hierarchy of organisational goals in a knowledge management initiative. For practitioners, my research makes two contributions. One, the KIAT readiness assessment instrument to diagnose their organisational readiness and take informed decisions. Two, the understanding of Communities For Performance. This study points the way for further research. This includes directions to explore the relationship between the levels of readiness and the effectiveness of KMS implementation, the relationship between organisations' experience and their readiness, and the relationship between the dynamics of the KIAT Factors and organisational learning.

Keywords: Knowledge Management, Knowledge Management System, Knowledge Sharing, Means-End Chain, Laddering Technique, Socio-Technical System, Organisational Development

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Undertaking a doctoral research is a major commitment. When this is concurrent with a full-time job the undertaking is significant. In the four years spent working on this research, I have discovered much that is new to me and a little that is new to the world. Along the way many people have assisted and supported me in this undertaking. Some warrant special mention. I would acknowledge the foremost contribution from Dr. Ashley Braganza, my supervisor, without whom there would be no thesis to read. His dedication, scholarship and direction for my work have not only been instrumental in bringing this work into reality, I regarded his guidance as a fundamental necessity. My panel chair, Prof. John Bessant, played a critical role in ensuring that I stayed on track and focused. The clarity of both his critiques and support is such that ambiguity became cleared. I learnt from him that clarity creates transparency. The panel member, Dr. Chris Morgan, stressed the importance of looking at things in a holistic way.

I also owe gratitude to the faculty members of Cranfield School Management, especially to Prof. Kim James who always makes herself available, listens, and tries her best to come up with solutions to issues. Prof. Richard Croucher who elaborately went through a painstaking path to ensure that his students understand and go through the research with his “Street-fighters Guide” to research. His genuine helping hands make me feel *I can make it.* I also thank Prof. Ann Huff who patiently provided critiques and guidance in the last stage of my study. Many more faculty members and staff have contributed to my doctoral study. It would take many pages to list them all with their contribution. However, I take this opportunity to thank Barbara Birtles for her continuous support as the programme administrator and to Anita Beal from the Cranfield library who tirelessly responded to my request for articles and books.

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A research work almost never stands alone. It is related to many other previous, relevant works. This is definitely the case in my research. It is impossible to name all scholars and practitioners who have contributed to this piece of work. I pray for those who always strive for a better world to live in, as that is what we are created for.

Paris, December 2006

TABLE OF CONTENTS

6. Tanudjojo_FP_2_Project3.xls
7. Tanudjojo_FP_3_Project3.xls
8. Tanudjojo_FP_4_Project3.xls
9. Tanudjojo_FP_Comparison_Project3.xls
10. Tanudjojo_FP_GroupWork_Project3.xls
11. Tanudjojo_SLB LMS_BHA_Project3.xls
12. Tanudjojo_SLB LMS_GroupWork_Project3.xls
13. Folder: KIAT Application to Literature Cases

TABLE OF FIGURES

TABLE OF TABLES

TABLE OF KEY TERMS

Attributes	Practical items that the case study organisation actually created or where it took action when operationalising InTouch.
Business Process	The coordination and integration of activities performed in different functions to create outputs that are of value to one or more stakeholders.
Competitive Advantage	Competitive advantage is understood, in my research context, as quicker decision making in the field and a faster new product/service introduction, contributed by the capability of the firm that is not easily imitable.
Innovation	Innovation refers to efforts to change products or processes based on new ideas.
InTouch	InTouch is a registered name of the intranet-based Knowledge Management System that supports the worldwide technical service delivery process in Schlumberger.
.	
Knowledge	A fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. In organisations, it often becomes embedded not only in documents or repositories but also in organisational *routines*, *processes*, *practices*, and *norms* (from Davenport and Prusak, 1998).
Knowledge life-cycle	Knowledge life-cycle theory suggests that knowledge goes through its creation, mobilisation, diffusion and commoditisation stages. In this research the commoditisation stage is not included because this stage involves the public domain whereas my research focuses on the enterprise domain.
Knowledge Creation	The stage of the knowledge life-cycle where knowledge starts out as a little more than an idea in someone's head. At this stage, the idea may be rather abstract but coherent enough for testing.
Knowledge Mobilisation	The stage of the knowledge life-cycle where an idea becomes more concrete and its broader value is established through continued testing and validation. The defining characteristic of this stage is that the originators share their

	knowledge with people who make up part of a trusted community.
Knowledge Diffusion	The stage of the knowledge life-cycle where a validated knowledge is available to anyone in the organisation who needs to use it.
Knowledge Management	Organisational capability to create knowledge, mobilise and sustain it for continuous innovation and to diffuse it to the people who need the knowledge at the place where they need it and at the time when they need it.
Knowledge Management Systems	Information Systems that relate to Knowledge Management. They are tools to support the management of knowledge that employs Information Technology.
OD Interventions	OD interventions are sets of structured activities in which selected organisational units engage in a sequence of tasks that will lead to organisational improvement.
Organisational Readiness	The state of an organisation where the necessary preconditions to implement a knowledge management system are satisfied.

CHAPTER ONE: LINKING COMMENTARY

The last phase of an Executive Doctorate Study in Cranfield University requires me to write a linking commentary, which is a synthesis of the entire four year programme of research. This chapter is the linking commentary.

The linking commentary is structured as follows. It starts by describing the issues that my research addresses, identifying gaps in existing research, and by highlighting the key findings. It then proceeds to set out the research questions and the project structure to study each question. Then, an overview of the research methods is discussed. This is followed by a summary of the research key findings. Next, I elaborate this research's contributions to theory, practice and methodology. The linking commentary closes with a discussion of the study's limitations and recommendations for further research.

1.1 Introduction and Background of the thesis

Some organisations reap benefits from implementing knowledge management systems (KMS), but many more wonder what they need to do to benefit from KMS implementation (Majchrzak et al., 2004; Beccerra-Fernandez et al., 2004). Little is known as to what makes effective implementation of KMS that facilitates the creation, mobilisation and diffusion of knowledge. My research explores the factors for implementing KMS that brings beneficial results to organisations. Previous research indicates that organisational readiness plays an important role for the success of a KMS implementation. This research further seeks to provide a readiness measurement instrument, the Knowledge Implementation Assessment Tool (KIAT), incorporating knowledge life-cycle and socio-technical system theories. My research then tests KIAT in different business settings. Therefore, the nature of my research encompasses exploration and testing.

> *What is in a name?*
>
> KIAT stands for **K**nowledge **I**mplementation **A**ssessment **T**ool. The abbreviation "KIAT" has a meaning in itself in the Indonesian language (Bahasa Indonesia). Kiat, a noun, is a word in Bahasa Indonesia to express something intangible that a firm or an individual may own that will make the firm or the person in a stronger position, either in a business environment or in a battle field. In short, Kiat can mean competitive advantage. Assessing and addressing the readiness factors for an organisation to implement a knowledge management system will shape the organisation towards translating knowledge into competitive advantage.

Much of the literature addresses knowledge management as discrete activities, either knowledge creation (Un and Cuervo-Cazurra, 2004; von Krogh, 1998; Nonaka, 1991) or knowledge diffusion (Lesser and Storck, 2001; Storck and Hill, 2000). My research gives a different viewpoint leading to the argument that managing knowledge is an activity that goes across the stages of the knowledge life-cycle: creation, mobilisation and diffusion. KIAT measures the organisational readiness to create, mobilise and diffuse knowledge.

Furthermore, the results of the research show that the community within which knowledge activities take place does not correspond to the definition of Communities of Practice (COP). This leads to a finding that there may be another organisational form – Communities for Performance (CFP). The knowledge activities taking place in CFP produce direct beneficial results to organisations.

The initial empirical research was conducted in Schlumberger, an international oilfield organisation, with operations in more than eighty countries. InTouch, its intranet-based KMS, is the case for my study to construct KIAT. InTouch has won an award from Wharton Business School and Infosys Company as an effective knowledge management system implemented by Schlumberger in its technical service delivery process. The research applied the Means-End Chain approach with the Abductive research strategy. By incorporating Socio-technical system research for knowledge management into my research, KIAT was established. KIAT was then operationalised in three different processes within different organisations: Power International's customer service delivery process, Friends Provident's initiative to manage knowledge in the customer service process, and Schlumberger's competency development process.

This thesis finds that (1) measuring readiness is a prerequisite for implementing KMS, (2) KMS implementation is effective when it integrates the creation, mobilisation and diffusion of knowledge; therefore, organisational readiness can be understood by gauging the readiness to create, mobilise and diffuse knowledge. The study further finds that (3) readiness to create knowledge increases as the measure of the infrastructure, knowledge structure, knowledge culture for knowledge creation increases, (4) readiness to mobilise knowledge increases as the measure of the infrastructure, knowledge structure, knowledge culture for knowledge mobilisation increases, (5) readiness to diffuse knowledge increases as the measure of the infrastructure, knowledge structure, knowledge culture for knowledge diffusion increases. The research also finds (6) Communities For Performance (CFP) that is different from Communities Of Practice (COP), and that (7) CFPs may be required to leverage COPs to deliver business results, (8) effective KMS implementation needs to be governed within and by business processes, (9) effective KMS implementation requires structurally diverse communities.

1.1.1 Key Concepts and the Business Issue

Knowledge and Knowledge Management

Knowledge has long been recognised as a valuable resource for organisational growth and sustained competitive advantage (Bessant, 2003; Leonard-Barton, 1998; Drucker, 1995). Moreover, some researchers have argued that knowledge is an organisation's most valuable resource because it represents intangible assets that are hard to imitate (Grant, 1996; Kogut and Zander, 1992). The knowledge-based view of the firm contends that knowledge created, mobilised, and diffused in social settings such as organisations, forms the basis for competitive advantage (Grant, 1996). Conventional economic resources such as land and capital arguably play a lesser role in an organisation's quest to sustain competitive advantage as compared with its capability

to exploit knowledge (Kogut and Zander, 1992; Barney, 1991). Drucker anticipated that "the performance of an individual, an organisation, an industry, a country, in acquiring and applying knowledge will increasingly become the key competitive factor" (1995:236).

With the recognition that knowledge plays a critical role in the competitiveness of an organisation, consequently, it has drawn the attention of management teams of many organisations to how to manage knowledge. The subject of knowledge and how to manage it has grown in importance to practitioners who want to take advantage for business benefits and to academics to better understand the dynamics of knowledge interaction within organisations (Siemieniuch and Sinclair, 2004; Davenport et al., 2003; Birkinshaw, 2001).

Knowledge is differentiated from data and information, as Davenport and Prusak state, "knowledge is neither data nor information, though it is related to both, and the differences between these terms are often a matter of degree." (1998:1). In the long tradition of Western epistemology, knowledge has been defined as 'justified true belief' (Nonaka and Takeuchi, 1995). Nonaka and Takeuchi (1995) argue that 'knowledge is justified true belief' gives an impression that knowledge is something objective, absolute and context-free; which, of course, is contrary to the fact that it is humans who hold and justify beliefs – knowledge cannot exist without human subjectivities and the contexts that surround humans. Since epistemologists spent centuries trying to understand what it means to know something, this thesis does not pretend to provide a definitive account. The literature indicates a number of knowledge's essential characteristics: 1) knowledge is related to belief and commitment (Nonaka and Takeuchi, 1995), hence it is about meaning and can be intangible (Blair, 2002); 2) knowledge is dynamic and action oriented (Davenport and Prusak, 1998); 3) knowledge is about causal relationships (Sanchez, 2001a); 4) knowledge is contextual – it is a function of situation, experience, culture, and judgment (Davenport and Prusak, 1998); 5) knowledge is heuristic that enables a person to discover or learn something for him/herself (McInerney, 2002; Sanchez, 2001a); and 6) knowledge is a set of routines (Nelson and Winter, 1982).

One of the common themes emerging from the knowledge management literature suggests that knowledge management deals with knowledge activities with the objective to leverage the organisational knowledge for competitive advantage (Gupta and Govindarajan, 2000). At the heart of the knowledge management movement is the concept of the firm as a "social institution" (Birkinshaw, 2001; Tsoukas, 1994). The firm draws value from the employees within it and from its ability to harness their knowledge that then becomes organisational knowledge. But individuals also draw a value from the firm they work for – they learn from their colleagues and are able to accomplish tasks they could not do on their own (Kogut and Zander, 1992). The extent to which firms can bring both the knowledge they own, and the knowledge they can access, to bear on their ongoing activities can provide sources of competitive differentiation. Managing knowledge in an organisation, therefore, involves encouraging or persuading individuals to collaborate as well as capturing the knowledge to make it reusable and available for members of the organisation. Knowledge management is enacted when knowledge is created within the social network of the organisation, mobilised and validated within the knowledge communities and diffused throughout the organisation (Birkinshaw and Sheehan, 2002). Knowledge becomes available to those who need it at the place where they need it and at the time when they need it.

The knowledge management movement emerged in early 1990s following the growth of Information Technology (IT). It was soon acknowledged that knowledge management does not equate to implementing IT (Gold et al., 2001; Davenport and Prusak, 1998). Practitioners and academics argue that knowledge management is much more than technology. Knowledge management requires IT for its effectiveness. However, individuals interacting within the knowledge activities need social interaction – both for its own sake, and because it provides a powerful vehicle for learning (Brown and Duguid, 2001; Hansen and von Oetinger, 2001). At the heart of knowledge management are fundamental changes in the ways organisations operate and people behave (Birkinshaw, 2001). This argument has led academics and practitioners to look into how individuals create, mobilise and diffuse knowledge in Communities of Practice (COP).

A COP is a self-organised group of employees who share common work practices, interests, or aims (Wenger, 2000). COP has illuminated the understanding of how people interact that results in the creation, mobilisation and diffusion of knowledge, and that COP and information technology are complementary as demonstrated by Hansen et al. (1999) in their study of strategies in managing knowledge.

Birkinshaw and Sheehan (2002) suggest a knowledge life-cycle theory where knowledge goes through creation, mobilisation, diffusion and commoditisation stages. Furthermore, they argue that when implementing strategy for managing knowledge, an organisation needs to understand the life-cycle of the knowledge in question, and the appropriate tools and techniques needed to generate value from knowledge in each knowledge life-cycle stage. Four categories are recommended for consideration in each stage: informal systems for mobilising and sharing knowledge, information technology systems, human resources, and relationships with external parties.

Knowledge management requires IT to be effective (Birkinshaw and Sheehan, 2002; Davenport and Prusak, 1998). The development of IT for knowledge management, or Knowledge Management System (KMS) involves its use to facilitate social network interaction as well as content management. The recent development of KMS further includes the integration of different knowledge management initiatives within an organisation and between different organisations (for example Francis and Bessant, 2005; Cummings, 2004; Grant and Baden-Fuller, 2004). The KMS supporting this recent development may be tools such as Integrated Enterprise Applications. The objective is to optimise the different combination of existing knowledge management systems for the improved performance of certain alliances/partnerships or joint-developments (Grant and Baden-Fuller, 2004).

Challenges faced by practitioners and academics

Knowledge management has gone through different stages from its emergence in the early 1990s with different levels of acceptance and success in the business world. Gilmour (2003) describes frustration by claiming that US$4.5 billion was spent in 2003 in the USA on software and other technologies that are expected to foster knowledge sharing, without bringing the expected results. Yet certain firms have reported significant successes in implementing knowledge management (Hauschild et al., 2001; Davenport and Prusak, 1998) but many other firms show very few results from knowledge management. In other words, knowledge management promises much, but often delivers very little. Much research has been devoted to knowledge

management and there are no simple solutions to this challenge. A strand of the literature argues that core to the organisations' inability to reap benefits from KMS implementation is the organisations' unreadiness to implement KMS (Siemieniuch and Sinclair, 2004; Gold et al., 2001). My research is aimed at contributing to the measurement of organisational readiness to implement KMS that may bring beneficial results.

1.1.2 Gap in existing research

The promise and the reality of knowledge management

In a fast-moving and increasingly competitive world, a firm's enduring source of advantage is its knowledge – the knowledge of its individual employees, and the knowledge that gets built into its structures and systems (Davenport et al., 2003; Birkinshaw, 2001). Despite the persistence of the phrase 'knowledge management' and the genuine feeling that knowledge management does refer to a new and legitimate practice, the problem remains that most companies struggle to implement KMS (Janz and Prasarnphanich, 2003; Cranfield University, 1998).

Several reasons have turned managers' attention to knowledge management. Firstly, the realisation that it is necessary to capture individuals' knowledge as they may leave for other organisations or retirement (Blair, 2002). Secondly, businesses require innovation where knowledge creation plays a fundamental role (Nonaka and Takeuchi, 1995). Thirdly, it is important that knowledge is made available to employees who need it where they need it and at the time they need it; knowledge is useful only, at least in business environments, when it can be translated into actions (Ghoshal and Gratton, 2002; Davenport and Glaser, 2002). In short, knowledge management promises 1) knowledge continuity within the firm, 2) a capacity for innovation, and 3) faster real-time diffusion of organisational knowledge across the geographical spread of the operations.

Beazley et al. (2003) contend that the management function has been redefined. According to them, for the first time in 100 years – since Henry Fayol described the five functions of a manager and the fourteen principles of management – a new function has emerged to alter the basic configuration of a manager's responsibility, namely towards leveraging knowledge for the benefits of the organisation. "With knowledge as the new fulcrum on which organisational fortunes turn, preserving knowledge continuity has emerged as a basic management priority and, hence, a fundamental responsibility of management." (Beazley et al., 2003:65). Very often knowledge 'panic' develops when someone – or some document – in the organisation holds knowledge, say for example, a new hire's needs and nobody knows who has it or where to access the document (Blair, 2002; McInerney, 2002). Managing continuity of relevant knowledge can, therefore, provide a sustainable difference between competitor organisations, leading customers to select the organisation that can better manage continuity – in other words, continuity management provides competitive advantages (Beazley et al., 2003). Managing continuity turns out to be more complicated than suggested; employees are not eager to collaborate with each other or they may be concerned about their hierarchical position and status (Blair, 2002; Southon et al., 2002). The implementation of

continuity management requires overcoming cultural and structural barriers within the organisation.

It is acknowledged that innovative products and services are dependent on knowledge created within an organisation (Bessant, 2003; Leonard-Barton, 1998). Strategies for knowledge creation have become a popular area for scholars to study (Un and Cuervo-Cazurra, 2004). Nonaka and Takeuchi's (1995) suggest that knowledge creation goes through a socialisation, externalisation, combination, and internalisation (SECI) mechanism which is an interplay between tacit and explicit knowledge. In order for the firm to become a knowledge system (Grant, 1996) the promotion of interactions among individuals who embody knowledge is required (Tsoukas, 1994; Polanyi, 1966). Whereas single individuals can create knowledge, and technology can facilitate the transfer of knowledge between individuals (Hansen and von Oetinger, 2001), a greater challenge for organisations is to promote social interactions that facilitate not only the transfer of explicit knowledge, but also the creation of both explicit and tacit knowledge (Nonaka and Takeuchi, 1995; Kogut and Zander, 1992). The extant literature has dealt with the strategic level, but more research is required as to how this can be implemented within an organisation (Grover and Davenport, 2001).

Plenty of knowledge management tools, powered by information technology and termed knowledge management system (KMS), have come into the market to diffuse knowledge across the globe (Alavi and Leidner, 2001). Investment has been poured into this technology with, in most cases, unsatisfactory results (Siemieniuch and Sinclair, 2004; Gilmour, 2003; Birkinshaw, 2001). Core to this problem is the assumption that knowledge management equals KMS investment. Where information technology can be a powerful engine for knowledge management, much more than technology needs to be considered.

Knowledge Management as a capability

Siemieniuch and Sinclair (2004) and Gold et al. (2001) suggest that knowledge management is an organisational capability. It is the capability to create knowledge, mobilise and sustain it for continuous innovation, and to diffuse it to the people who need that knowledge anywhere at any time. Gold et al. (2001) postulate that such capabilities are necessary pre-conditions for effective knowledge management to flourish. Siemieniuch and Sinclair (2004) emphasise that, as with any capability, organisations must be prepared for the introduction of knowledge management. They argue that looking into certain factors and developing those factors will lead to an effective deployment of knowledge management. My research is aimed at complementing the work of these scholars by providing an assessment instrument to measure organisational readiness to implement a knowledge management system to create, mobilise and diffuse knowledge.

The gap in the literature

The preceding discussion shows that the conceptual gap is a need to assess organisational readiness for knowledge management. This gap can be filled by an assessment method that enables organisations to gauge their readiness levels. This study is dedicated to developing such an instrument to fill in this gap. A three-staged

research programme was designed to achieve this objective. Section 1.2 describes the structure of this research programme.

1.1.3 Towards Readiness Assessment Instrument

Attributes for operationalising knowledge management systems

Many leading thinkers fragment the management of knowledge into disconnected activities of knowledge creation (von Krogh, 1998; Nonaka, 1991) and knowledge diffusion (Lesser and Storck, 2001). This may be partly caused by the distinction made between tacit and explicit knowledge; 'tacit' being responsible for knowledge creation and 'explicit' being the way to diffuse knowledge for application. In practice, however, organisations implementing KMS cover the entire knowledge life-cycle from its creation to its diffusion. Therefore, understanding how to operationalise KMS should not focus solely on knowledge creation or knowledge codification/diffusion because they do not necessarily lead to improved performance, nor do they create value (Alavi and Leidner, 2001). Value is created only when knowledge is diffused throughout an organisation and applied where it is needed. I posit that turning knowledge into competitive advantage requires knowledge management that addresses the knowledge life-cycle: creation, mobilisation and diffusion of knowledge – and takes the interplay of tacit and explicit knowledge into consideration. Little is known empirically about how to operationalise KMS that support knowledge activities where members of the knowledge communities interact to create, mobilise and diffuse knowledge. This leads to the research subject to find empirically the attributes required for successful implementation of KMS in an organisation.

Organisational readiness for knowledge management

It has been suggested that organisations must prepare themselves prior to implementing KMS (Siemieniuch and Sinclair, 2004; Taylor and Wright, 2004). Developing an instrument that can be used to measure organisational readiness for implementing KMS will, therefore, contribute to the body of knowledge and the practice of knowledge management. Organisations that measure readiness at the start of a KM initiative can focus on those factors that will hinder or support the effective implementation of a KMS. Operationalising KMS often includes both the social and technical aspects of an organisation; therefore, measuring readiness can be approached from a Socio-Technical System (STS) perspective.

Pan and Scarbrough (1998) apply an STS approach to reveal the multi-layered nature of knowledge management systems. The socio-technical perspective adopts a holistic approach which highlights the interweaving of social and technical factors in the way people work (Pasmore et al., 1982). It also underlines the complex interactions which take place between the subjective perceptions of employees and the objective characteristics of work processes (Griffith and Dougherty, 2001; Mumford and Ward, 1966). The major implication of socio-technical analysis is the need to seek

the joint optimisation and parallel design of the social and technical subsystems within the organisation (Pasmore, 1995).

Assessment of Organisational Readiness and Organisational Development

French and Bell (1999) suggest that Organisational Development (OD) is very much related to organisational change and it addresses planned changes. In other words, OD is essentially an action-oriented programme based on valid information about the status quo, current problems and opportunities, and effects of actions as they relate to achieving goals. Diagnosis may form the start of OD to address a picture of the organisation as it is. French and Bell (1999) contend that diagnostic activities are necessary to know the state of the organisation and to allow a further development of certain aspects of the organisation.

What emerges from different OD definitions (see Chapter Two section 2.6.2) is that OD addresses change through social interaction between the organisation agents, and recently OD addresses the change related to technology. Implementing KMS to facilitate the creation, mobilisation and diffusion of knowledge involves changes in peoples' behaviours. It also involves the organisation itself as a system – some jobs may need to be removed and others created, while some processes may need to be modified, suppressed or created. Consequently, assessing organisational readiness for knowledge management can be positioned within OD practices.

1.1.4 The structure of this thesis

This thesis is constructed and presented on the basis of the three major structured projects within the Cranfield Executive Doctorate Programme. This Chapter One: Linking Commentary serves as a synthesis of the findings from the three projects. It gives an overview of the background of the thesis, the research question and methodology, and the project structure. It presents the summary of the research's key findings, the contributions of the thesis and the limitations. It further discusses the opportunities for further research. In the following chapter, Chapter Two: Literature Review and Research Questions, I present a detailed review of the knowledge management literature. A review of STS and OD literature is presented, in particular how STS and OD relate to my research and Research Questions are derived from the literature gap. In Chapter Three: The Research Methods, and Project Structure, I present the discussions of the choice of the research methods. This Chapter Three also discusses the details of how the three projects are linked structurally. In Chapter Four: Project One, I present the details of the work performed in Project One where the attributes responsible for effective KMS implementation are established. In Chapter Five: Project Two, I present the details of the Knowledge Implementation Assessment Tool (KIAT) construction. In Chapter Six: Project Three, I present the details of operationalising KIAT in three different organisations and the modification applied to the initial KIAT produced from Project Two. Chapter Seven: Personal Development

brings the thesis to a close with my personal development lessons learnt throughout the process of the Executive Doctorate Programme.

1.2 The Research Questions and Project Structure

1.2.1 Developing the research questions

From the discussion in the previous sections, providing a readiness assessment instrument to organisations is a need that may be addressed to contribute to academics and practitioners. My contribution is to the knowledge management literature and to the business world in this domain. The research questions (RQ) for the research programme are presented as follows:

RQ 1: *What attributes enable the implementation of KMS for the creation, mobilisation and diffusion of knowledge?*

RQ 2: *What factors and measurement scales constitute organisational readiness for KMS implementation?*

RQ 3: *How can the organisational readiness assessment instrument be operationalised in different business settings?*

Chapter Two – the literature review – provides theoretical substantiation of these research questions.

This research aims at narrowing the "theory – implementation" gap, described in section 1.1.2, by examining how a knowledge management system is implemented in an oilfield services company: Schlumberger, in order to form a readiness assessment instrument, and by applying the readiness assessment instrument to different organisations and business settings to operationalise the instrument. Schlumberger manages knowledge within its technical service delivery process through a system called *InTouch*. This study examines the attributes in operationalising the system. Attributes are the practical items that the company actually creates that become features or where it takes action when operationalising InTouch. The study integrates the STS dimensions for knowledge management with the attribute findings to develop an instrument to measure organisational readiness for implementing KMS to create, mobilise and diffuse knowledge. As the instrument is created from a single business setting, it is then operationalised for its applicability in three different companies: Power International, Friends Provident, Schlumberger LMS.

1.2.2 Project structure

The three projects are structured to follow the three research questions outlined in the subsection 1.2.1. Projects One, Two and Three are designed to answer RQ1, RQ2 and RQ3 respectively. Figure 1-1 summarises the focus, the method, the disciplines that informed the research, and the outcomes of each project.

	Project One	Project Two	Project Three
Focus on	Revealing the attributes for KMS implementation	Developing readiness assessment instrument	Verifying the readiness assessment instrument
Method	> Abductive research strategy > Means-End Chain and the laddering technique	> Abductive research strategy - First-order construct - Second-order construct	> Abductive research strategy > Multiple-Case Analysis
Disciplines that informed the research	> Knowledge Management	> Knowledge Management > Socio-Technical Systems	> Knowledge Management > Socio-Technical Systems > Organisational Development
Outcomes	35 attributes	50 factor readiness assessment instrument - KIAT	KIAT version 1.1 as a diagnostic instrument

Figure 1-1: The focus, method, discipline and outcomes of Projects One, Two, Three

Project One was conducted to establish the attributes for an effective implementation of InTouch in Schlumberger. The Means-End Chain technique is used to produce the results in a Hierarchical Value Map (see Chapter Four: Project One, section 4.4.3). Data were collected from interviews with 19 Schlumberger employees from different organisational levels and different geographical locations.

Project Two led to the creation of the organisational readiness assessment instrument for implementing a knowledge management system. To achieve the objective of Project Two, the work of Pan and Scarbrough (1998) is integrated into the results from Project One. Their socio-technical system approach forms the basis for the analysis and presentation of KIAT (see Chapter Five: Project Two, section 5.3.1).

Project Three was conducted to operationalise the instrument created in Project Two. The instrument was applied to three different business settings in real cases and to two cases derived from literature. This allowed the instrument to be refined and led to the development of a Guideline to apply KIAT in other industries and processes (see Chapter Six: Project Three, section 6.5.3).

1.3 Overview of the Research Design

1.3.1 Research Philosophy

The research is based on a phenomenological approach. Informed by the interpretive philosophy, I take the realist position where common subjectivities of some respondents become objective realities. In other words, the research design data collection during the course of this study is from the perspective that reality is not objective and exterior, but is socially constructed and given meaning by people. Respondents express their views freely in their subjective context because reality is the product of individual cognition. Data, obtained from the respondents' every day concept and meaning, are then processed with the realist approach in order to discover logical relationships within the data. Concepts should incorporate stakeholders' perspective, generalisation through theoretical abstraction; sampling requires small numbers of cases chosen for specific reasons (Easterby-Smith et al., 2002; Burrell and Morgan, 1979).

Researchers have an underlying anxiety as to how the research will stand up to outside scrutiny. The technical language for withstanding external scrutiny includes terms such as validity, reliability and generalisability. For the phenomenological research approach, the validity of the research can be examined from the answer to the question "Does the study clearly gain access to the experiences of those in the research setting?"; its reliability can be examined from the answer to the question "Is there transparency in how sense was made from the raw data?"; and its generalisability can be examined from the answer to the question "Do the concepts and constructs derived from this study have any relevance to other settings?" (Easterby-Smith et al., 2002). The discussion in Chapters Three, Four, Five and Six addresses these questions. The summary can be tabulated in Table 1-1.

1.3.2 The choice of Research Methods

This research adopted an Abductive research strategy (Blaikie, 2000). The idea of abduction refers to the process used to generate social scientific accounts from social actors' accounts; for deriving technical concepts and theories from lay concepts and interpretations of social life. As I intended to explore the field in order to build a theoretical organisational readiness assessment instrument, this strategy provides the greatest scope for exploring a phenomenon from the first hand account of people who have experienced the phenomenon to be investigated. It has the added advantage of providing researchers with a framework for collecting and analysing data from which to build conceptual instrument (Blaikie, 2000). It is flexible enough to be used with other data analysis techniques; in this study it is the laddering technique. The drawback of the Abductive strategy is the possible biased interpretation of the lay concepts projected by the respondents. This drawback can be overcome by using a technique referred to as "mirroring or reflecting" (Easterby-Smith et al., 2002; Easterby-Smith and Malina, 1999). This technique involves expressing in the researchers' own words what the respondent has just said. This prompts the respondent to rethink his/her answer and reconstruct another reply that amplifies the previous answer. In practice, I use questions such as: "What you seem to be saying is …."

The aim of the research is to construct an organisational readiness instrument based on an empirical study that may illuminate the attributes required for effective KMS implementation. A case study approach (Yin, 1994) was adopted for the research. Easterby-Smith et al. (2002) and Yin (1994) suggest that the definition of the unit of analysis is related to the way the initial research questions have been defined. Referring to the above-stated research questions the unit of analysis is where the creation, mobilisation and diffusion of knowledge take place. The unit of analysis of my research is an organisation's business process. In the case of Schlumberger, it was the technical service delivery process; in the case of Power International, it was the customer service delivery process; in the case of Friends Provident, it was the customer service process; in the case of Schlumberger LMS, it was the competency development process.

I used a Means-End Chain model with its laddering technique to uncover the attributes that ultimately bring beneficial results. A Means-End Chain is a structure containing inter-connected meanings through which certain action attributes are seen as the means to an end (Baker, 2002). The model embodies the concept of levels of abstraction: 1) lower level *attributes* link with 2) higher level *consequences* which, in turn, link with 3) still higher level *values*. The laddering technique refers to the approach in data collection that forces respondents up a "ladder of abstraction". Open-end questions are recommended to encourage interviewees to give answers specific to their particular thoughts in their own way to ladder up the abstraction. Following Gutman (1997; 1982) I used the Means-End model to conceptualise the hierarchy of organisational goals in managing knowledge. My research uses the Means-End Chain model, integral to the laddering method, to focus attention on the linkages between: 1) activities 2) the consequences or outcome goals from certain activities and 3) benefits resulting from the outcome goals or consequences. Section 3.1.5 further explains the Means-End Chain model with its laddering technique.

Sample and Data Collection

A theoretical, rather than a statistical, sampling method (Eisenhardt, 1989) was used to choose the research subject. The criteria used to choose the research site were as follows: First, that the site manages the knowledge life-cycle at the level of business processes; Second, that knowledge is managed within communities; Third, that the system is operational and widely used, proved by some detailed facts or measures; Fourth, that knowledge management brings beneficial results to the organisation; Fifth, that the organisation has obtained recognition from practitioners and academics. Looking into three different processes in Schlumberger, detailed in Chapter Four, Schlumberger's technical service delivery process fulfilled these criteria. This process addresses knowledge-intensive activities across all stages of the creation, mobilisation, and diffusion life-cycle.

The data gathering technique used was laddering – an in-depth interview technique. Each interview was guided by probing questions exemplified by the list of questions in Appendix 2. All interviews were recorded and transcribed. For Project One, a total of 19 interviewees included Schlumberger's InTouch users, middle and top managers, the programme manager and team members of InTouch support. The data from the interviews were further used for Project Two. For Project Three, a total

of 7 respondents from Power International, 4 respondents from Friends Provident and 5 respondents from Schlumberger LMS were interviewed.

Scrutiny	Questions	Answers for this research
Validity	Does the the study clearly gain access to the experiences of those in the research setting?	19 interviewees were all actively involved in the research subject from different levels and different geographical locations. The researcher had extensive access to the required information (Research Project One and Project Two). Respondents from Power International, Friends Provident and Schlumberger LMS were all actively involved in their knowledge management initiatives. Access was granted to the KM project teams by the KM project leaders (Research Project Three).
Reliability	Is there transparency in how sense was made from the raw data?	In all three research projects an Abductive research strategy was adopted. The Means-End Chain approach with its laddering technique and the Hierarchical Value Map give transparency as to how the collected data were analysed (Project One). The categorisation of the one-to-one relationship between the Factors and the STS dimensions to construct KIAT was discussed in detail (Project Two). In depth discussion for the individual case and multiple case analysis is presented (Project Three).
Generalisability	Do the concepts and constructs derived from this study have any relevance to other setting?	The objective of the research's Project Three is to address this specific question for generalisability.

Table 1-1: Answers of the research to external scrutiny

Data analysis

Emergent conceptual constructs were identified using an Abductive strategy (Blaikie, 2000). These conceptual constructs – referred to as second-order constructs – were derived from first-order constructs – which constitute participants' social reality captured in the interview transcripts. Using content analysis, the structural relationships between specific attributes, consequences, and beneficial results – seen as a hierarchy of goals – are aggregated across interviewees in an asymmetric implication matrix (Reynolds and Gutman, 1988). Implication matrix is constructed through the laddering analysis of the interview data by counting the number of relationships. The implication matrix is then used to draw a hierarchical value map (HVM) as a means to illustrate the relationships among constructs. The results are presented in subsection 1.4.1, and the detailed explanation of the implication matrix and the HVM is presented in Chapter Four subsection 4.4.3.

Data analysis for Project Two and Three remains within the Abductive strategy with the first-order and second-order constructs. They are individually explained in Chapter Five and Chapter Six.

1.4 Summary of Key Findings of the research

1.4.1 Attributes for effective implementation of knowledge management systems

The study identified thirty five generic attributes essential to the creation, mobilisation and diffusion of knowledge. These attributes are discussed in Chapter Four: Project One, and the summary of the attributes is presented in Table 1-2 on the next page. The attributes are presented in the HVM format in Chapter Four and the results show the intricacy of implementing a system that enables the creation, mobilisation and diffusion of knowledge. The attributes are neither linear nor discrete and do not fit neatly into different stages of the knowledge life-cycle. There are interdependencies between the consequences, between the beneficial results, and across consequences and beneficial results.

1.4.2 Readiness Assessment is Essential

Constructing Organisational Readiness Assessment

Thirty five attributes for effective implementation of a knowledge management system are established from Project One. One-to-one relationships between the attributes and the STS dimensions are sought to allow the construction of a readiness measurement instrument. The three STS dimensions are: Infrastructure, Knowledge Structure, and Knowledge Culture. The technique used to conduct this analysis is detailed in subsection 5.2.4. For each attribute, an in-depth analysis is made to search for any distinct sub-attributes that may relate directly to any one particular STS dimension. The analysis of the 35 attributes leads to 50 factors that each relates distinctly to one particular STS dimension. These 50 factors form the assessment tool for organisational readiness. Fourteen Factors have relationships with Infrastructure, sixteen Factors with Knowledge Structure, and twenty Factors with Knowledge Culture. Infrastructure is the physical and organisational structures, the policies and the technologies that are required for operationalising a system that facilitates the creation, mobilisation and diffusion of knowledge. Knowledge Structure is the formal structures, rules and facilitation for knowledge being exchanged, which govern the knowledge activities within the system between workers to create, mobilise and diffuse knowledge. Knowledge Culture is the social setting within which knowledge activities are performed. This culture is normally taken for granted as it is intangible – embedded in the daily routines and the social relations surrounding the work processes between workers in creating, mobilising and diffusing knowledge.

As knowledge management is a capability (Gold et al., 2001), and like any other capability, Siemieniuch and Sinclair (2004) contend that organisations need to be prepared for it. In other words, it is important for organisations to know their readiness prior to embarking on a knowledge management initiative. This study has established a Knowledge Implementation Assessment Tool (KIAT) with its fifty

Factors to be evaluated. The results are presented in three socio-technical system dimensions, exemplified by Figure 1-2. The readiness is presented with a scale between 1 to 5 in a 'traffic light' environment. The fifty Factors in KIAT and the detail of the readiness presentation are explained in Chapter Five: Project Two.

Attribute	Description of attribute
01. Targeted domain	A specific activity knowledge domain, e.g. InTouch addresses the operational and technical knowledge within a technical service delivery process.
02. Accessibility	The way users can reach the knowledge source, e.g. through Intranet.
03. Standard Language	The lingua franca or media in which the knowledge activity is conducted.
04. PM Reporting	Project Management reporting structure of the knowledge management initiative.
05. Financial Support	Allocated financial commitment.
06. System Feedback	Systematic opportunity of giving feedback for the change or development of the system.
07. Content management	The way the content of knowledge is structured within the system.
08. Governance body	The committee that sets the rules of the game and provides the go/no-go of initiatives.
09. Personalisation	The interaction with the system that can be tailored or personalised by users.
10. User-friendliness	Simple and easy to use by users.
11. Training programme	A structured training programme addressing different types of user or role.
12. People mobility	Employees from one function to another and/or from one geographical area to another.
13. Single source	There is no other option that can replace the system as such.
14. Embedded process	The use of the system for the knowledge activities is within users' work process.
15. Alert feature	Automatic alert feature within the system.
16. Answer to users' need	The system answers to users' needs such that users can benefit from the system.
17. Problem solving	The system offers problem solving activities.
18. Knowledge broker	A person assigned to link the people who need the knowledge and the people who have the knowledge, e.g. in InTouch it is the InTouch Engineer.
19. Expert Users	Users identified as experts in some products or services who are willing to collaborate within communities.
20. Knowledge champion	A person in the delivery site that acts as 'cheer-leader' and is knowledgeable in his/her duties as well as the knowledge project.
21. Subject Matter Experts	Identified subject matter experts for particular knowledge that is managed within the system.
22. Communities	People getting together to collaborate and to come up with a solution to a problem.
23. Validation process	A process to validate a proposed solution prior to its diffusion throughout the organisation.
24. Measurement	Metrics that are created within the system and are communicated to the organisation.
25. Relevant knowledge	The knowledge in the system must be relevant to users' duties in their work.
26. Awareness programme	A programme that reveals the benefits to the users and the management.
27. Recognition scheme	Recognition, by name, of contributors to the creation, mobilisation and diffusion of knowledge.
28. Knowledge Feedback	A mechanism for users to give feedback to the knowledge being shared.
29. Communication	Direct championing of communicating the knowledge project by the leadership.
30. Campaign	A campaign run by a few people to ensure coverage of users, at least at the beginning of the system being put into operation.
31. Shared vision	Decision to embark on a knowledge management initiative needs to be a shared one between management and the targeted users/workers.
32. Autonomy	Knowledge management initiative needs to create and sustain the workers' autonomy in controlling their time spent at work.
33. Shared benefits	Benefits from the knowledge management initiative need to address both management and the users – these benefits need to be demonstrated accordingly.
34. Streamlined activities	Additional activities resulting from the KMS implementation need to be compensated for with some other users' working activities that need to be removed from their routines prior to knowledge management.
35. Enriching workers' value	KMS that make the workers' existence in the organisation more valuable; that suppress certain positions during pre-KMS and create other positions post-KMS.

Table 1-2: Attributes of implementing InTouch in the technical service delivery process

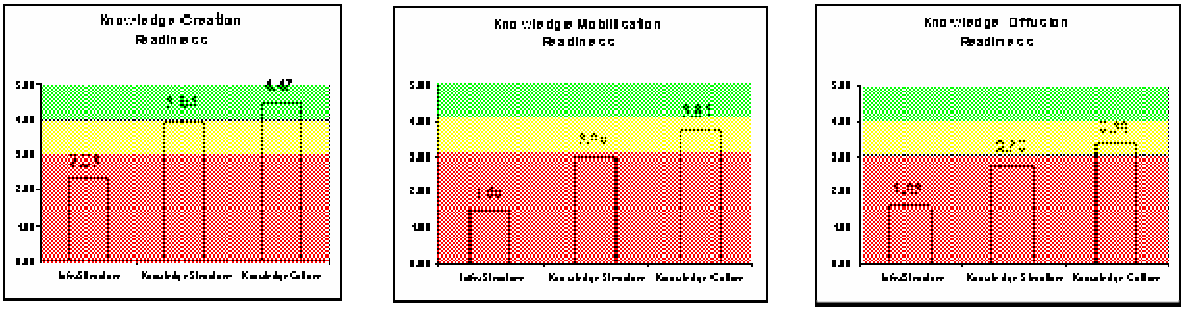


Figure 1-2: Example of Organisational Readiness presentation

Application of Readiness Assessment leads to Informed Decisions

This assessment instrument has been applied in three different organisational environments: 1) Power International within its customer service delivery process, 2) Friends Provident with its intention to implement a wider knowledge management system, 3) Schlumberger LMS within its competency development process. The application of KIAT provided these three organisations with important insights. Power International took the benefits from the results and revised their plan to implement the knowledge system. They identified what they needed to work on and are addressing the issues, in particular Factors related to the knowledge structure dimension. Friends Provident learnt that in order to implement a knowledge management system they needed to decide the objectives and, consequently, the business process within which the system is going to operate. They also learnt that they have a reasonable readiness for the knowledge culture dimension across the knowledge life-cycle stages. Schlumberger LMS know what they 'already knew' that they are ready to implement LMS – it is, therefore, a confirmation.

The objective of KIAT is to provide managers with an assessment instrument to evaluate how ready their organisation is and what Factors they need to address. As exemplified by the Power International and the Schlumberger LMS cases, without KIAT, managers' perception of what makes them ready or not to implement a knowledge management system is limited to a few Factors, fourteen Factors in the Power International case and nine in the Schlumberger LMS case (see subsections 6.4.1 and 6.4.3). Furthermore, literature related to an organisational readiness for knowledge management lists fourteen (Siemieniuch and Sinclair, 2004) and six (Taylor and Wright, 2004) overlapping Factors. In this respect, KIAT has helped the management of those three companies take informed decisions with the fifty Factors evaluated to produce the readiness reports in the socio-technical dimensions: infrastructure, knowledge structure and knowledge culture.

In all three cases, the application of KIAT to assess the organisational readiness for knowledge management gives critical insights for management in making their decisions. The software service director of Power International postponed the decision for the KMS choice to be implemented in the software service delivery process and its launch date. The management addressed the weaker Factors identified by KIAT and shaped the organisation to be in a better position to succeed in implementing the chosen KMS. The Friends Provident management now realises that many Factors, identified from applying KIAT, have to be considered, such as the business processes and the knowledge structure, prior to embarking on KMS

implementation. Friends Provident took the results for a further study within the organisation to evaluate what they will have to do in knowledge management. The programme director of Schlumberger LMS learnt that Schlumberger was indeed ready to implement LMS for its competency development process. Schlumberger management took the KIAT results to show why and in what ways they were ready to implement a knowledge management system in the competency development process. Readiness assessment may be for the purpose of discovery as much as for the purpose of confirmation. Measuring organisational readiness for knowledge management, exemplified by these three cases, is essential to lead to informed decisions. The software director of Power International said, "This assessment tool has helped me to reposition myself and my company to have a better chance to succeed in implementing knowledge management".

1.4.3 A different type of knowledge community

InTouch was created to support Schlumberger's knowledge intensive activities in the technical service delivery process. The nature of the oil business involves high value assets that incur significant costs. Rapid and accurate decision-making is crucial. Organisations serving the oil industry must respond to this demanding requirement for shared knowledge.

InTouch, in general, has two functionalities: 1) it facilitates person-to-knowledge repository inquiry – termed by Schlumberger 'knowledge service', and 2) it facilitates person-to-person interaction – termed by Schlumberger 'knowledge support'. It was discovered that the communities where the members interacting using InTouch are not the widely known and defined Communities of Practice (COP). The diagram in Figure 1-3 demonstrates how members of the communities interact with the InTouch system.

A field user having an inquiry or a problem (indicated by "?" in Figure 1-3) will first interrogate the Knowledge Base (KB) in the InTouch system. If knowledge is found in the knowledge base, the field user is satisfied and does not pursue the matter further. If the field user feels the need to give feedback on the knowledge found in the repository, either for an improvement or a correction, she or he will pursue exactly the same process as if the knowledge is not found in the knowledge base. Ideally, local interaction is encouraged by and through the knowledge champion and the peer field users.

When knowledge is not found in KB, the knowledge communities involved in InTouch will interact with each other within a clearly-defined procedure. In such a case, the field user will send an inquiry or request to the system that will then forward the inquiry to the pre-defined InTouch Engineer or Manager assigned for a certain subject related to the inquiry. The InTouch Engineer (ITE) is an appointed position with a clear job description and objectives for knowledge interaction activities. ITEs have a list of subject matter experts and applied experts that he/she may call on for help and to solve problems when the inquiry involves problem solving matters. Depending on the nature of the inquiry, either related to specific design issues or operational issues, the ITE will contact either the subject matter experts or the applied experts. Subject matter experts and applied experts are voluntary members within the InTouch communities. Subject matter experts are normally located in the research and development centres and applied experts are located in the field. The experts and the

field users then interact to find solutions. The ITE will facilitate the interaction among experts and field users when necessary. In the case of emergency the experts interact directly with the field user and find solutions to the problem that can be immediately implemented to avoid any down time. In non-emergency situations these experts answer to the ITE. Knowledge creation takes place in this interaction. In all cases, the newly created solutions and/or knowledge will have to be validated, or re-validated in the case of an emergency answer. Knowledge mobilisation takes place in this interaction. The ITE plays a role to decide as to when and how the knowledge is diffused and freely reused by field users. Knowledge diffusion takes place in this interaction.

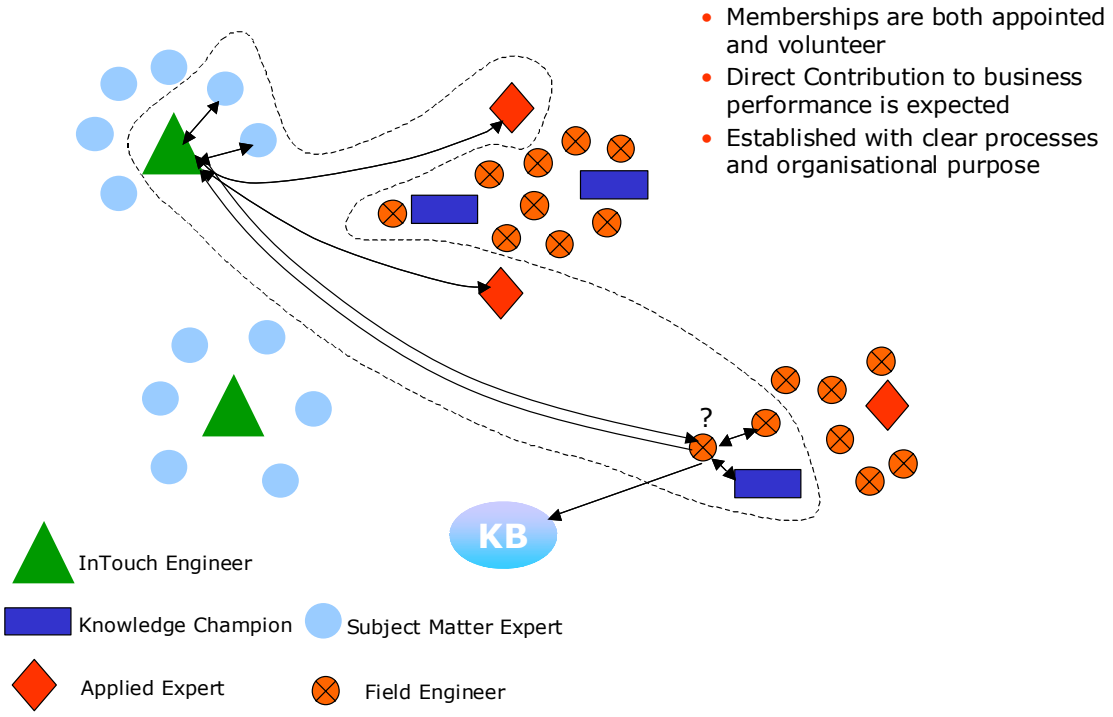


Figure 1-3: Interaction of knowledge community members within InTouch

These InTouch communities do not correspond exactly to the definition of COPs. COPs have members who collaborate freely, but the InTouch communities have members with both those who are appointed and those who collaborate freely. COPs' members interact with each other with no clear objective to contribute directly to the business performance. The InTouch communities contribute directly to the business performance and they may indirectly contribute to the strategic benefits brought by InTouch as summarised in sub-section 1.4.1. COPs' members define the interaction process and the authority relationship themselves, but InTouch has a pre-defined interaction process with no-authority relationship among members.

This phenomenon of a different type of community is further discussed in subsection 1.5.3. I term this type of community as Communities For Performance (CFP).

1.4.4 Knowledge Management System brings important benefits to the firm

Schlumberger achieved a number of enhancements resulting from effective implementation of a knowledge management system. These achievements in turn have brought significant financial improvements and industry recognition of InTouch as a knowledge management system. The important benefits are discussed below:

- *strengthened competitive advantage*

Schlumberger's competitive advantage was strengthened through the implementation of InTouch with the continued development and growth of its technological capabilities. Organisations who understand and develop the management of knowledge dominate, because products are physical manifestations of knowledge, and their worth largely, if not entirely, depends on the value of the knowledge they embody (Bessant, 2003; Leonard-Barton, 1998). An external survey showed that the system had generated cost savings and revenue totalling more than $200 million. Moreover, this study showed a 95% reduction in the time required to solve operational problems and a 75% decrease in the time necessary to update engineering modifications.

- *process within the new form of the organisation*

In the past, e-mails and phone calls were the primary means for discussing technical issues in decision-making. InTouch, however, directs knowledge through a single communication channel, which enables Schlumberger to apply knowledge more efficiently. In fact, the previous knowledge flow could not be effectively sustained within the new matrix organisation. The delivery sites assigned to Geomarkets and the technology centres became the responsibility of the Business Segments. InTouch provided the "Ba" (Nonaka and Konno, 1998) or "space" for the knowledge communities. Therefore, the establishment of a direct connection between the delivery sites and technology centres removed the hierarchical clutters in the knowledge activities, and InTouch facilitated the technical service delivery process which provided a common global standard.

- *improved speed and quality of technology solutions provided to clients*

Decision makers need to integrate local knowledge with information from other parts of the organisation. In the oil industry, this is particularly vital in the exploration of new oilfields and exploitation of producing fields. For example, action taken by field

managers in the Middle East will depend on decisions made by executives located in various American, Far Eastern or European cities. In turn, to effectively manage the global organisation, executives need to be familiar with the actions taken in the field while exploration and exploitation work is underway. The nature of the oil business also involves high value assets that incur significant costs. Rapid and accurate decision-making is crucial which makes managing knowledge critical. Organisations serving the oil industry must also be able to respond to this demanding requirement for shared knowledge. With users actively creating, mobilising, and diffusing knowledge across functional and regional boundaries, InTouch enabled the technology centres to understand end-user needs in a much shorter time. Consequently, technology centres were able to define issues more accurately and to propose more relevant and reliable solutions. Hence, the improved speed and quality of technology solutions provided to clients.

- *meritocracy of ideas*

The creation of new knowledge is often within knowledge exchange activities (Hargadon and Sutton, 2000; Nonaka, 1991). Newly acquired knowledge interacts with existing knowledge to spark ideas (Hansen and von Oetinger, 2001). According to Wenger (2000) and Nonaka and Takeuchi (1995), the major source of new knowledge is bringing together people with different ideas to work on the same problem. Davenport and Prusak (1998) further emphasise that active knowledge interaction brings a meritocracy of ideas – it continually validates and refines knowledge, it tests official beliefs, exposes the flaws of the faulty ones and espouses those with merit. Operationalising InTouch triggered open feedback and debate among field users, subject matter experts, and applied community experts, which led to the development of more effective solutions for clients.

- *job enrichment for employees*

Several roles and responsibilities were affected by the implementation of InTouch. Positions related to knowledge flow, prior to InTouch, became redundant and were abolished while new positions were created. Drucker (1993; 1988) anticipated that the roles of knowledge workers would transform into knowledge intensive roles. One respondent, an InTouch manager, expressed this as follows, "The thrust was away from positions focused on pushing the knowledge flow and towards finding solutions". Managing knowledge for effective decision-making and the development of improved, real-time solutions, enriched the jobs of many employees. The extensive, continued exchange within InTouch, and the horizontal integration of knowledge workers (Ghoshal and Gratton, 2002), appear to motivate users to further share knowledge.

- *real time access to knowledge*

Braganza and Morgan (2000) point out that speed of access to knowledge affects organisational performance. In the case of Schlumberger it was the advantage of having a real time access to knowledge. In the past, users had to wait days or even weeks to receive much-needed information from subject-matter experts. With the

InTouch intranet-technology based system, users obtain the required knowledge immediately, at any time and from anywhere. Moreover, new solutions can be proposed to meet growing business demands.

- *efficient link between delivery sites and technology centres*

InTouch links the delivery sites and the technology centres. It connects the subject-matter experts directly to the people in the field who need the expert's knowledge to deliver quality services to customers. For instance, through the use of InTouch, a delivery site manager in offshore Indonesia or the Congo enjoys the same level of knowledge support as a delivery site manager in West Texas or the North Sea. Moreover, since InTouch promotes people-to-people collaboration, these managers are able to benefit from each other's experiences.

- *faster introduction of new products*

Historically new products had been introduced in a vacuum from introductions in other parts of the company resulting in slow deployment and repeated mistakes. Through InTouch, users of new products shared and reused knowledge in real-time. This created fast-moving knowledge that is shared worldwide in the introduction of new products. This also facilitated the engineering centres to react quickly for any required modification that resulted in a substantial reliability improvement. The result was that new products were introduced faster and they delivered revenues earlier.

- *quick response adjustment through use of metrics*

Schlumberger introduced metrics to manage InTouch performance and its impact upon the business. For example, to ensure the knowledge sharing activity, a metric measuring of the number of contributions (shared knowledge) per employee is taken. Another example of a metric is one that will identify the current business-critical issues. The objective of this kind of metric is to ensure a quick-response adjustment to those issues.

1.5 Contributions to Theoretical Knowledge

In this section I elaborate each potential contribution to scholarship from my research. For each contribution a summary of important literature is presented; then, findings from my research are discussed; and consequently propositions are advanced for testing by further research.

1.5.1 Knowledge Implementation Assessment Tool (KIAT)

KIAT measures organisational readiness that is critical for KMS implementation

One strand of the knowledge management literature argues that little has been delivered by knowledge management and this may lead to the concept of knowledge management being questioned (Gilmour, 2003; Gold et al., 2001). Some scholars suggest that when KMS yield little innovation and other beneficial results for an organisation, it is because organisations are unprepared for effective implementation of the systems (Janz and Prasarnphanich, 2003; Gold et al., 2001). Gold et al. state, "Therefore, a key to understanding the success and failure of knowledge management within an organisation is the identification and assessment of preconditions that are necessary for the effort to flourish. These preconditions are described broadly as 'capabilities' or 'resources' within the organisational behaviour literature." (2001: 186). They further argue that organisational effectiveness is a function of knowledge infrastructure capabilities and knowledge process capabilities. The knowledge infrastructure refers to the technical, structural and cultural conditions that enable the maximisation of social capital. Social capital is the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by a social unit. The knowledge process refers to the capture, reconciliation, and transfer of knowledge. To have a successful implementation of knowledge management, organisations need to address these two capabilities that drive knowledge management initiatives (Gold et al., 2001).

Siemieniuch and Sinclair (2004) argue that organisations do not have the habit of evaluating themselves as to how prepared they are to embark on knowledge management prior to embarking on it – no wonder then, that the end results of KMS implementation give very little return to the organisations. Siemieniuch and Sinclair (2004) further suggest fourteen Factors that managers need to look into in the effort to prepare the organisation for knowledge management. The details of these Factors are presented in Chapter Five: Project Two.

Taylor and Wright (2004), in a different research setting, suggest that an organisation needs to examine six different Factors to make the organisation ready to embark on knowledge management. The details of these Factors are presented in Chapter Five: Project Two. Similar to Siemieniuch and Sinclair (2004) and Gold et al. (2001), Taylor and Wright (2004) contend that organisations need to prepare themselves for a knowledge management initiative by addressing the noted six Factors.

These more recent works on considering knowledge management as a capability, together with the insight into organisational readiness for knowledge management have contributed to the argument why and how implementation of KMS can be effective. Current research has not produced a comprehensive assessment instrument that may help academics and practitioners to measure an organisation's perceived readiness to implement a KMS across the life-cycle of creation, mobilisation and diffusion of knowledge. The diagnostic instrument, KIAT with its fifty Factors and the Guidelines to use it, adds to academic research on the subject of organisational readiness for knowledge management in the way that it provides a readiness snapshot. Without such an instrument that helps to assess readiness, organisations are unable to progress in preparing themselves for KMS implementation. KIAT fills this gap. It provides a comprehensive list of Factors and a measurement mechanism for a framework of organisational readiness to implement a system to

manage knowledge across the life-cycle stages. Executives wondering how to get started with managing knowledge can refer to KIAT in order to first assess their organisation's readiness prior to the decision on an investment for a knowledge management system and then during its implementation. Applying KIAT to assess organisational readiness and bringing Factors to the required level are ways that both academics and practitioners can consider.

Proposition 1: Measuring Organisational Readiness is a prerequisite for implementing knowledge management systems.

KIAT addresses the implementation of knowledge management systems across the knowledge life-cycle stages

In establishing the attributes responsible for effective KMS implementation, a Means-End Chain approach was used and the result is presented in a Hierarchical Value Map (HVM). In my research the HVM illustrates the relationships among the attributes, the high-level strategies and the beneficial results. This is further discussed in Chapter Four: Project One. The HVM shows that the attributes responsible for an effective KMS implementation are neither neatly interlinked nor linear to the stages of the knowledge life-cycle. The way KIAT assesses an organisation for its readiness to implement KMS to manage the creation, mobilisation and diffusion of knowledge takes this into account. The same Factors can contribute to readiness for the different stages of the knowledge life-cycle. This raises a question as to whether knowledge management can mean managing knowledge creation only or knowledge mobilisation only or knowledge diffusion only. One subset of knowledge management literature deals mainly, if not solely, with the management of the knowledge creation (Un and Cuervo-Cazurra, 2004; Obstfeld, 2002; von Krogh, 1998; Nonaka, 1994). Similarly, another subset deals mainly, if not solely, with the management of the knowledge diffusion (Majchrzak et al., 2004; Storck and Hill, 2000; Brown and Duguid, 1998). The knowledge creation school advises that competitive advantage is sustained only when firms can sustain knowledge creation. The knowledge diffusion school focuses on how knowledge can be diffused and reused to ensure the return of investment of the knowledge creation, and argues that knowledge diffusion, thus knowledge reuse, gives competitive advantage.

Un and Cuervo-Cazurra (2004) take the view that firms are distributed knowledge systems composed of individuals who embody knowledge. In their work, they suggest that developing the capability to create knowledge in firms brings competitive advantage and to achieve it firms need to develop both an organisational strategy that integrates facilitation to create knowledge among individuals and project-team strategy that facilitates the creation of knowledge within projects. Obstfeld (2002) suggests that innovation is generated from the involvement of individuals who are knowledgeable and articulated within a dense social network. Innovation refers to efforts to change product or process based on new ideas, and firms that wish to be innovative require knowledgeable and articulated individuals who interact within a densed social network. Von Krogh (1998) suggests that firms need to build the social and organisational conditions that encourage and facilitate knowledge creation because competitive advantage is sustained through the

generation of new knowledge. Taking a similar stance on where competitive advantage is derived, Nonaka (1994)'s suggests a socialisation, externalisation, combination, and internalisation (SECI) mechanism which is an interplay between tacit and explicit knowledge for knowledge creation. The SECI mechanism takes place in both individual and organisational knowledge creation. Organisational knowledge creation is a "knowledge spiral process", starting at the individual level and moving up through expanding communities of interaction, that crosses sectional, departmental, division and organisational boundaries.

Knowledge creation is an important part of translating knowledge into competitive advantage. A central concern to the members of the knowledge creation school is a question that can be posed to them, " What do we do with the created knowledge?" Knowledge is useful, at least in the business environment, only when it is put into action (Ghoshal and Gratton, 2002; Weick, 2002). I argue that implementing KMS should not, therefore, be reduced to only supporting knowledge creation.

The Majchrzak et al. (2004) study shows that knowledge diffusion is exploited for innovations to products and services. This work is intended to ground knowledge diffusion research in a relatively unexplored context: innovation. In this context, as Grant (1996) aptly explains, knowledge is being reused, but how? The study of Majchrzak et al. (2004) addresses this question. Storck and Hill (2000) examine how knowledge is diffused and suggest that knowledge is diffused through what they call strategic communities, that is communities of practice designed specifically for the purpose of diffusing knowledge for business performance. Brown and Duguid (1998) explain how knowledge is diffused within the Xerox company's technicians in performing their duties to serve customers, and that this diffusion has created competitive advantage.

Knowledge is being diffused and the capability to implement KMS for knowledge diffusion may bring competitive advantage to the firms (Majchrzak et al., 2004; Grant, 1996). The concern to the members of the knowledge difffusion school is *what knowledge to diffuse and how is this knowledge created?* In other words, if there is no relevant knowledge to diffuse then there is also no competitive advantage that can be created. Therefore, organisations that have the capability to create, mobilise and diffuse knowledge, that is to manage knowledge across its life-cycle, will have distinct competitive advantage.

Hansen et al. (1999) suggest that firms need to decide their knowledge strategy either focusing on knowledge creation or focusing on knowledge diffusion. They recommend that organisations should not straddle the two knowledge management strategies. Birkinshaw and Sheehan (2002), however, suggest a different way to look at managing knowledge. They contend that firms need to look into the stages of the knowledge life-cycle, namely, creation, mobilisation and diffusion – to define their knowledge strategy. Depending on the stages of the knowledge life-cycle, firms can focus on knowledge creation and mobilisation (for example, at the research department) or on the knowledge diffusion (for example at the field operations). Therefore, I posit that the strategy to pursue knowledge management depends on the nature of the knowledge in question. Therefore, organisations need to have the capability to manage the stages of the knowledge life-cycle, hence to implement a KMS that manages the creation, mobilisation and diffusion of knowledge.

The findings of my study show that effective KMS is used for the creation, mobilisation and diffusion stages of the knowledge life-cycle. Taking Schlumberger's technical service delivery process as an example, InTouch is used to facilitate the

creation, mobilisation and diffusion of knowledge. Knowledge creation starts to happen when field users ask questions to which the answer cannot be found in the knowledge repository. Experts then get together and try to come up with innovative solutions. In the process of finding the answers, experts interact with each other and with the field users to validate the solutions – knowledge is being mobilised. Once the anwers are validated, knowledge is then diffused, facilitated by the InTouch Manager. All these activities happen within the InTouch system. Furthermore, the second-stage knowledge creation happens when feedback to the available knowledge in the repository is given by the field users. In this case, a validation process takes place – knowledge is being mobilised, and once validated, knowledge is again diffused. The research department of Schlumberger, located in different parts of the world, can also access the knowledge interaction data related to their relevant subjects and take them as inputs to their research programme – knowledge creation and diffusion happen at the same time. Empirically, therefore, InTouch shows how a KMS has effectively been used to manage knowledge across its life-cycle. The Power International case shows a similar condition of KMS implementation. Power International manages the creation, mobilisation and diffusion of knowledge in the customer service delivery process.

KIAT is designed to measure organisational readiness in the three different stages: knowledge creation, knowledge mobilisation and knowledge diffusion. Theoretically, KIAT results can show major differences of a certain socio-technical system (STS) dimension between the different stages of knowledge life-cycle. However, the three cases where KIAT is applied, i.e. in Power International, Friends Provident and Schlumberger LMS, do not show this phenomenon. This implies that KMS is effective when the readiness for the three different stages of the knowledge life-cycle are integratedly addressed. March (1991) suggests that there is a healthy tension between exploration and exploitation of knowledge, and it is a reflection of the more fundamental organisational tension between efficiency and innovation, that has long been recognised in the organisation literature. He further argues that organisations need to have the capability to handle both the exploration and exploitation of knowledge. In March's own words, "maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity" (March, 1991:71). In their recent work, Birkinshaw and Gibson (2004) contend that the current economic situation has reaffirmed to managers the importance of *adaptability* – the ability to move quickly towards new opportunities, to adjust to volatile markets and to avoid complacency; however, successful companies have an equally important capability in what they call *alignment* – a clear sense as to how value is being created in the short term and how activities should be coordinated and streamlined to deliver that value. They further argue that for a company to succeed in the long term, it needs to master both adaptability and alignment – or *ambidexterity*. Therefore, there is little use in being ready to implement a KMS that supports the creation of knowledge but not for the mobilisation and diffusion of knowledge. The created knowledge will have little contribution to the organisations if it is not diffused, used and reused, within those organisations. Equally, there is little use in being ready to implement a KMS that supports the diffusion of knowledge but not for the creation and mobilisation of knowledge. If there is no knowledge that is created and mobilised within the organisations then there is nothing to diffuse. My research in four organisational cases and the above argument lead to a conclusion, expressed as:

Proposition 2: Implementation of knowledge management systems is effective when it integrates the creation, mobilisation and diffusion of knowledge.

1.5.2 Managing the Creation, Mobilisation and Diffusion of Knowledge

It is important for managers to understand the Factors they have to focus on to increase the organisational readiness for the creation, mobilisation or diffusion of knowledge. KIAT diagnoses the organisational readiness independently for each stage of the knowledge life-cycle. Therefore, for an organisation that appears to be more prepared for knowledge creation than the other two, managers can identify the Factors to address to improve the readiness for the other two stages of the knowledge life-cycle. This clarity as to which Factors play significant roles for each stage of the knowledge life-cycle helps managers to position the organisation in a ready state to implement KMS across the stages of the knowledge life-cycle. The following discussion examines and proposes the relevant Factors leading to the readiness of the Infrastructure, Knowledge Structure and Knowledge Culture dimensions for each stage of the knowledge life-cycle.

Knowledge Creation and Socio-Technical System dimensions

Knowledge management research suggests that knowledge culture is an important condition for knowledge creation activities to take place in an organisation (von Krogh, Nonaka and Aben, 2001; De Long and Fahey, 2000; Nonaka and Konno, 1998). Un and Cuervo-Cazurra (2004) suggest that the recognition scheme, the structure of communities and the habits of knowledge workers to work in communities, and integrative communication are positively correlated with the capability to create knowledge. They suggest that the project team strategy in problem solving with knowledgeable members is positively correlated with the capability to create knowledge. Obstfeld (2002) contends that for an organisation to have a capability for knowledge creation it needs a dense network of workers who are knowledgeable and eager to share their knowledge.

Nonaka and Takeuchi (1995) claim that the role of the organisation in the organisational knowledge creation process is to provide the proper context for facilitating group activities as well as the creation and accumulation of knowledge at the individual level. They suggest five conditions are required at the organisational level to promote the knowledge spiral: Intention, Autonomy, Fluctuation and Creative Chaos, Redundancy, Requisite Variety. Intention is meant to cover the strategy of the firm that will make the workers understand what knowledge they need for the business and that the firm listens to the workers as to what knowledge needed to be pursued. With this, collective commitment is achieved. Autonomy is meant to allow workers to act autonomously. In other words, workers can control their own time at work. According to De Long and Fahey (2000) and Nonaka and Takeuchi (1995) autonomy increases the possibility that individuals will motivate themselves to create new knowledge. Fluctuation in the organisation can trigger creative chaos that

strengthens individual commitment. Fluctuation means the exposure of external conditions to the workers. In other words, working habits in communities that include external communities will enhance the knowledge creation activities. Redundancy refers to the existence of information and knowledge that goes beyond the immediate operational requirements. When there is redundancy knowledge, creation is enhanced. In other words, when the KMS addresses both the organisation and the workers' benefits, knowledge creation activities are enhanced. Requisite Variety is meant to have communities with skill varieties. In other words, the structure of communities needs to be addressed to induce and enhance knowledge creation.

Bartlett and Ghoshal (2002) state that it is unrealistic to expect workers to exercise knowledge activities outside their work process. Knowledge activities need to be streamlined and aligned with the business processes (Davenport and Glaser, 2002; Braganza and Lambert, 2000). In their work studying the knowledge stickiness, Szulanski (1996) and von Hipple (1994) suggest that if workers feel threatened from their current position it is only natural that their knowledge and the information they possess become 'sticky', i.e. the knowledge is not shared. Therefore, an implementation of KMS should address the workers' value inside the organisation if it is to bring beneficial results to the organisation. Heaton and Taylor (2002) and Wenger (2000) demonstrate how communities of practice, that is the structure of communities and the habits of people working in communities, enable the knowledge creation in an organisation.

My research indicates, as elaborated in Project Two, that a number of Factors in KIAT significantly or completely affect the Knowledge Creation (KC) stage. Those Factors are listed in Table 1-3. One Factor is of the infrastructure dimension, seven Factors are of the knowledge structure dimension, and nine Factors are of the knowledge culture dimension. The evaluation of these Factors, as explained in Project Two, reports the readiness of the Infrastructure – KC (i.e. the Infrastructure for Knowledge Creation), Knowledge Structure – KC, and Knowledge Culture – KC with a scale between one to five. A scale of five is the highest readiness state. As elaborated in Chapter Four: Project Two, I propose that a scale of three is a level where organisations have a better chance for implementing KMS. Readiness of lower than three does not, however, necessarily mean that the organisations must not proceed with the implementation. What it means is that managers have the information as to what lower-scored Factors they need to address in the effort to implement KMS for knowledge creation.

	Infrastructure	Knowledge Structure	Knowledge Culture
Knowledge Creation	Training programme that links to people development and business needs	Structure of communities	Workers who understand what they need to know to perform
		Recognition scheme	Workers who are eager and positive towards becoming trained and sharing what they know
		Knowledge feedback loop	Problem solving
		Identification of important knowledge that comes from workers	Expert users
		Knowledge structure that addresses both the organisation's and the workers' benefits	Subject matter experts
		Stream-lined activities	Working in communities
		Enriching workers' value	What Is in It For Me (WIIFM) awareness
			Two-way communication
			Workers who control their own time

Table 1-3: Factors that significantly or completely affect the knowledge creation (KC)

This discussion leads to a conclusion, expressed as:

> **Proposition 3**: Readiness to create knowledge increases as the measure of the Infrastructure – KC, Knowledge Structure – KC, Knowledge Culture – KC increases.

Knowledge Mobilisation and Socio-Technical System dimensions

Mobilising knowledge means validating knowledge prior to its diffusion to a larger community, and at this stage the originators share their knowledge with people who make up part of a trusted community (Birkinshaw and Sheehan, 2002). In other words, the structure of communities on which community members can build trust needs to exist in an organisation. As the objective of this stage of knowledge life-cycle is to confirm new knowledge, a validation process will need to be available (Brown and Duguid, 2000) and may be facilitated by knowledge brokers (Davenport and Prusak, 1998).

Knowledge mobilisation involves fewer people than knowledge diffusion (Birkinshaw and Sheehan, 2002). However, members of this trusted community will need to have motivation in associating themselves with others to confirm knowledge prior to diffusing it (Francis and Bessant, 2005; Birkinshaw and Sheehan, 2002). Furthermore, motivation of the 'confirming knowledge' community members very soon decreases if they learn that the results of their participation are in vain (De Long and Fahey, 2000).

My research indicates, as elaborated in Project Two, that a number of Factors in KIAT significantly or completely affect the Knowledge Mobilisation (KM) stage. Those Factors are listed in Table 1-4. Two Factors are of the infrastructure dimension, eleven Factors are of the knowledge structure dimension and eleven Factors of the knowledge culture dimension. The evaluation of these Factors, as explained in Project Two, reports the readiness of the Infrastructure – KM (i.e. the Infrastructure for

Knowledge Mobilisation), Knowledge Structure – KM, and Knowledge Culture – KM with a scale between one to five. A scale of five is the highest readiness state. As elaborated in Chapter Four: Project Two, I propose that a scale of three is a level where organisations have a better chance of implementing KMS. Readiness of lower than three does not, however, necessarily mean that the organisations must not proceed with the implementation. What it means is that managers have the information as to what lower-scored Factors they need to address in an effort to implement KMS for knowledge mobilisation.

This discussion leads to a conclusion, expressed as:

Proposition 4: Readiness to mobilise knowledge increases as the measure of the Infrastructure – KM, Knowledge Structure – KM, Knowledge Culture – KM increases.

	Infrastructure	Knowledge Structure	Knowledge Culture
Knowledge Mobilisation	Direct funding to individual projects is an organisation policy	Relationship of knowledge to business activities	Workers who understand what they need to know to perform
	The means to channel system feeback	Ease of navigation	Workers who communicate and build trust with a standard language
		Knowledge broker	Workers who are eager and positive towards becoming trained and sharing what they know
		Structure of communities	Problem solving
		Validation process	Expert users
		Recognition scheme	Subject matter experts
		Knowledge feedback loop	Working in communities
		Structured team to promote knowledge initiative	Workers who work through metrics
		Knowledge structure that addresses both the organisation's and the workers' benefits	What Is in It For Me (WIIFM) awareness
		Stream-lined activities	Two-way communication
		Enriching workers' value	Workers who control their own time

Table 1-4: Factors that significantly or completely affect the knowledge mobilisation (KM)

Knowledge Diffusion and Socio-Technical System dimensions

The enthusiasm about knowledge management, historically, has been induced by the potential Information Technology (IT) can bring to diffuse knowledge (Alavi and Leidner, 2001; Davenport and Prusak, 1998). The role of IT remains important for knowledge diffusion (Majchrzak et al., 2004; Beccerra-Fernandez et al., 2004; Pan and Leidner, 2003). Davenport and Glaser insist that an alert feature needs to be

considered to have just-in-time knowledge – "the key to success is to bake specialised knowledge into the jobs of highly skilled workers - to make the knowledge so readily accessible that it can't be avoided" (2002:108). They further suggest that the most promising approach for knowledge diffusion is to embed it into the technology that knowledge workers use to do their jobs. In other words, knowledge activities need to be streamlined within the business processes (Ghoshal and Gratton, 2002) and that the communities adhere to the business processes (El Sawy et al., 2001). Knowledge management is supposed to help knowledge workers to perform their work and not to make it harder (Fahey and Prusak, 1998), therefore ease of use for KMS deserves a great deal of attention (Alavi and Leidner, 2001; Grover and Davenport, 2001).

Diffusing knowledge requires communities with members that are eager to share knowledge (Brown and Duguid, 2001; Wenger and Snyder, 2000). Furthermore, the role of knowledge brokers is required to facilitate the interaction between the people who have the knowledge – the experts and the people who need to use the knowledge (Hauschild et al., 2001; Fahey and Prusak, 1998). It is important to note that a KMS will be used when users are informed of its availability and are trained on how to use it. Assuming that they will automatically use the system without training is a recipe for marginal return (Fahey and Prusak, 1998). Training programme, consequently, is an important Factor that needs to be addressed.

Brown and Duguid (2000) suggest that allowing untested knowledge into KMS will quickly make it lose credibility. Diffused knowledge requires validation (Birkinshaw and Sheehan, 2002; Brown and Duguid, 2000) and a knowledge feedback loop needs to be facilitated to allow users to have active participation (McInerney, 2002; Szulanski, 1996).

At the heart of knowledge diffusion is people not only technology (Storck and Hill, 2000; Hansen et al., 1999). Therefore, Factors related to knowledge culture are often mentioned by different authors, for example commitment from top management (Beazley et al., 2003; Davenport, de Long and Beers, 1998), open communication (Grant and Baden-Fuller, 2004), workers that have freedom of 'space' (Heaton and Taylor, 2002), and problem solving culture (Lesser and Storck, 2001).

My research indicates, as elaborated in Project Two, that a number of Factors in KIAT significantly or completely affect the Knowledge Diffusion (KD) stage. Those Factors are listed in Table 1-5. Fourteen Factors are of the infrastructure dimension, fifteen Factors are of the knowledge structure dimension, and seventeen Factors are of the knowledge culture dimension. The evaluation of these Factors, as explained in Project Two, reports the readiness of the Infrastructure – KD (i.e. the infrastructure for Knowledge Diffusion), Knowledge Structure – KD, Knowledge Culture – KD with a scale between one to five. A scale of five is the highest readiness state. As elaborated in Chapter Four: Project Two, I propose that a scale of three is a level where organisations have a better chance of implementing KMS. Readiness of lower than three does not, however, necessarily mean that the organisations must not proceed with the implementation. What it means is that managers have the information as to what lower-scored Factors they need to address in the effort to implement KMS for knowledge diffusion.

This discussion leads to a conclusion, expressed as:

Proposition 5: Readiness to diffuse knowledge increases as the measure of the Infrastructure – KD, Knowledge Structure – KD, Knowledge Culture – KD increases.

	Infrastructure	Knowledge Structure	Knowledge Culture
Knowledge Diffusion	IT Technology	Relationship of knowledge to business activities	Workers who understand what they need to know to perform
	Organisation's policy for the use of a standard language	Information that is well structured	Workers who communicate and build trust with a standard language
	Direct funding to individual projects is an organisation policy	Ease of navigation	Senior management that shows support through direct reporting and gains respect
	The means to channel system feeback	Single source	Feedback-response loop is established in the organisation
	Infrastructure that supports content management	Knowledge broker	Workers who are eager and positive towards becoming trained and sharing what they know
	Ability of the organisation to set up a respected governance body	Knowledge champion	Adherence to Business Processes
	Personalisable IT system	Structure of communities	Answer to users' needs
	A system that is fast, real-time, and easy to use	Validation process	Problem solving
	Training programme that links to people development and business needs	Recognition scheme	Expert users
	Mobility of workers across geographical areas and/or business units	Knowledge feedback loop	Subject matter experts
	Embedded in Business Process	Structured team to promote knowledge initiative	Working in communities
	Alert feature	Identification of important knowledge that comes from workers	Workers who work through metrics
	Objective-based appraisal	Knowledge structure that addresses both the organisation's and the workers' benefits	What Is in It For Me (WIIFM) awareness
	Organisation communication policy and structure	Stream-lined activities	Two-way communication
		Enriching workers' value	Leadership who walk the talk
			Reaching all
			Workers who control their own time

Table 1-5: Factors that significantly or completely affect the knowledge diffusion (KD)

1.5.3 Communities For Performance

Some scholars, for example Iverson and McPhee (2002), Wenger (2000), Kogut and Zander (1992) and Brown and Duguid (1991) suggest that the locus of knowledge is within communities. These communities are described as Communities of Practice or COP (Wenger, 2000; Brown and Duguid, 1991). The communities of practice school contends that knowledge is created and exchanged within communities (Kogut and Zander, 1992; Brown and Duguid, 1991) and argues that the accumulation of knowledge, experiences, and practical or cognitive skills takes place in a community; therefore, organisations should regard communities as assets and seek ways to

promote and preserve them (Iverson and McPhee, 2002; Brown and Duguid, 2001; Wenger and Snyder, 2000).

A COP is defined as a self-organised group of employees who share common work practices, interests, or aims (Wenger, 2000). They are informally bound together (Wenger and Snyder, 2000). They define competence by combining three elements: (i) members are bound together by their collectively developed understanding of what their community is about and they hold each other accountable; to be competent is to understand the community in order to contribute, (ii) members build their community through mutual engagement; to be competent is to be able to engage with this community as a trusted partner in the interaction, and (iii) communities of practice produce a shared repertoire such as language, values, and routines; to be competent is to access and use this repertoire. COPs are important social units of learning even in the context of much larger systems such as organisations (Lesser and Storck, 2001).

COPs generate new approaches that may lead to problem solving (Heaton and Taylor, 2002; Brown and Duguid, 1991). COPs form significant sources of innovation (Wenger and Snyder, 2000). Knowledge is created within communities and is difficult to copy; hence, it produces competitive advantage. The work of these researchers shows that COPs are a valuable and useful organisational form that provides an effective basis for knowledge activities. It provides a forum for creating new knowledge, mobilising and diffusing it. Yet, the literature indicates that communities of practice have several drawbacks (Lesser and Storck, 2001; Storck and Hill, 2000).

Lesser and Storck (2001) claim that although many authors assert that communities of practice create organisational value, there has been relatively little systematic study of the linkage between communities of practice outcomes and the underlying social mechanisms that are at work. They further argue that the social capital resident in communities of practice leads to behavioural changes, which in turn positively influence business performance. In other words, the work of a COP does not directly link to organisational performance. The work of COPs creates social capital which in turn improves the organisational performance. Social capital is the sum of the actual and potential resources embedded within, available through, and derived from the network relationships possessed by an individual or social unit (Nahapiet and Ghoshal, 1998).

Storck and Hill (2000) observe a new organisational phenomenon when conducting their research in studying how a diverse group of IT managers responsible for global technology infrastructure developed a way of working together that enabled Xerox to create and transfer knowledge more effectively. They admit that the Xerox community does not have the same characteristics as a COP. “Because community members engaged in the same professional practice, one might think of them as a *community of practice*. However, communities of practice are usually considered to be voluntary groups that emerge from common work practices, whereas Xerox top management quite deliberately established the Alliance” (Storck and Hill, 2000:65). Their finding highlights further the shortcoming of generalising COPs across all communities that deal with knowledge interaction.

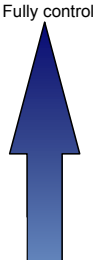
Historically, most established organisations have a traditional, functional or divisional structure based on Taylor’s principles of functional specialisation (Morgan, 1998). Communities of Practice are often found within these vertical ‘silos’ (Denison et al., 1996). For example, the Ford Company defines a COP to be central engineering, body assembly, paint, materials planning and logistics. Each functional community, in essence, pulls together people based on the traditional divisions of labour. Yet, producing a car requires processes that transcend all functions. Thus, improvements in

the paint department, as a result of applying knowledge, hold positive and negative implications for other functions. Furthermore, recent work by McFayden and Cannella (2004) shows that as relationships increase in numbers, return to knowledge creation diminishes and increased interactions with a single other shows a similar effect. This means as COP members and/or their interactions increase, after a certain point, knowledge creation diminishes. The implication of this study is that with free style self-selected membership of COP, at a certain point, its effectiveness to contribute to the organisation diminishes.

As described in subsection 1.4.3, a finding of this research shows that the InTouch knowledge communities do not correspond strictly to the definition of COP. These communities collaborate together for the purpose of business performance, in this case for the service delivery performance. I refer to the InTouch workgroup as a 'community' because this term captures the sense of responsible, independent action that characterises these groups, which, at the same time, continue to function within vertical functional boundaries of a large organisation (Storck and Hill, 2000). The members of the communities are from the InTouch Managers and/or InTouch Engineers appointed by Schlumberger management and the experts who become members voluntarily. The field users become members as they require InTouch to perform their duties. They all come together to collaborate and exchange knowledge for performance. The reasons why they can get together is the mutual need from individuals: 1) to be mutually supported (among field users and applied experts) and 2) the desire to share their knowledge (the subject matter experts and the applied experts). The InTouch communities feel the need to collaborate as long as there is a need to achieve a certain performance (for example to provide seamless operations). The communities may be transformed into different communities when the business processes change. From this argument, I call these types of community, Communities For Performance (CFP). CFP should not aim to replace COP. On the contrary, COP needs to be strengthened within an organisation so that it will facilitate the creation of CFP for business performance.

Where is the place of CFP within an organisation? Wenger and Snyder (2000) argue that communities of practice differ from other forms of organisation in several ways as outlined in Table 2-3 of Chapter Two. The table is reproduced here as Table 1-6 with modifications: adding CFP as a different form of organisation at a different layer, and the 'control intensity' as the vertical axis. For COPs to be able to produce business results, managers need to create CFPs within the business processes facilitated by KMS where the members and the cultural aspects of COPs can be brought into play and be challenged to perform.

Fully controlled



	What's the purpose?	Who belongs?	What holds it together	How long does it last?
Formal hierarchical work group	To deliver a product or service	Everyone who reports to the group's manager	Job requirements and common goals	Until the next reorganisation
Project Teams	To accomplish a specified task	Employees assigned by senior management	The project's milestones and goals	Until the project has been completed
		Some members are		As long as there is a

Table 1-6: A snapshot comparison of CFP with other forms of organisation

This discussion leads to conclusions, expressed as:

Proposition 6: Community for Performance is different from Community of Practice. It is an organisational form with members either appointed or volunteering, getting together with the purpose of collaboration and exchanging knowledge for performance, guided within a certain business process.

Proposition 7: Communities for Performance are required to leverage Communities of Practice to deliver business results.

1.5.4 Business Process and Structural Diversity in KMS Implementation

El Sawy et al. (2001) state that one of the key requirements for effective business process innovation is an organisation's readiness for sharing knowledge. The organisation needs to have the capability to create, mobilise and diffuse the knowledge that is required for the modelling, analysis, redesign and implementation phases of the process redesign. They suggest that knowledge activities happen around business processes where shared views can be developed rather than grafting knowledge activities onto existing work processes (Braganza and Lambert, 2000; Davenport and Prusak, 1998). Ghoshal and Gratton (2002) suggest that knowledge workers already have enough workload in their day-to-day activities within the work processes. According to Davenport and Prusak (1998), "expecting knowledge workers to peruse repositories of lessons and experiences in their spare time, or to share their own learnings at leisure, is highly unrealistic. Therefore, the knowledge management process has to be 'baked' into key knowledge work processes" (1998:xi). In other words, how organisations create, mobilise and diffuse knowledge must blend well

with how people perform their work (Brown and Duguid, 2001). Davenport and Prusak (1998) further claim that many firms have yet to explore this avenue – knowledge creation, mobilisation and diffusion need to be located within the business processes being re-engineered.

The findings of my research show that organisation readiness needs to be assessed at the level of business processes. Knowledge activities in Schlumberger facilitated by InTouch happen within the technical service delivery process. One key Factor that makes InTouch highly utilised is that it is *embedded* within knowledge workers' day-to-day work processes. Field users access InTouch and interact with it to resolve problems because it is a part of the tasks required in performing their work delivering technical services. InTouch Managers access InTouch and interact with it because it is a part of the tasks required in performing their work in supporting the field users. Experts access InTouch and interact with it because it is a part of their work in supporting the InTouch communities to deliver seamless services to clients. InTouch forms the core knowledge management system within Schlumberger's technical service delivery process. The research found similarities when applying KIAT to Power International and Schlumberger LMS. Power International plans to implement KMS to support the software services process and Schlumberger LMS uses the KMS within the competency development process. The findings from the application of KIAT to Friends Provident show that the absence of business processes in the evaluation causes major differences between respondents in defining organisational readiness to implement KMS. Respondents initially referred to their respective vertical functional organisations in applying KIAT and each respondent interpreted the readiness to the respective function. When discussing the results with all the respondents being present together, it showed that the differences had been caused by the lack of a common reference, namely the business process as a unit of analysis. Absence of the business process, as the unit of analysis, risks inconsistent readiness evaluation. The implication from these findings is that effective KMS implementation requires a design of KMS within business processes. Business processes cut across vertical boundaries, hierarchical structures and often geographical locations; therefore, knowledge management activities are more encouraged and successful when the workgroup is structurally diverse (Cummings, 2004).

Structural diversity refers to the variation in features of the group structure such as different geographical locations, different functions, different reporting hierarchies, and different business units (Maznevski and Chudoba, 2000). According to Cummings (2004), while demographic diversity (sex, age, tenure) barely increases knowledge sharing activities, structural diversity does lead to an increase in knowledge diffusion. Lesser and Storck (2001) also suggest that structural diversity encourages knowledge sharing. In many studies (for example: Heaton and Taylor, 2002; Southon, et al., 2002) the research subjects satisfy the existence of structural diversity in the workgroups. Current research does not address knowledge management and structural diversity.

My research found that from all four cases, links to KIAT structural diversity is present. Structural diversity exists in InTouch. The InTouch communities consist of engineers working in different geographical areas and in different business units (BU), for example Wireline BU, Drilling Measurement BU, and others. Subject matter experts work in the research and development centres with reporting lines within research and development management. They are located in different areas in the world. Each area works for a different product line. InTouch brings together experts

and field users who have the responsibility to create real time innovative solutions for clients. For example, problems in the Vietnam operation in the exploration field were solved due to the involvement from user expert communities in Scotland, UK and Subject Matter Experts in research and development in Houston. Without InTouch it would have taken weeks compared to the day it took to identify a solution. In addition, this saved millions of dollars in relation to faster new product introduction. New products which normally took six to eight months to introduce are now brought into operation within two months. InTouch operates effectively within structurally diverse communities. This study confirms that for InTouch communities to be effective, structures and processes must be in place to foster members working together. In this respect, InTouch provides clear structures and processes for how communities interact for knowledge in their work activities.

In the Power International case, experts are located in both the USA and France and service engineers are located in many different geographical locations. Their interactions go across the hierarchical structure and geographical location borders. Furthermore, engineers and managers from different business units interact with the KMS to achieve their goals in providing responsive and reliable service to their customers. This finding confirms prior studies that have demonstrated benefits resulted from bringing together diverse workgroups (for example Allen, 1977). Workers getting involved in in-depth knowledge activities bring greater financial benefits to the organisation while at the same time enriching their jobs and role.

This discussion leads to conclusions, expressed as:

Proposition 8: Effective implementation of knowledge management systems needs to be governed within and by business processes.

Proposition 9: Effective implementation of knowledge management systems requires 'structurally diverse communities'.

1.6 Contributions to Methodology

The Means-End Chain model is based on the perception and expectation of consumers in choosing the products, thus, there is a flow towards desired ends at successfully higher-levels of abstraction from the product attributes (Gutman, 1997; Reynolds and Gutman, 1988). My study extends the Means-End Chain model to the field of knowledge management by representing a hierarchy of organisational goals in a knowledge management initiative. This hierarchy of goals – attributes leading to consequences linking to higher level values – are uncovered in organisational settings by using a laddering interview technique. Taking a tried and tested research technique into a field where it has not previously been tried is considered as a contribution to methodology (Baker, 2002; Easterby-Smith et al., 2002). I used top-down (Means-End) or bottom-up (reverse Means-End) techniques during the interview to construct

the relevant ladders. The Means-End Chain concept in my research focuses attention on the linkages between activities within which Schlumberger management and InTouch support engage, the consequences or outcome goals from certain activities or from certain InTouch attributes, and ultimately benefits resulting from the outcome goals or consequences.

Traditionally, a Means-End Chain model is widely applied in marketing research (Walker and Olson, 1991). This approach seeks to explain how a product selection facilitates the achievement of desired end states (Reynolds and Gutman, 1988). The Means-End approach focuses on why and how product attributes are important. Why and how are addressed by assessing the sequence of Means-End relations that link product attributes to personal values (Gengler et al., 1999; Reynolds and Gutman, 1988). Embodied in this model is the concept of levels of abstraction: lower-level attributes link with higher-level consequences which, in turn, link with still higher-level values (Baker, 2002). The findings of such research, undertaken using this technique, are used extensively to explain the promotion of products to the market (Wansink, 2003; Botschen and Hemetsberger, 1998; Claeys et al., 1995). In more recent work, the Means-End Chain model has been used in different types of research, such as for example Deeter-Schmelz et al. (2002) applied the Means-End Chain model to reveal the key attributes of effective sales managers, and Gengler et al. (1999) applied it to reveal why mothers initiate and terminate breastfeeding. The application of the Means-End Chain model in my research provides insights that traditional survey-based knowledge management quantitative studies miss.

In summary, the contribution of this research to methodology is to lead the way for the Means-End Chain (MEC) research approach into knowledge management research by using the goal hierarchical approach recommended by Gutman (1997), and for the MEC providing deeper insights to create an organisational readiness instrument based on an empirical case study where the requirement to reveal the attributes responsible for the effective implementation of a knowledge management system needs to be satisfied.

1.7 Contributions to Practice

My research is based on empirical case studies. Practitioners can learn from the outputs of the study of these organisational cases. I make two distinct contributions that practitioners need to consider when implementing a knowledge management system.

1.7.1 Contribution of KIAT to practitioners

KIAT provides a fresh tool for managers to assess the readiness of their organisation to implement KMS. The field of knowledge management continues to gain momentum as it enters its second decade. According to one estimate, 81% of the leading companies in Europe and USA are utilising some form of knowledge management (Beccerra-Fernandez et al., 2004). Knowledge management is being adopted by the world's respectable corporations such as for example, British

Petroleum, DaimlerChrysler, Accenture, Unilever, and many more (Rao, 2005; Davenport et al., 2003). Knowledge management is not only being adopted at the corporate level; it is recognised as an important aspect of national economic growth and is being taken seriously by international development institutions (Janz and Prasarnphanich, 2003; Gold et al., 2001). Over the past decade enabling information technologies that foster collaboration and the sharing of knowledge have also held a key position in the knowledge management landscape. Examples include intranets and extranets, groupware, data warehousing and data mining tools, search engines, content management system, enterprise knowledge portals, online communities of practice, and social network analysis (Rao, 2005).

While the promise of knowledge management and enabling technologies are attractive, there are too many examples of knowledge management failures. The reasons for failure are ascribed to non technical issues such as management buy-in, knowledge hoarding, lack of trust, knowledge stickiness and lack of organisational readiness (Stankowsky, 2005; Siemieniuch and Sinclair, 2004; Gilmour, 2003). Often, managers adopt a knowledge management initiative from an organisation that has effectively implemented it, only to find that the end results for their own organisations do not bring much value. Roberts (2004) argues that there is no generic fit for organisational initiatives to build competitive advantage; organisations need to develop and establish their own patterns of fit among the elements within their organisations to gain competitive advantage. I contend, therefore, that one way to operationalise a KMS that may work for one organisation does not mean it will work the same way for another organisation. For example, Schlumberger places their knowledge brokers in the research and engineering centres and Power International places them in the operational sites. Yet both are good examples of effective knowledge management.

In this study, I argue that KMS implementation depends on an organisation's socio-technical characteristics, namely its Infrastructure, Knowledge Structure and Knowledge Culture. Each time these STS dimensions vary, implementations of KMS also vary. However, through KIAT, Factors that influence the degree of effectiveness in KMS implementation can be examined and evaluated. Managers using KIAT can understand what those Factors are, evaluate those Factors in their own organisations, and address them to position their organisation ready to implement a KMS. KIAT helps managers in assessing their organisational readiness and locating the Factors that need to be addressed for a better preparation. The application of KIAT in Power International (subsection 6.4.1) and Friends Provident (subsection 6.4.2) serve as examples of how KIAT helps managers prepare their organisations.

Managers planning to implement KMS need to evaluate their organisation's readiness for knowledge management. The assessment indicates the perception of readiness of the organisation which is important when organisations plan to invest in KMS. Readiness assessment can be for the purpose of confirmation as much as the purpose of discovery (French and Bell, 1999; Armenakis et al., 1993). KIAT provides a profile of organisational readiness to implement a KMS, and a list of the Factors that have lower or higher readiness levels. In creating readiness, managers must not only communicate the Factors with lower readiness, but must also bolster the Factors with higher readiness Factors as they may be used as leverage to increase the readiness of the other Factors. This is exemplified by the Power International case (subsection 6.4.1).

1.7.2 Contribution of CFP to practitioners

The research has also found the need to create Communities For Performance (CFP) to operationalise a knowledge management system in an organisation. As already elaborated in sub-section 1.5.3, the work of Communities of Practice (COP) has illuminated the valuable contribution of this organisational form to provide an effective basis for knowledge activities in an organisation. At the same time, it also carries some downsides, in particular the difficulties of such a knowledge community in contributing directly to the business performance. CFP appears to be a different organisational form that may directly deliver beneficial results.

To create CFP, managers need to 1) ensure that a clear process for knowledge activities be defined within a certain business process; 2) appoint full time members of CFP; 3) create an organisational atmosphere where experts are willing to collaborate; 4) set the expectation of CFP's performance level; 5) consider the structural diversity of the CFP, and 6) continue to nurture communities of practice.

1.8 Limitations and Further Research

In this section, the limitations of the research are acknowledged and discussed. The research has also identified avenues for further research.

1.8.1 Limitations of the research

This research has a number of limitations. Each of these is discussed next.

1. The initial assessment tool, KIAT, is derived from a single type of industry, that is Oil and Gas and from one single firm, namely Schlumberger. The generalisability, therefore, needs to be treated with caution. The choice of the research site is based on a theoretical, not a statistical, sampling (see section 1.3.2). The criteria used to choose the research site was pre-determined to address the research questions. While conducting a research in one organisation is a limitation, I found that in building an instrument such as KIAT, the in-depth study within one organisation helps to focus on the specific Factors that form the instrument. In Project Three, the KIAT Factors were refined through field testing in different business settings. Nonetheless, care must be taken when generalising the KIAT Factors to other KM initiatives.
2. The number of cases, while theoretically sampled, is few in number. Therefore, it is not possible to understand the correlation between experience in knowledge management and readiness level. Schlumberger with a lot of experience shows a high degree of readiness to implement KMS. However, Power International, which has more experience in KM than Friends Provident, shows less readiness than Friends Provident. To draw a meaningful correlation

a study using statistical sampling techniques needs to be conducted. This merits another research for further investigation which is discussed in the next section of this chapter.

3. I was a senior manager in Schlumberger when Project One was carried out in the company. This situation may have given rise to a certain bias during the data collection and the data analysis. I was, however, never part of InTouch development or deployment teams. Blaikie (2000) terms a researcher in my situation as an empathetic observer; in which case I can still aim to achieve some kind of objectivity and can place myself in the social actors' positions. This situation may bring either advantages or disadvantages to the research project. The advantages are that my in-depth knowledge brings to the research a better understanding of the business setting and that my knowing the interviewees may gain more transparent information during the interviews. The disadvantages are that I may have answered my own questions and that I may steer the interviewees to the answers I want to hear. I used the technique termed as "mirroring or reflecting" (see section 3.1.3) to avoid this potential bias. At the same time with my extensive access to the internal materials related to InTouch, I used other available data for triangulation during the interview gathering and data analysis phases of this study.
4. In constructing the Hierarchical Value Map (HVM) I used a cut-off value of 3. This cut-off value is required to allow the rich meaning represented in the map and yet be simple enough to be represented and interpreted. A different cut-off value could have been selected. However, it has been suggested in this research technique that the criterion for evaluating the ability of the map to represent the data is to assess the percentage of all relevant and meaningful relations among elements accounting for the mapped elements. A minimum of 70% is the recommended reference; in my research this percentage is 82.3%.
5. Ideally, all the interviews should have been done face-to-face. This was the case for Project Three but not for Project One. 30% of the Project One data collection was conducted through telephone-interviews. I acknowledge that there might be some missing information that could have been useful for the research. To avoid such a situation, all telephone-interviews were recorded and transcribed. When in doubt about the data gathered, I contacted the interviewees for confirmation.
6. In Project Two, the thirty five attributes developed in Project One had to be categorised under the STS dimensions. This required me to interpret the Factors to create the relationships. In order to avoid mis-categorising the Factors, where I was uncertain about a Factor I recontacted twelve respondents to understand the meaning they ascribed to the Factor before constructing the relationship between a Factor and an STS dimension.
7. The KIAT model assumes all Factors contribute equally to organisational readiness to implement knowledge management systems. This may not always be the case. Therefore, organisations using KIAT need to assess the relative importance of Infrastructure, Knowledge Structure and Knowledge Culture dimensions to prepare their organisation for knowledge management.

1.8.2 Opportunities for Further Research

I have identified five lines of further research. One is to examine the relationship between the level of readiness and the effectiveness of organisations in implementing KMS. A number of samples of KIAT application can be collected from different business settings in companies that are about to implement KMS. Following this diagnosis, a follow up study is required to assess the effective use of the KMS. Based on these samples a correlation between readiness level and the KMS implementation effectiveness can be drawn.

Two is the study of different organisations by applying KIAT to acquire in-depth understanding as to how those organisations address the weaker Factors to a higher readiness level. The study can be conducted either in a single business sector in a number of organisations or a larger scope addressing different business sectors. What is interesting to study is the organisational dynamics in moving lower readiness Factors to higher ones. One example is illustrated in Figure 1-4. Factors can be grouped into a matrix of readiness vs Factor complexity. Senior and middle managers with their team may decide which Factors will require complex or significant efforts to address and which ones will not. To ensure readiness, managers' task is to move the Factors from lower to higher readiness level. Complexity for each Factor may differ from one organisation to another. However, the dynamics as to how managers address those Factors, or as to how managers decide to proceed with the KMS implementation and its timing, may be of an interest to both academics and practitioners.

The above two possible further researches may provide a better understanding for academics of the dynamics required for organisations in implementing KMS, and a benchmarking for practitioners.

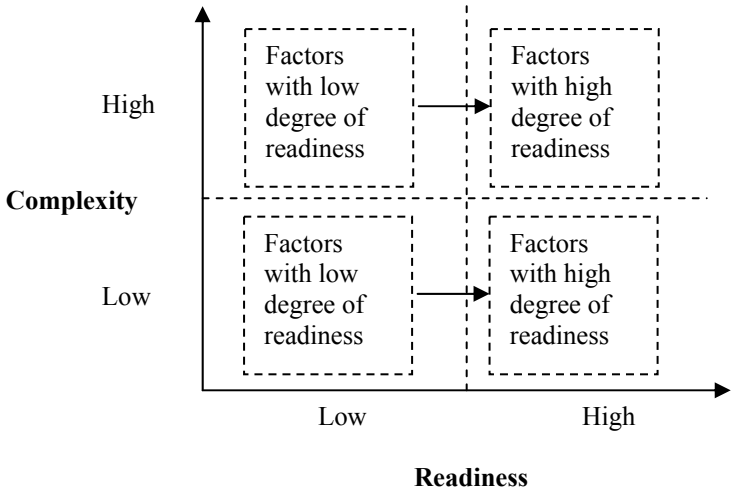


Figure 1-4: Readiness vs Complexity for KIAT Factors

Three is to study the correlation between experience in knowledge management and readiness level. In my research, the application of KIAT to the three organisations produces different levels of organisational readiness for each of them. With three samples, it is not possible to draw a meaningful correlation between experience in knowledge management and readiness level. The question that can be raised is whether there is a correlation between experience and readiness. To achieve this, research is suggested based on statistical sampling using a quantitative data collection and data analysis.

Four is to study how developing Factors towards readiness induce organisational learning. My research deals with the readiness to create, mobilise and diffuse knowledge. The desire to engage across territorial debates about the distinctions and connections between organisational learning and knowledge management has existed for a decade (Vince et al., 2002). There is a further opportunity for research in understanding the dynamics as to how developing Factors towards readiness induce organisational learning. For example, Sole and Edmondson (cited by Vince et al., 2002) have analysed learning processes in the context of geographically dispersed project teams. Their focus is on understanding how these teams acquire knowledge from the various sites where their team members are located. This fits in well with the concept of structural diversity. I have proposed that implementing KMS needs to include structural diversity in the equation. The study on how developing readiness induces organisational learning may illuminate some connections rather than distinctions between organisational learning and knowledge management. Research can be conducted in either one case or a multi-case study to derive different dynamics in developing Factors towards readiness that induce learning.

Five is to study the dynamics and the development of Communities For Performance (CFP). Weick states, "knowledge is not something people possess in their heads but rather something people do together" (2002:S8). Learning takes place when members of communities create, mobilise and diffuse knowledge. Weick (2001) and Ghoshal and Gratton (2002) further remind us that knowledge is of little use, at least in a business world, if it is not put into action. Weick concludes that to achieve successful performance, a manager "(i) *animates people* and gets them moving and generating experiments that uncover opportunities; (ii) *provides direction*; (iii) *encourages updating* through improved situation awareness and closer attention to what is actually happening; (iv) *facilitates respectful interaction* in which trust, trustworthiness and self-respect develop equally and allow people to build a stable rendition of what they face" (2002:S9). I have argued in this thesis that communities which bring beneficial results to organisations are CFP. Further study is required to illuminate a better understanding about these types of community. Weick (2002) seems to have started the discussion related to this. I have outlined an early understanding of CFP found in Schlumberger's technical service delivery process and proposed the characteristics of these types of community. Research can be designed to better understand the dynamics of CFP and the organisational development involved in creating CFP.

1.9 Chapter Summary

In this chapter I presented the background and conceptual location of this research. I discussed the research methods and findings. I also explicated the contributions of my research to theoretical knowledge, methodology, and practice. I highlighted the limitations of my work and directions for further research.

In summary, the findings of my research suggest that measuring readiness is a prerequisite for implementing knowledge management systems; implementing KMS is effective when it integrates across the creation, mobilisation and diffusion stages of the knowledge life-cycle; readiness to create, mobilise and diffuse knowledge increases as the measure of the Infrastructure, Knowledge Structure, Knowledge Culture increases. The thesis argues for the need of structurally diverse communities for performance to leverage communities of practice in delivering direct business results, and that implementation of KMS must be governed within and by business processes. The research contributes to methodology in leading the way for the Means-End Chain approach into knowledge management research by adapting the goal hierarchical concept. To practitioners, the research contributes KIAT and the understanding of Communities For Performance.

In the next chapter, I present the literature review and the research questions. Knowledge management literature is reviewed and the relevance of Socio-Technical Systems literature and Organisational Development literature for my thesis are discussed. Then, Research Questions are derived from the gap identified in the literature.

CHAPTER TWO: LITERATURE REVIEW AND RESEARCH QUESTIONS

The previous chapter, the linking commentary, provided a synthesis of the entire study. This and subsequent chapters examine specific areas in more detail, starting with a review of current academic thinking. Specificallly, this chapter reviews the relevant literature about knowledge in an organisational context, its role in knowledge management and in knowledge management systems. The chapter discusses the concept of organisational readiness for knowledge management. A brief review of the relevant socio-technical system and organisational development literature is presented to address the understanding of these two disciplines in their contribution in shaping this research. The Research Questions derived from the literature gap are presented in this chapter.

2.1 Introduction

Knowledge management literature spans from the philosophy of knowledge to the practical application of KMS in and across enterprises. The amount of the literature in this domain is vast. Covering it has proved to be a challenge, which required a systematic approach to reviewing the literature.

Nonaka and Takeuchi (1995) explicitly present the paradox between the Western and the Eastern philosophical inquiry of knowledge or *epistemology*. While there is a rich epistemological tradition in Western philosophy, there is very little to speak of in the East. They further argue that in itself this is a reflection of the very different ways that the two cultures think about knowledge. In Western philosophy there has long been a tradition separating the subject who knows from the object that is known. Descartes gave a solid methodological basis for this tradition by positing the "Cartesian split" between subject (the knower) and object (the known), mind and body, or mind and matter. In contrast, in the Eastern intellectual tradition, the split between subject and object has not been as deeply rooted; instead, the characteristic of Eastern thinking can be considered and termed as "oneness of humanity and nature." Nonaka and Takeuchi (1995) suggest that this comparison is presented not to say that an either/or choice has to be made between the Western and the Eastern approaches, but more that this needs to be understood to be able to appreciate the two different angles which are complementary in dealing and understanding knowledge and knowledge activities. A discussion about knowledge itself is, therefore, required to frame the research to which it relates.

From the preliminary approach to the literature, it emerged that the enthusiasm about knowledge management came from the refreshed awareness of both the importance of knowledge in an organisation, and that it provides competitive advantage to the organisation that has it and manages it well from its creation to its diffusion. A keen interest in the subject of knowledge has been developing since the 1990s. An explosion of sorts has occurred in the business press in the last ten to fifteen years with many prominent authors such as for example Drucker (1993), Grant (1996), Kogut and Zander (1992) leading the field. In their own ways, they all herald

the arrival of a new economy or society, referred to as the "knowledge society" by Drucker (1993), which distinguishes the past itself from the key role knowledge plays within the society. Drucker (1995) further argues that in the new economy, knowledge is not just another resource alongside the traditional Factors of production – labour, capital, and land – but the only meaningful resource today. He anticipated that "the performance of an individual, an organisation, an industry, a country, in acquiring and applying knowledge will increasingly become the key competitive factor" (1995:236). Grant (1996) and Kogut and Zander (1992) suggest a knowledge-based view of the firm. According to this view, firms exist because it is difficult to create, mobilise and diffuse the required types of knowledge via markets. Firms then are created as systems for creating, mobilising and diffusing the knowledge required for development and delivery of products and/or services. The resource-based view of the firm (Connor and Prahalad, 1996; Amit and Schoemaker, 1993) postulates that a firm's profitability is not only a function of its market and competitive position but also a function of its internal capabilities and know-how, i.e. its knowledge, in combining its resources to deliver products and services, and to enhance organisational performance. In other words the knowledge-based view of the firm contends that knowledge which is created, mobilised, and diffused in social communities, e.g. organisations, forms the basis for competitive advantage. Conventional economic resources such as land and capital arguably play a lesser role in an organisation's quest to sustain competitive advantage as compared with its capability to exploit knowledge (Kogut and Zander, 1992; Barney, 1991).

As knowledge management is viewed to be important for academic research and industrial practice (Wang and Ariguzo, 2004; Davenport et al., 2003; Markus et al., 2002), it has drawn more interest year after year, proven by the growth of the literature in this subject, as shown in the chart in Figure 2-1 and Figure 2-2.

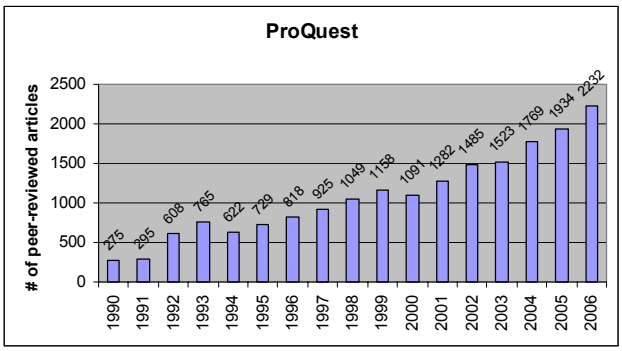


Figure 2-1 Number of articles related to knowledge management from ProQuest search

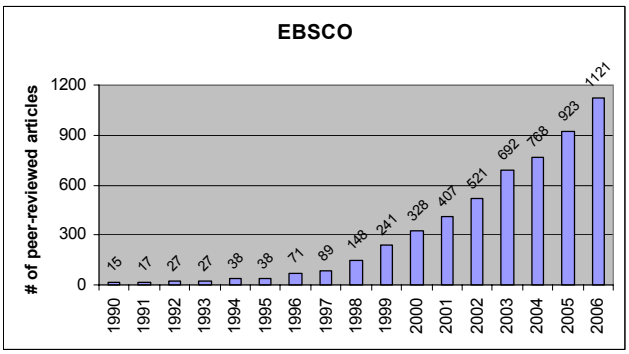


Figure 2-2 Number of articles related to knowledge management from EBSCO search

These two charts are concerned only with peer-reviewed literature and are produced using the following search criteria: knowledge management or managing knowledge or knowledge sharing or knowledge exchange or knowledge interchange or knowledge creation or knowledge mobilisation or knowledge diffusion or knowledge transfer or knowledge dissemination or knowledge activity. For ProQuest the search is based on citation and abstract, and for EBSO it is based on the default fields.

This enthusiasm is a natural progression of the increasing understanding that management of knowledge has emerged as a major challenge in maintaining sustainable competitive advantage (Spender, 1996; Barney, 1991). Knowledge management has also become an overarching concept covering a variety of disciplines. It extends into general management (Buchel and Raub, 2002), information system development (Sage and Rouse, 1999), information resource management (Nissen et al., 2000), decision support systems (Holsapple, 2001; Parent et al., 2000; Ramesh and Tiwana, 1999), and human resources management (Rastogi, 2000).

According to the knowledge-based view of the firm, firms or organisations are indeed knowledge systems. Knowledge is created and exchanged within a community (Kogut and Zander, 1992; Brown and Duguid, 1991). Thus, there is the notion that Communities of Practice (COP) actually animate the knowledge activities within an organisation. The study and the understanding of COP, therefore, became very much related to knowledge management.

In exploring further the abundant knowledge management literature I conducted an in-depth review of the extant literature based upon evidence-informed techniques (Tranfield et al., 2003). The technique is explained in the following section.

2.2 Literature review

From the preliminary literature review discussed in the previous section, I decided to frame the literature search in the domains of the creation, mobilisation, and diffusion of the knowledge life-cycle from the perspectives of communities of practice theory and knowledge-based theory of the firm.

The review started with the literature search using the ProQuest and EBSCO search tools; only peer-reviewed papers were included. The keywords for the search criteria were decided based on the domain of the literature and complemented with the normally used terms for synonyms. Appendix 1 presents the summary of the search findings. For reasons of relevance and manageable quantities of articles to be reviewed, a judgment was made to follow the pattern of search options as highlighted in the table in Appendix 1. Comparison of the literature suggested by ProQuest and EBSCO was then made to remove duplication of references. A literature list was obtained for further evaluation.

Some articles were excluded due to reasons of irrelevance to my study and the quality of their sources. Additional relevant research was sought based on the citations within the articles. The discussion that follows is based on a review of the identified literature. This literature review was an on-going process throughout the period of the research.

2.3 Knowledge, Knowledge Management, Knowledge Management System

2.3.1 Knowledge: Concept Underpinning

Data, Information and Knowledge

The use of the words 'knowledge', 'information', and 'data' in current research is confusing; central to this confusion is an understanding of what knowledge is, how it relates to, or differs from, information and data, and how this shapes and impacts its management (McInerney, 2002; Grover and Davenport, 2001). As clarity of terminology is a critical factor in any study, understanding what knowledge means is important in exploiting knowledge management in organisations (Blair, 2002; Southon et al., 2002).

In understanding what knowledge is, one needs to start with the previously more widely used terms: data and information. The assumption seems to be that if knowledge is not something that is different from data or information, then there is nothing new or interesting about knowledge management (Fahey and Prusak, 1998). Levitin and Redman (1998) argue that data are used in, and created by, all daily operations, from serving customers to manufacturing a product, to tracking inventory. They further suggest that data are collected according to the status of events, and that they support managerial and professional work. This corresponds to the well-accepted definition that data are representations of events that people notice and bring to the attention of others in the organisation (Sanchez, 2001a). They are mainly a compilation of facts and figures (Blair, 2002; Drucker, 1995). Davenport (1994) stresses that data are not information.

Boisot and Griffiths (2001) describe information as what is extracted from data when incoming data can be related in a meaningful way to an observer's prior expectation. Or simply put, as Prusak (1996) proposes, information is a message that is bounded. This leads to an understanding that there must be a meaning bound to the data that makes data information; therefore, Sanchez (2001a) defines information as the meaning that is imputed to some data by evaluating the data in an interpretive framework. Drucker (1995) argues that information is data that has been organised for a particular purpose. To make data into information, a particular use must be identified so that it can be structured in as readily an accessible form as possible. Taking an example of customers: customer data are mainly a compilation of facts such as addresses, items purchased, time of purchase, total value of purchase, and others. To turn this into information, a particular purpose must be defined. The purpose can be exemplified as targeting credit control in a specific group. To become information, the data can then be categorised into customers with receivables of more than a certain period. This information needs to be used to create a difference (Styhre, 2002). As soon as a piece of information is used, it is, as Luhmann (2000) points out, turned into non-information.

While there is a wide agreement as to what data and information are, there appear to be various definitions and concepts of knowledge. Transformation of information into knowledge is by no means linear or uncomplicated (Styhre, 2002). Knowledge is the intelligent use of data and information, and the more knowledge is

exercised and shared the greater it becomes. Adler states that, "Knowledge is a remarkable substance. Unlike other resources, most forms of knowledge grow rather than diminish with use" (Adler, 2001:45).

Philosophical analysis and debate relating to the meaning of knowledge began in the ancient Greek period and continues today, with a multitude of different and often competing approaches. A difference exists within the Western tradition, between Platonic idealism and Aristotelian empiricism. There is also a difference between the Western tradition, separating the subject who knows and the object that is known, and the Eastern or Japanese tradition of unity of body, mind, nature and other (Nonaka and Takeuchi, 1995). This reflects and illustrates the importance of cultural factors in the way the world is understood and knowledge interpreted.

Kogut and Zander (1992) include information within their definition of knowledge. According to them, knowledge consists of information and know-how. Information is knowledge that can be transmitted without loss of integrity once the syntactical rules for deciphering it are known. Know-how is the accumulated practical skill or expertise that allows one to do something smoothly and efficiently. On the other hand, Nonaka and Takeuchi (1995) assert that knowledge - unlike information - is about beliefs, commitment and action; knowledge, like information, is about meaning.

Blair (2002) makes out the case that by using the "let the use teach the meaning" method introduced by Ludwig Wittgenstein in 1953, knowledge is not something tangible that we can possess, exchange, or lose in the way that we can with data or information. When we lose knowledge, we lose an ability to do something. Therefore, knowledge is something intangible attached to an individual that in a normal healthy situation cannot disappear at once but can "erode" over time when not exercised. Applying knowledge often depends on having relevant data or information. But data or information that enables a knowledgeable person to exercise expertise are insufficient by themselves to enable someone else to exercise that expertise.

Context is also crucial. One view is that knowledge is contextual and that it will distinguish one person or organisation as more knowledgeable than the other(s) (Blair, 2002). Davenport and Prusak (1998) capture this sense of context within the decisions or movement undertaken as a result of the knowledge available. For Davenport and Prusak, knowledge comprises a person's experience, truth, and judgment, and may be heuristic. They define knowledge as "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. In organisations, it often becomes embedded not only in documents or repositories but also in organisational *routines*, *processes*, *practices*, and *norms*" (1998:5).

Sanchez defines knowledge as "a set of beliefs about causal relationships in the world and an organisation" (2001a:5). He argues that this causal relationship is very relevant in the discussion of knowledge management because it is concerned with forms of knowledge that can be used to cause things to happen. He further emphasises "this concept of knowledge helps to make an important distinction between simply being aware of something, which means having data or information in our framework, and having knowledge, which implies actually knowing how to do things or to cause things to happen" (2001a:6). Knowledge, consequently, resides in the minds of individuals and organisational knowledge exists when individuals in an organisation share sets of beliefs about causal relationships that enable them to work together (Sanchez, 2001a). From a similar perspective, Boisot and Griffiths (2001:214) summarise that "data is something 'out there' that an observer notices. The observer

constructs what he believes is information in the form of an interpretation of data that modifies the beliefs that reside 'in him' and constitute his or her knowledge."

This discussion leads to the understanding that there is an implication of a hierarchical view of data, information and knowledge. However, Tuomi (1999) makes the iconoclastic argument that the often-assumed hierarchy from data to knowledge is actually inverse: knowledge must exist before information can be formulated and before data can be measured to form information. He argues that knowledge exists which, when articulated, verbalised, and structured, becomes information which, when assigned a fixed representation and standard interpretation becomes data. Critical to this argument is the fact that knowledge does not exist outside of an agent (a knower): it is indelibly shaped by one's needs as well as one's initial stock of knowledge (Tuomi, 1999). Through an in-depth case analysis in a large utility company, Braganza (2004), in agreement with Tuomi, found that the data-information-knowledge hierarchy was of limited practical use. Braganza (2004) further suggests the knowledge-information-data model, which proposes a top-down perspective rather than the traditional bottom-up approach. Knowledge is the result of cognitive processing triggered by the inflow of new stimuli (Alavi and Leidner, 2001). Alavi and Leidner (2001) further posit that information is converted to knowledge once it is processed in the mind of individuals and knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms.

Alternative Knowledge Perspectives

The accepted philosophical definition of knowledge as the "justified true belief" (Nonaka and Takeuchi, 1995:21) that increases an entity's capacity for effective action, and the more business-like definition "a capacity to act" by Sveiby in 1997 (cited in Southon et al., 2002:1049) alone do not really help to define the meaning of knowledge in a sense helpful to undertaking knowledge management.

A number of alternative perspectives on knowledge can be explored. Schubert et al. (1998) described knowledge as a state or fact of knowing with knowing being a condition of understanding gained through experience or study; the sum or range of what has been perceived, discovered, or learned. The perspective on knowledge as a state of mind focuses on enabling individuals to expand their personal knowledge and apply it to the organisation's needs. Carlsson et al. (1996) and Zack (1999) posit that knowledge can be viewed as a thing to be stored and manipulated, or alternatively, knowledge can be viewed as a process of simultaneously knowing and acting. The process perspective focuses on the applying of expertise (Zack, 1999). Grant and Baden-Fuller (2004) suggest that knowledge is that of a condition of access to information. Therefore, organisational knowledge must be organised to facilitate access to and retrieval of content. Gold et al. (2001) view knowledge as a capability with the potential for influencing future action. Davenport and Prusak (1998) suggest that knowledge is the capacity to use information; learning and experience result in an ability to interpret information and to ascertain what information is necessary in decision making.

A Taxonomy of knowledge

Scholars have classified organisational knowledge across some dimensions. One common dimension distinguishes between tacit and explicit knowledge. There seems to be a congruence of understanding that knowledge can be either explicit or tacit (Nonaka and Takeuchi, 1995; Polanyi, 1966) and scholars often use the word 'knowledge' to mean both. Explicit knowledge or "codified" knowledge refers to knowledge that is transmittable – that is articulated, codified, and communicated – in formal systematic language. An example is an owner's manual accompanying the purchase of an electronic product. The manual contains knowledge on the appropriate operation of the product. Tacit knowledge, sometimes known as implicit knowledge, is unspoken and hidden. It is personal, context-specific, and therefore hard to formalise and communicate. In Polanyi's own words "*we can know more than we can tell*" (1966:4). This tacit knowledge is comprised of both cognitive and technical elements (Nonaka, 1994): the cognitive element refers to an individual's mental models consisting of mental maps, beliefs, paradigms, and viewpoints, the technical element consists of concrete know-how, crafts, and skills that apply to a specific context. Many scholars suggest that tacit knowledge is more valuable than explicit to create competitive advantage (Alavi and Leidner, 2001).

Another dimension is that knowledge can also be viewed as existing in individuals or in the collective (von Krogh, 1998; Nonaka, 1994; Kogut and Zander, 1992). Individual knowledge is created by and exists in the individuals whereas collective or organisational knowledge is created by and inherent in the collective actions of a group (Heaton and Taylor, 2002; Kogut and Zander, 1992). In their knowledge creation theory Nonaka and Takeuchi (1995) use the interplay between explicit/tacit knowledge and individual/organisational knowledge. They state, "new knowledge always starts with an individual" (1995:13) and suggest that organisations have to mobilise individual knowledge so that it becomes organisationally amplified through the 'knowledge conversion spiral' at a higher ontological level.

Matusik and Hill (1998) suggest that although the above two dimensions are important in understanding the nature of organisational knowledge, two other distinctions are particularly germane to arguments of turning knowledge into competitive advantage: 1) private versus public knowledge and 2) architectural versus component knowledge. Figure 2-3 summarises these dimensions and the relationships to each other.

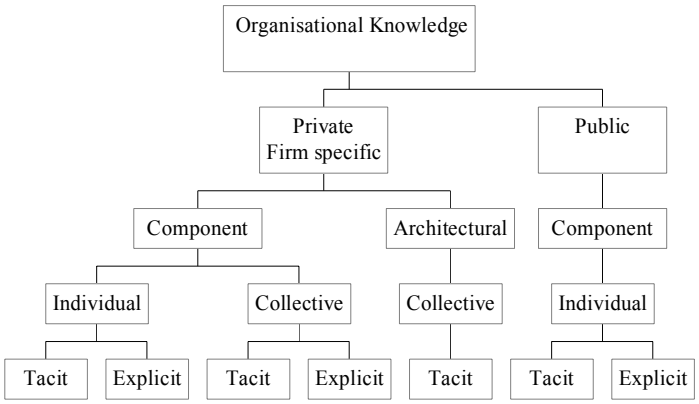


Figure 2-3 A Taxonomy of Organisational Knowledge (Matusik and Hill, 1998:684)

According to Matusik and Hill (1998) and Barney (1991) private – or firm-specific – knowledge can be a source of competitive advantage if it is valuable, rare, and imperfectly imitable and non-substitutable. By definition, public knowledge cannot be a source of competitive advantage since it is neither unique nor proprietary to any one organisation but is, instead, readily available to everyone. However, Matusik and Hill argue that the failure to apply such knowledge within a given firm can be a source of competitive disadvantage. Private knowledge includes such items as a firm's unique routines, processes, documentation and trade secrets. Public knowledge consists of knowledge not unique to any one firm. Rather, it resides in the external environment and is, in essence, a public good. Public knowledge includes such items as industry and occupational best practices.

Matusik and Hill (1998) explain that component knowledge is the knowledge that relates to a subroutine or discrete aspect of an organisation's operations. It is the knowledge that relates to "parts" or "components", rather than the whole. The knowledge underpinning a firm's new product development process, technical service delivery process, and so on, could be considered component knowledge (Leonard-Barton, 1998; Amit and Schoemaker, 1993). Each of these processes constitutes just one aspect of a firm's overall knowledge structure. Component knowledge can be held individually or collectively and it includes both tacit and explicit knowledge. Private component knowledge can be a source of competitive advantage, such as for example, when a firm has developed a superior technical service delivery process.

Matusik and Hill (1998) further explain that architectural knowledge relates to the whole – that is, to organisation-wide routines and schemas for coordinating the various components of the organisation and putting it to productive use. Because it is organisation-wide, architectural knowledge is held collectively. Moreover, often no one individual can comprehend, and articulate the totality of architectural knowledge. Therefore, architectural knowledge tends to be tacit by default. Because no two firms have the same architectural knowledge (Nelson and Winter, 1982), architectural knowledge must be considered private knowledge . Such knowledge may be a source of competitive advantage.

Discussion

An understanding of the concept of knowledge and the different types of knowledge is important because theoretical developments in the knowledge management area are influenced by distinctions among the different types of knowledge.

The various definitions and concepts of knowledge capture a number of knowledge's essential characteristics: 1) knowledge is related to belief and commitment (Nonaka and Takeuchi, 1995), hence it is about meaning and can be intangible (Blair, 2002); 2) knowledge is dynamic and action oriented (Davenport and Prusak, 1998); 3) knowledge is about causal relationships (Sanchez, 2001a); 4) knowledge is contextual – it is a function of situation, experience, culture, and judgment (Davenport and Prusak, 1998); therefore, 5) knowledge may be heuristic (McInerney, 2002; Sanchez, 2001a); and 6) knowledge is a set of routines (Nelson and Winter, 1982).

Knowledge may be viewed from different perspectives: 1) Hierarchical evolution from data and information, 2) a state of mind, 3) an object, 4) a process, 5) a condition of having access to information, 6) a capability. These different views of knowledge lead to different perceptions of knowledge management and the knowledge management system. Table 2-1, adapted from Alavi and Leidner (2001),

summarises this implication. When knowledge is viewed as an evolution of information or state of mind, then knowledge management will focus on enhancing individuals' understanding. When knowledge is viewed as an object or as a condition of having information access, then knowledge management will focus on building and managing knowledge stocks. When knowledge is a process, then the implied knowledge management focus is on knowledge flow and the processes of creation, mobilisation and diffusion of knowledge. The view of knowledge as a capability suggests building core-competency centred knowledge management. The major implication of these various concepts of knowledge is that each perspective suggests a different strategy for managing the knowledge and a different perspective of the role of systems in facilitating an organisation to manage knowledge.

Perspective of Knowledge	Brief description	Implications for Knowledge Management (KM)	Implications for Knowledge Management Systems (KMS)
Hierarchical relationship: Data, Information, Knowledge	Data is compilation of facts, Information is processed data, Knowledge is personalised information	KM gives useful information to individuals and facilitates the assimilation of information into personalised knowledge	KMS is mainly Information Systems with an addition for the use of personalising information to become personalised knowledge
State of mind	Knowledge is the states of knowing and understanding	KM enhances individual's understanding through the provision of information	KMS is to provide access to sources of knowledge
Object	Knowledge is an object to be stored and applied	KM builds and applies knowledge stocks	KMS is to capture, store, and diffuse knowledge
Process	Knowledge is a process of applying expertise	KM focuses on knowledge flows and the process of creation, mobilisation and diffusion of knowledge	KMS is to manage the link among knowledge sources to create better permeability of knowledge flows
Access to information	Knowledge is a condition of access to information	KM focuses on organising access to and retrieval of content	KMS is to provide effective search and retrieval mechanisms
Capability	Knowledge is the ability to take the right decision and action	KM focuses on building core competencies for decision making and actions	KMS is to support the development of individual and organisational competencies

Table 2-1 Knowledge perspectives and the implication to knowledge management and knowledge management systems

The table is inspired and adapted from Alavi and Leidner (2001).

I consider that the question whether tacit or explicit knowledge is more valuable for competitive advantage actually misses the point. The two are not dichotomous states of knowledge, but mutually dependent and reinforcing qualities of knowledge: tacit knowledge forms the background necessary for assigning the structure to develop and interpret explicit knowledge (Polanyi, 1966). The inextricable linkage of tacit and explicit knowledge suggests that only individuals

with a requisite level of shared knowledge can truly exchange knowledge: if tacit knowledge is necessary to the understanding of explicit knowledge, then in order for a person to understand another person's knowledge, there must be some overlap in their underlying knowledge bases, a shared knowledge space (Tuomi, 1999). This shared space, according to Braganza (2004) could be the business process, which points to a unit of analysis for understanding knowledge management.

Organisational knowledge is understood as socially constructed, therefore, the knowledge that enables competitive advantage must be a combination of tacit and explicit knowledge (Kogut and Zander, 1992). Scholars such as Bessant (2003), Sanchez (2001b), Sawhney and Prandelli (2000), Leonard-Barton (1998) insist that knowledge fuels innovation within an organisation. They further argue that organisations which manage knowledge have better innovative products and services than those which do not. In contrast to the knowledge-based view of the firm, Grant (1996) and Kogut and Zander (1992) also discuss a contract-view theory of the firm. The contract-view perspective charaterises organisations as bundles of contracts that serve to allocate property rights efficiently. It serves to keep a check on the transaction costs arising from the self-interested motivation of individuals. I posit that turning both tacit and explicit knowledge into competitive advantage needs to start from a knowledge-based view of the firm. Table 2-2 describes how tacit and explicit knowledge may become competitive advantage from the two different theories of the firm. With a contract view of the firm, at best only explicit knowledge can be captured from individuals. This is because the contract view of the firm rests on assumptions about selfish motives of individuals that result in shirking or dishonesty (Kogut and Zander, 1992). Whether this can turn into competitive advantage depends on the managerial control capacity. With a knowledge-based view of the firm both tacit and explicit knowledge can be turned into competitive advantage with different types of processes for example the ones suggested by Hansen et al. (1999).

Letting individuals have ideas, validating those ideas within communities, capturing their knowledge, and sharing the knowledge with other organisation members to enable decision-making or to take required actions, are the essence of knowledge activities. The first two deal with tacit knowledge and the second two deal with explicit knowledge. In other words, managing knowledge may start from its creation and follow through to its diffusion for application. Knowledge management is the subject of the next section.

	Knowledge type as source of competitive advantage	
	Tacit	Explicit
Contract view of the firm	Cannot exist as a source	Through a forced process, as a result of keeping a check on the transaction costs arising from the self-interested motivation of individuals.
Knowledge-based view of the firm	Competitive advantage is achieved through knowledge which is socially constructed by which new knowledge and learning is created. People-to-people process is to be established	The sharing and transfer, or diffusion, of the knowledge of individuals and groups within an organisaiton through codification. Re-use is to be emphasised. People-to-document process is to be established

Table 2-2 Turning tacit and explicit knowledge into competitive advantage from the perspective of two different theories of the firm.

2.3.2 Knowledge Management in Organisations

Knowledge Management: A Thick Web of Themes

Knowledge management continues to attract significant amounts of attention from academics and practioners as shown in the charts Figure 2-1 and Figure 2-2. Like knowledge itself, however, the understanding as to what knowledge management is varies between different scholars. Delving into the knowledge management literature projects a thick web of themes from a variety of disciplines, with a multitude of different "a la carte" approaches to manage knowledge. The literature varies from care required for knowledge creation (von Krogh, 1998; Nonaka, 1994), managing the knowledge sharing or knowledge exchange and managing the codified knowledge (Zack, 1999), managing the tacit knowledge (Hansen et al., 1999), managing the accumulation and utilisation of knowledge (March, 1991), and managing the communities of practice (Wenger, 2000; Brown and Duguid, 1991).

Nonaka and Takeuchi (1995) proposed two dimensions in their framework of knowledge creation: ontology and epistemology. From the ontological dimension, only individuals create knowledge. An organisation cannot create knowledge without individuals. It supports the creative individuals and provides the processes and tools for them to create knowledge. From this viewpoint, only a person can be knowledgeable, i.e. only a person can have and exercise knowledge. From the epistemological dimension, there are two types of knowledge: tacit and explicit. These types of knowledge are within each individual; they are not totally separate but mutually complementary entities. For a person to acquire knowledge from others and create knowledge, she/he will go through a social interaction between tacit and explicit knowledge. Nonaka and Takeuchi termed this process "knowledge conversion". This individual knowledge is the basis for organisational knowledge. The organisation has to mobilise individual knowledge so that it becomes "organisationally" amplified through the knowledge conversion "spiral" at higher ontological levels.

Sanchez's (2001a) five learning cycles: individual, individual/group, group, group/organisation, and organisation, are based on the fact that the foundation of organisational knowledge is the knowledge that individuals develop through their own personal endeavour which then escalates through the process of learning cycles. From the new knowledge explored by individuals, they then share their knowledge with the group, the group goes through an evaluation and selection of new knowledge, then other groups go through an evaluation and selection of group knowledge, and finally the organisation disseminates the organisational knowledge.

There appears to be some congruence between Sanchez's five learning process and Nonaka's conversion spiral. Both state that knowledge resides in individuals and that the process of creating organisational knowledge is a process of mobilising the individual knowledge into higher ontological levels. Knowledge management is to make knowledge become a competitive advantage through this process. Moreover, Styhre (2002), Weick (2002) and Adler (2001) suggest that a great deal of knowledge is both produced and exploited collectively. Weick states, "We also sometimes forget that knowledge is not something people possess in their heads but rather something people do together" (2002:S8). Brown and Duguid (1998), Grant (1996) and Kogut and Zander (1992) argue that the creation of know-how knowledge very often results

from the collaboration of a community of practice, and the knowledge is then collectively held and practiced. Without collaboration new knowledge might not be created and diffused. At an organisational performance level, Drucker (1995) points out that even though by any measure knowledge in application is always specialised (i.e. attached to an individual) to be productive, by itself specialised knowledge yields no organisational performance. For an organisation to perform effectively, knowledge workers must work in a team. Knowledge management practice starts with a common platform of knowledge community.

Applying knowledge management in an organisation therefore involves encouraging or persuading individuals to collaborate as well as capturing the knowledge to make it reusable and available for members of the organisation. According to some scholars, organisations should implement different strategies based on their strategic intent in the business (Birkinshaw and Sheehan, 2002; Hansen et al., 1999). Different strategies will lead to different drivers. Hansen et al. (1999) propose two groups of knowledge management strategy: *codification strategy*, by which knowledge is codified using a "people-to-document" approach – knowledge is extracted from the person who developed it, made independent of that person and reused for various purposes; and *personalisation strategy*, which focuses on dialogues between individuals not on knowledge objects in a database – knowledge that has not been codified and probably could not be, is transferred in brainstorming sessions and one-to-one conversations. Hansen et al. further propose to apply codification strategy to *reuse economics* strategy and the other to *expert economics* strategy, as exemplified in companies such as Bain and McKinsey. They strongly recommend that organisations should not straddle the two knowledge management strategies. With a similar view, but following a different approach and format, Boisot and Griffiths (2001) advise managers to choose either protection or speed as a basic strategy for managing knowledge. In the protection strategy, much knowledge may be kept in tacit form to prevent its diffusion outside the firm, and significant efforts will be made to control knowledge legally and contain it within the firm. By contrast, the speed strategy for managing knowledge emphasises the creation of incentives for knowledge workers to articulate their knowledge into explicit form. By focusing on facilitating articulation and dissemination of knowledge rather than trying to control leakage of knowledge beyond the organisation, the speed strategy seeks to create an engine of learning and knowledge leveraging, such as IT technology, that can outpace competing firms with fewer knowledge management systems.

One common theme emerges from all of the literature: knowledge management deals with knowledge activities with the objective to leverage organisational knowledge for competitive advantage (Gupta and Govindarajan, 2000). While it may seem straightforward, managing knowledge may, and often does, become difficult (Birkinshaw, 2001; Grover and Davenport, 2001) because at the heart of knowledge management are fundamental changes in the ways organisations operate and people behave. In general, knowledge management promises much, but often delivers very little (Gilmour, 2003; Birkinshaw, 2001). There are no simple solutions to this challenge, but as Birkinshaw and Sheehan (2002) and Grover and Davenport (2001) point out, it is possible to make some progress through a more complete understanding of what exactly knowledge management is, where the problems lie, and the steps organisations can take to resolve those problems. "The *why* of knowledge management has become clear, but the *how* has proved to be more elusive" (Beazley et al., 2003:67).

Knowledge Life-cycle

Birkinshaw and Sheehan (2002) suggest a knowledge life-cycle theory where knowledge goes through its creation, mobilisation, diffusion and commoditisation stages. They devise a model to explain the life of an idea in commercial settings. The model shows that new knowledge is 'born' as something fairly nebulous and that it takes shape as it is tested, matures through application in a few settings, is diffused to a growing audience and eventually becomes widely understood and recognised as common practice. Many ideas in the creation stage will run into dead-ends or fail to generate interest, but some will become more clearly formed and make it to the mobilisation stage. The defining characteristic of this stage is that the originators share their knowledge with people who make up part of a trusted community. Once it passes the trusted community, the knowledge is then diffused and further exchanged within the relevant market place. The commodity stage relates to the situation where the commonness of the knowledge means it can easily be found in the public domain.

In response to the pre-defined choice of knowledge management implementation strategy, according to the organisation's business model, suggested by Hansen et al. (1999) and Boisot and Griffiths (2001), Birkinshaw and Sheehan (2002) argue that when implementing strategy for managing knowledge, an organisation needs to understand the life-cycle of the knowledge in question, and the appropriate tools and techniques needed to generate value from knowledge in each knowledge life-cycle stage. Four categories are recommended for consideration in each: the informal systems for mobilising and sharing knowledge, information technology systems, human resources, and relationships with external parties.

I contend that the differences in opinion between the pre-defining knowledge management strategy and the knowledge life-cycle do not really exist in organisation practices; the two views are looking at the same thing from two different axes and they are complementary. At the time knowledge is created the best diffusion of it is obviously through personalisation strategy. The newly created knowledge needs to be tested in the environment. However, to do that, it needs to be shared within the small community in the organisation and at the same time to be hoarded against competition. Therefore, with the lack of a validated "test" of the knowledge and its strategic position as a hoarded knowledge within the company a codification strategy will be inappropriate. As knowledge becomes more mature, rapid diffusion within the organisation becomes the better strategy against competition. In this case codification strategy needs to be followed. In a graphical presentation, this can be described as shown in Figure 2-4:

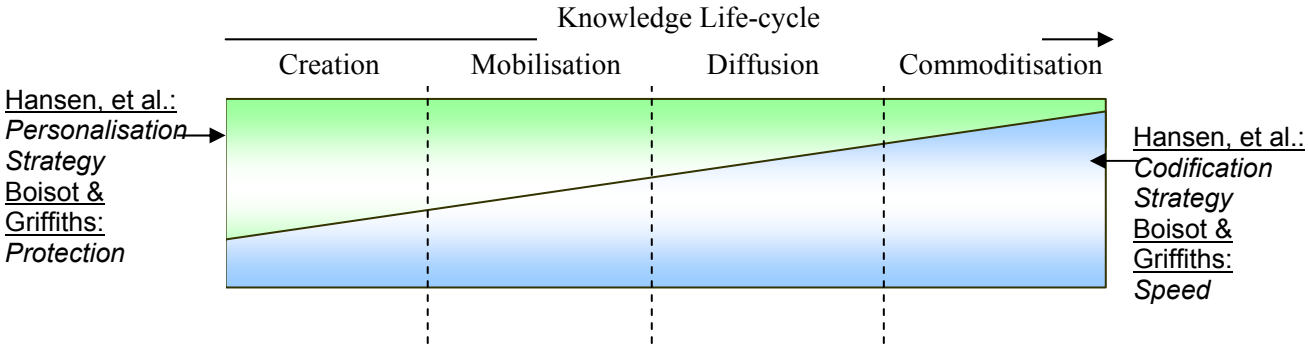


Figure 2-4: Comparison of Hansen et al.'s and Birkinshaw and Sheehan's knowledge management strategies

In practice, both personalisation and codification strategies can be found within a company. In a strategy consulting firm (e.g. McKinsey and Bain as referred to by Hansen et al., 1999), more work is performed in the early life-cycle of knowledge therefore personalisation strategies are more appropriate. However, personalisation strategies are also appropriate for the newly created knowledge found in most other companies' research departments. Therefore, I posit that knowledge management strategy is not really driven by the economics, either reuse or expert, of knowledge in the business, but by the nature of the knowledge in question.

Community of Practice (COP)

There are two schools of thought: one is that the locus of knowledge is on the individual and the second is that the locus of knowledge is on communities. Nonaka and Takeuchi (1995) contend that organisations cannot create organisational knowledge without individuals. The organisation has to mobilise individual knowledge so that it becomes organisationally amplified through the "knowledge conversion spiral" at higher ontological levels. While scholars such as Friedman (2002), Nonaka and Takeuchi (1995), Sanchez (2001a), and von Krogh (1998) mention the requirement for collaboration among individuals to create, mobilise and diffuse knowledge, their locus remains at the individual level.

The other school puts the locus on communities, generally known as Communities of Practice (COP). Kogut and Zander (1992) and Brown and Duguid (1991) suggest that knowledge is created and exchanged within communities. This school further argues that the accumulation of knowledge, experiences, and practical or cognitive skills takes place in a community; therefore, organisations should regard communities as assets and seek ways to promote and preserve them (Iverson and McPhee, 2002; Brown and Duguid, 2001; Wenger and Snyder, 2000). Kogut and Zander (1992) argue that, if knowledge is held only at the individual level, then organisations could change simply by employee turnover. They further make a point that this is not the case in practice and therefore, knowledge is embedded in communities within organisations as well as within individuals.

A COP is a self-organised group of employees who share common work practices, interests, or aims (Wenger, 2000). Wenger (2000) states that COPs define competence by combining three elements. One, members are bound together by their collectively developed understanding of what their community is about and they hold each other accountable; to be competent is to understand the community in order to contribute. Two, members build their community through mutual engagement; to be competent is to be able to engage with this community as a trusted partner in the interaction. Three, communities of practice produce a shared repertoire such as language, values, and routines; to be competent is to access and use this repertoire. Communities of practice are important social units of learning even in the context of much larger systems. These larger systems are constellations of interrelated communities of practice, i.e. organisations.

Wenger and Snyder (2000) contend that a COP differs from other forms of organisation in several ways. A snapshot comparison is presented in Table 2-3. They consider COP differs from Teams. Teams are created by managers to complete specific projects. Managers select team members on the basis of their ability to contribute to the team's goals, and the group disbands once the project has been finished. COPs, on the other hand, are informal – they organise themselves, meaning

they set their own agendas and establish their own leadership. And membership in a community is self-selecting. Giroux and Taylor (2002), and Brown and Duguid (2000) suggest that participants in COPs learn together by focusing on problems that are directly related to their work. In the short-term, this makes their work easier or more effective; in the long-term, it helps build both their communities and their shared practices – thus developing capabilities critical to the continuing success of the organisations. The strengths of COPs is self perpetuating. As they generate knowledge, they reinforce and renew themselves.

	What's the purpose?	Who belongs?	What holds it together	How long does it last?
Community of Practice	To develop members' capabilities; to build and exchange knowledge	Members who select themselves	Passion, commitment, and identification with the group's expertise	As long as there is interest in maintaining the group
Formal hierarchical work group	To deliver a product or service	Everyone who reports to the group's manager	Job requirements and common goals	Until the next reorganisation
Project Teams	To accomplish a specified task	Employees assigned by senior management	The project's milestones and goals	Until the project has been completed
Informal Network	To collect and pass on business information	Friends and business acquaintances	Mutual needs	As long as people have a reason to connect

Table 2-3 A snapshot comparison of CoP with other forms of organisation (Wenger and Snyder, 2000)

Knowledge Management and Business Process

Organisations function with their business processes to produce the deliverables to customers and other stakeholders. By business process I mean the coordination and integration of activities performed in different functions to create outputs that are of value to one or more stakeholders (Braganza and Lambert, 2000; Hammer and Champy, 1994). Hammer (2002) contests that traditional management systems are inimical to processes, having been designed for functionally centred organisations. But as process management becomes ingrained, all the organisation's management systems refocus to support processes. People work in teams not departments; and the culture encourages collaboration not conflict. Most researches in knowledge management address a certain business process within an organisation. This business process can be a new product development process (for example El Sawy et al., 2001), a technical service delivery process (for example Brown and Duguid, 1991), an order fulfilment process (for example Braganza and Möllenkramer, 2002). El Sawy et al. (2001) argue that knowledge management is required to support the function of business processes. Braganza (2004) and Braganza and Lambert (2000) suggest that the unit of analysis for knowledge management initiative is a business process.

When Grant views "organisation capability as the outcome of knowledge integration: complex, team-based productive activities such as American Express's customer billing system, Chrysler's automobile design process, and Shell's deep-sea oil exploration" (1996:112), it clearly shows that he links knowledge management in

organisations to business processes. In their description of the Xerox Tech Reps.'s community of practice, Brown and Duguid (2000; 1991) explain how the technical service delivery process is performed with the knowledge management supporting it. This shows an indication that knowledge management is linked to cross functional business processes of an organisation. Both see organisations as teamwork, collaboration, and process-centred. Many fall into the trap of treating business processes within rather than across functional boundaries (Ray et al., 2004), thereby exacerbating problems often associated with COPs (Szulanski, 2003). However, little attention has been given to this link in the literature. Only a few scholars, for example Braganza (2004), El Sawy et al. (2001), Braganza and Lambert (2000) mention the importance of business process in knowledge management.

Production of any kind involves the transformation of inputs into outputs. Fundamental to a knowledge-based theory of an organisation is the assumption that the critical input in production and primary source of value is knowledge (Grant, 1996). In other words, business processes create productions and therefore, the management of knowledge – how organisations facilitate the knowledge creation, rejuvenation and flow to the right people at the right time in order to create value for the organisations – is very much linked to the concerned business processes.

Knowledge Management Success Factors

Scholars argue that the success of a knowledge management initiative depends on different factors. Davenport and Prusak (1998), and Davenport (1994) point out that historically technology's, in particular Information Technology (IT), roles have dominated knowledge management in organisations in the past. Too many managers believe that once the right technology is in place knowledge activities such as knowledge sharing, will follow. Davenport et al. (1998) argue that while IT is important to help reinforces sharing behaviour, managers must begin a knowledge management initiative with how people use information and knowledge, not how people use machines. This argument is further emphasised by others that at the heart of knowledge management are people each of whom has specialised knowledge (Braganza and Möllenkramer, 2002).

Brown and Duguid (1998; 1991), Nonaka and Konno (1998), Levitt and March (1988) contend that knowledge is always created in a context within a "shared space" for emerging relationships among members of a group of people. This shared space can be physical, virtual, mental, or any combination of these. This space provides a platform for advancing individuals and/or collective knowledge. To participate in a shared space means to become involved and surpass one's own limited perspective or boundary. This exploration is considered necessary by Arieti (cited in Nonaka and Konno, 1998) in order to profit from the fusion rationality and intuition that produces creativity. Within this shared space, members of the group then produce and hold collectively new knowledge that subsequently becomes both organisational knowledge and productive – this is collaboration. Because the essence of knowledge management is to make the organisation's knowledge productive (Grant, 1996; Drucker, 1995), it is consequently the responsibility of leaders to provide or at least to support the creation of the shared space where employees can interact freely. Nonaka and Konno (1998) express how important the role of leaders is in a very specific manner. Knowledge is manageable only insofar as leaders embrace and foster the

dynamism of knowledge creation. The role of leaders is to provide the "shared space" for knowledge creation.

Individuals producing knowledge need to learn continuously. Knowledge generation and use at the level of individuals and groups is a never ending work-in-progress (Fahey and Prusak, 1998). Thinking and reasoning are skills that have to be enhanced and maintained. As George Kelly postulated in 1970 (cited in Goffin, 2002:202) that "to make sense of our world all humans develop 'rules' by which we view or categorise situations, people, relationships and objects, in fact almost any phenomenon with which we are confronted"; it is indeed compulsory to keep individuals challenged of their developed 'rules' through learning. Working, learning and innovating are closely related, compatible and potentially complementary. Learning and training serve as the bridge between working and innovating (Brown and Duguid, 1991). Therefore, training programmes addressing the learning requirement of employees are one important structure to exist to make knowledge management credible (Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995).

The study by Hauschild et al. (2001) of 40 organisations shows that companies which offer employees incentives to share knowledge, encourage participative decision making, set performance standards, co-locate teams and departments, apply job rotation, provide systematic support for creativity in their human resources policies, are more successful than those which do not demonstrate these actions. The study suggests that human resources policies be tailored to address the encouragement of knowledge management in an organisation.

Finally, knowledge management is concerned with the reliability of information and knowledge. Davenport (1994) mentions that many people suffer from far too much non-information and non-knowledge rather than overload. Brown and Duguid state, "Often what one person thinks useful others find flaky, idiosyncratic, incoherent, redundant, or just plain stupid. The more a database contains everyone's favourite idea, the more unusable it becomes" (2000:78). Knowledge management needs a validation process to help scrutinise the shared information and knowledge because it is the true knowledge, not non-knowledge, that is crucial to the operation of businesses, to predicting outcomes of events, to understanding how and why things function, and to appreciating things that are happening around us (McInerney, 2002; Sanchez, 2001a; El Sawy et al., 2001).

Discussion

Scholars when discussing knowledge management underpinning concepts typically treat the knowledge part of the term as more intriguing than the management part. Birkinshaw (2001) argues knowledge management in organisations is difficult. However, much of the academic literature on knowledge management assumes management to be something that is either self-evident and unproblematic (for example Hansen et al., 1999) or, more commonly, unexplained (see for example Heaton and Taylor, 2002). Nonaka and Takeuchi (1995) provide an example of the exception. In their work, they elaborate significant discussion on the problems of managing knowledge creation in organisations.

It is also identified that the connotation about what constitutes and what knowledge management is, remains unclear. In other words, and this is similar to the issue of knowledge, there is no clear and agreed definition of knowledge management. Knowledge management can refer to identifying and leveraging the collective

knowledge in an organisation to help that organisation compete (von Krogh, 1998). Knowledge management is purported to increase innovativeness and responsiveness (Bessant et al., 2002; Leonard-Barton, 1998). Knowledge management refers to maintaining, locating and applying knowledge (Cranfield University, 1998). The discussion in this section, however, informs us that the management of knowledge creation or generation, knowledge sharing or exchange, and knowledge exploitation are within the scope of knowledge management. This means that knowledge management covers the management of the knowledge life-cycle stages: creation, mobilisation, diffusion and commoditisation. Therefore, managing knowledge for competitive advantage cannot be isolated from understanding the knowledge life-cycle. The commodity stage of the knowledge life-cycle relates to the situation where the commonness of the knowledge means it can easily be found in the public domain. This stage of the knowledge life-cycle is not relevant to knowledge management in organisations as commodity is defined as a public good, whereas knowledge management in organisations focuses on the knowledge that is contained within organisations.

Research indicates that knowledge management is very much linked with how knowledge workers are facilitated to access the knowledge they need, when they need it, in order to take the necessary action. The use of knowledge, at least within the business organisation context, is when knowledge can be accessed by knowledge workers for them to take the appropriate actions. Moreover, time is an important factor in making business decisions. Different knowledge is required at different times and to turn knowledge into competitive advantage it has to be accessible when it is needed; to keep their competitive advantage, organisations must sustain this created knowledge for continuous innovation. This leads to a *working definition of knowledge management as: organisational capability to create knowledge, mobilise and sustain it for continuous innovation and to diffuse it to the people who need the knowledge at the place where they need it and at the time when they need it.* To ensure sustainable competitive advantage, managers ought to ensure and uphold knowledge management taking place in the organisation.

Research also suggests that creating, mobilising and diffusing knowledge takes place within the interactions of knowledge workers. While knowledge is understood as residing within individuals in an organisation (Friedman, 2002) and within the communities of an organisation (Giroux and Taylor, 2002; Wenger and Snyder, 2000; Brown and Duguid, 1991; Nonaka and Takeuchi, 1995), I argue that the creation, mobilisation, and diffusion of the knowledge conceptualised to a process within an organisation forms the basis for competitive advantage. I suggest that the purpose of knowledge management is not to manage *all* knowledge that exists within an organisation. As McInerney states, "Admitting that *all* (italics added) knowledge cannot be managed may help the credibility of knowledge management" (2002:1013); moreover, capturing *all* the targeted knowledge still remains unrealised (Hansen and von Oetinger, 2001; Brown and Duguid, 2000). I consider knowledge management's objective is to optimise the management of knowledge within a process that can be turned into competitive advantage.

These conceptual inter-relationships are depicted in Figure 2-5. The largest circle represents the sum of all knowledge relevant to a particular process within an organisation. Within this is a subset of knowledge that can yield competitive advantage. The smallest circle represents this knowledge which is captured in the practice and routines within the process of an organisation.

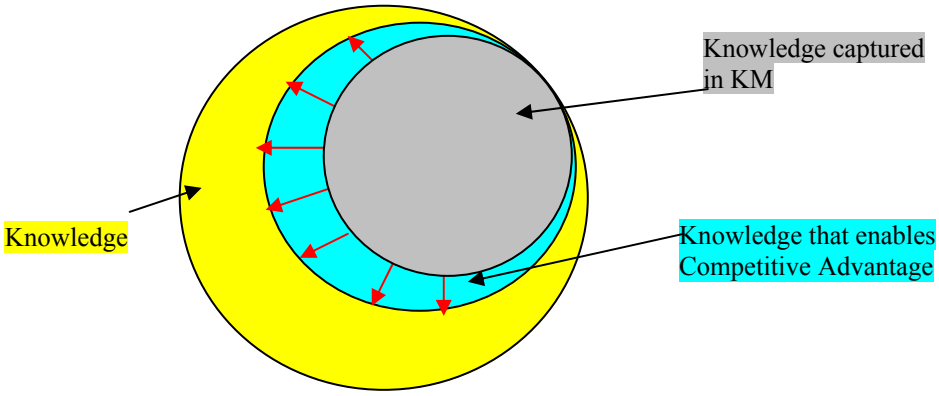


Figure 2-5 The conceptual inter-relationships of Knowledge, Knowledge that enables Competitive Advantage, and Knowledge captured in Knowledge Management

The arrows from 'Knowledge captured in KM' to 'Knowledge that enables Competitive Advantage' represent a knowledge management objective which is to expand knowledge that is translatable into competitive advantage. Communities of practice that exchange complementary knowledge ought to have members that will want to enlarge the 'Knowledge captured in KM' circle closer to the 'Knowledge that enables competitive advantage' (Wenger, 2000).

If COP is a 'free' community as defined by Wenger and Snyder (2000), it is not easily understood as to what really makes the members want to enhance the organisational competitive advantage. In the examples provided by Brown and Duguid (2001; 1991) the communities described in the papers seem to be somewhat managed communities. Storck and Hill (2000) describe their examples of COP as what they call Strategic Communities which are designed and defined by management. Therefore, they are not free communities. Lesser and Storck (2001) argue that the social capital resident in communities of practice leads to behavioural changes, which in turn positively influence business performance. They take the definition of social capital as the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. I contend, then, that while COP is a widely used term, there is a need to further explore and study how this COP can really turn knowledge into competitive advantage.

Current research suggests different strategic elements for managing knowledge. For example: leadership that encourages knowledge activities (Bartlett and Ghoshal, 2002; Nonaka and Konno, 1998), a culture that fosters knowledge sharing and continuous learning (De Long and Fahey, 2000; Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995), human resource policies that reinforce knowledge management practices (Hauschild et al., 2001; von Krogh, 1998), technologies that enable knowledge dissemination (Boisot and Griffiths, 2001; Davenport and Prusak, 1998), and reliable knowledge sources that maintain member confidence (Brown and Duguid, 2001; Brown and Duguid, 2000; Davenport, 1994). This research illuminates the understanding of knowledge management; however, little is understood empirically as to the attributes that enable organisations to operationalise the creation,

mobilisation, and diffusion of knowledge. There is a gap between theory and implementation in the knowledge management domain: "the growing literature on knowledge management should continue to draw from rich theoretical perspective, but also deal with the 'how' questions of management" (Grover and Davenport, 2001:12). My research aims to narrow this gap and to unbundle the high-level strategies suggested by the literature through an empirical case.

2.3.3 Knowledge Management Systems

The term knowledge management refers to organisational capability to create knowledge, mobilise and sustain it for continuous innovation and to diffuse it to the people who need the knowledge at the place where they need it and at the time when they need it. One key objective of managing knowledge for an organisation is simply to become more effective and productive such that knowledge is turned into competitive advantage. The organisational objective is straightforward; the solution requires a combination of organisation efforts and information systems.

It is acknowledged by academics and practitioners that knowledge management does not equal technology as it had been almost projected as such at the beginning of the knowledge management movement (Gold et al., 2001; Davenport and Prusak, 1998). Knowledge management is much more than technology. Technology alone will not make a knowledge-intensive company. However, if the appetite, skills, and attention to knowledge are already present in an organisation, technology can expand access and ease the problem of getting the right knowledge to the right person at the right time. Without technology knowledge management does not go very far. Information Systems that relate to knowledge management are widely termed as Knowledge Management Systems (KMS). They are tools to support the management of knowledge that employ information and communication technologies - IT (Alavi and Leidner, 2001). While not all knowledge management initiatives involve an implementation of IT, and admonitions against an emphasis on IT at the expense of the social and cultural facets of knowledge management are not uncommon (Fahey and Prusak, 1998), many knowledge management initiatives rely on IT as an enabler (Weill et al., 2002), with two identified underlying models for KMS: 1) the repository model, 2) the network model.

Knowledge Management Systems – The Repository Model

The repository model treats knowledge as an object that can be captured, stored, organised and diffused. These systems, therefore, focus on managing explicit knowledge and, consequently, they produce more storage-retrieval aspects of knowledge management (Prusak, 2001). These types of system were populating the knowledge management world from the first generation, and there are many still mushrooming today. Corporate intranets present the most prevalent technical infrastructure for the development and management of knowledge repositories. This is because intranets provide an ideal environment for multimedia publication of knowledge across multiple types of computer hardware and software, and for easy retrieval and display of interrelated knowledge items through hypertext links (Alavi and Leidner, 2001; Cranfield University, 1998). Cranfield's study (1998) further

suggests that repositories contain knowledge from both internal and external sources. Examples of external knowledge consist of competitive intelligence, industry trends, and other business related publications. Examples of internal knowledge include contents of internal reports, document templates, memos, internal best practices. Hansen et al. (1999) claim that the consulting firm Ernst & Young, for example, has made significant investment in codification of the firm's internal knowledge and development of large knowledge repositories; 250 individuals at the Ernst & Young Centre for Business Knowledge manage and maintain these knowledge repositories. Hansen et al. further explain that the staff at the Centre for Business Knowledge work with and help consultants to locate and access the required repository content; and in addition to this central group, staff members throughout the various Ernst & Young practice areas are responsible for capturing and storing practice-specific knowledge.

Creation of knowledge repositories for the capture and storage of internal best practices has become a popular form of KMS in most organisations. The teams managing the knowledge repositories ensure easy, fast and organisation-wide access to the repository content through the use of advanced IT tools. This type of KMS applies a what is known to be person-to-document process (Birkinshaw and Sheehan, 2002; Hansen et al., 1999).

This type of KMS follows very much the development in the IT industry and this may lead to an understanding that knowledge management equals IT implementation, but managers soon realise that technology alone will not make knowledge-intensive enterprises (Davenport et al, 2003). While the exciting IT is clearly developing, it is important to emphasise the limitation in any programme of knowledge management that, for example, effective knowledge management cannot take place without extensive behavioural, cultural, and organisational change (Cummings, 2004; Siemieniuch and Sinclair, 2004; Hansen and von Oetinger, 2001).

Knowledge Management Systems – The Network Model

The network model of KMS does not attempt to extract and codify into written documents knowledge from individuals who possess it. Knowledge remains with the individuals and the transfer of knowledge to other people, in contrast with the repository model, is through person-to-person contacts. The network model of KMS is predicated on providing access to knowledge that resides within individuals through establishing direct contacts among people rather than aiming at extracting and capturing the knowledge into electronic knowledge repositories. Thus, this type of KMS supports the social-interaction knowledge management initiative, which is based on the premise that knowledge creation and diffusion are fundamentally socially constructed and occur most efficiently through direct interactions among members of communities (Heaton and Taylor, 2002; Wenger, 2000).

The network model KMS uses technology, IT, for a different purpose from the repository model. Intranets are used more as yellow pages or knowledge mapping with the objective for the users to find the people who possess the knowledge he/she needs (Hansen et al., 1999). Hansen et al. (1999) give the examples of McKinsey and Bain consulting companies that heavily rely on this kind of KMS. Alavi and Leidner (2001) give the example of Hoffman-LaRoche, a pharmaceutical company, that has developed a knowledge map of its drug approval process. For each step of the process a directory of relevant people, organised according to their knowledge of the key

issues, is developed. The use of the system during the drug approval process to identify and tap into the required knowledge has greatly expedited the process and has reduced the rework and repeat of the process activities. Davenport and Prusak (1998) give as an example British Petroleum, a giant oil company, that has a programme running called BP's Virtual Teamwork. The objective of this programme is to build a network of people, not to develop electronically codified knowledge. The programme uses many different IT tools to form the KMS that has enabled the creation of rich communication networks among people around the globe. Many documented examples from BP's Virtual Teamwork Programme show the usefulness of this kind of KMS. One example (Davenport and Prusak, 1998) can be illustrated to show how this system has given particular value to BP. Due to equipment failure, an operation on a North Sea drilling ship could not continue. Through a satellite link, a communication to a group of experts in Aberdeen was established. Problems were solved in a few hours, rather than the traditional few days. This saved BP many hundreds of thousands of dollars when compared to possible alternative solutions without the Virtual Teamwork Programme system.

The network model of KMS faces its share of challenges in its design and implementation, for example in the creation and use of knowledge maps and the directory. Encouraging people to share about themselves is not always a straightforward matter. It is a matter of discipline, culture and other personal considerations which technology cannot address (Janz and Prasarnphanich, 2003; De Long and Fahey, 2000).

Discussion

There has been a shift in the literature on knowledge management since its emergence as a popular area of investigation from the 1990s onward. I have identified three generation of knowledge management and knowledge management systems. From an initially enthusiastic and largely uncritical focus on the potential for new IT to unlock and optimise the knowledge assets of organisations, accounts of knowledge management have become more diverse and less credulous (Marshall and Brady, 2001). I call this the first generation of knowledge management and knowledge management systems. Many of the initiatives mainly capturing individual and collective knowledge into a storage device and the KMS involved in this first generation were simply data bases and content management tools. The most inner oval in Figure 2-6 represents this first generation.

While admitting that IT has opened up new possibilities for the diffusion of knowledge and the processing of data and information, a growing number of scholars are unconvinced by the enthusiastic claims made by IT-led knowledge management approaches. Their critique of technologically biased accounts has done much to address the hitherto neglected social dimension in knowledge management (for example Storck and Hill, 2000; Wenger, 2000). I call this the second generation, in the mid 1990s, represented by the middle inner oval of Figure 2-6. In this second generation, knowledge management builds on the existing knowledge bases, and emphasises the learning and innovation or the knowledge creation through social interaction. The KMS involved in this era were intelligent content services, individual process-based application and knowledge mapping, and collaborative tools to facilitate distant social interactions.

The third generation, represented by the outer oval of Figure 2-6, is a movement towards integrated knowledge management – between different knowledge management initiatives within an organisation and between different organisations (for examples Francis and Bessant, 2005; Cummings, 2004; Grant and Baden-Fuller, 2004). The KMS supporting this generation may be tools such as Integrated Enterprise Applications. The objective of this third generation of knowledge management is to optimise the different existing knowledge managements for the improved performance of certain alliances/partnerships or joint-developments (Grant and Baden-Fuller, 2004).

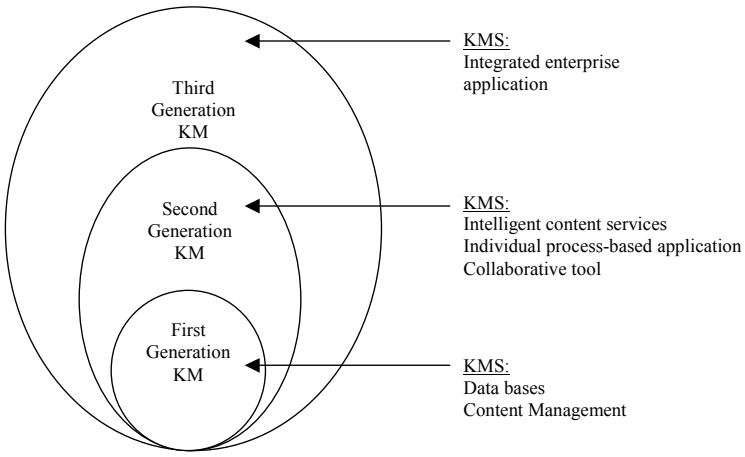


Figure 2-6: The three generations of knowledge management and the related knowledge management systems

2.3.4 Summary

The discussion on knowledge concepts has lead to the understanding that the differences as to how knowledge is viewed lead to different implications for knowledge management and KMS, as summarised in Table 2-1. It is also understood that even though the different perspectives of knowledge may be the subject of debate for hundreds of years, the knowledge management and KMS development has gone through different generations. Three generations are identified since the early 1990s to date, as depicted in Figure 2-6.

Because knowledge management initiatives started coming into the business arena with the availability of Information Technology (IT), it seemed logical that the rush into knowledge management was heavily dependent on applying a KMS that almost treated knowledge solely as an object and that to make people knowledgeable is to give them access to the stock of knowledge built within the KMS. This proved to be insufficient as knowledge and its management is more than just applying technology (Marshall and Brady, 2001). Knowledge is only interesting, at least in the

business environment, when it can be turned into competitive advantage for the organisation that owns it – knowledge perspective as a capability comes into play. It is then realised that managing knowledge in this perspective is difficult (Birkinshaw, 2001) as many challenges need to be overcome: knowledge has to be turned into actions (Hansen and von Oetinger, 2001; Grover and Davenport, 2001), tacit and explicit knowledge elements need to be considered (Nonaka & Takeuchi 1995; Polanyi 1966), the business processes have to be recognised (El Sawy et al., 2001; Braganza and Lambert, 2000; Tuomi, 1999), knowledge has to be captured in communities of practice and shared within and between communities (Brown and Duguid, 2001; Wenger, 2000), and structural barriers need to be overcome (Brown & Duguid 1998; von Hipple 1994). Consequently, knowledge management and its systems give hope and promises but deliver little. Gilmour (2003) claims that US$4.5 billion was spent in 2003 in the USA on software and other technologies that are expected to foster knowledge sharing, without bringing the expected results. The great trap in knowledge management is using information management tools and concepts to design KMS. Designing and implementing KMS has to start with an understanding of the knowledge management objective and to consider other related challenges (Ross and Weill, 2002).

Much literature addresses knowledge management in either knowledge creation or knowledge diffusion and the application stages of knowledge life-cycles independently. This may be partly caused by the distinction made between tacit and explicit knowledge; tacit being responsible for knowledge creation and explicit being the way to diffuse knowledge for application. Knowledge management should not focus solely on knowledge creation or knowledge codification because they do not necessarily lead to improved performance, nor do they create value (Alavi and Leidner, 2001). Value is created only when knowledge is diffused throughout an organisation and applied where it is needed.

Both tacit and explicit knowledge play roles in knowledge creation and knowledge diffusion and application, summarised in Figure 2-7. Nonaka and Takeuchi's (1995) knowledge creation study suggests a socialisation, externalisation, combination, and internalisation (SECI) mechanism which is an interplay between tacit and explicit knowledge for knowledge creation. This SECI mechanism takes place in both individual and organisational knowledge creation. Organisational knowledge creation is a "knowledge spiral process", starting at the individual level and moving up through expanding communities of interaction that crosses sectional, departmental division and organisational boundaries. Tacit knowledge is diffused and applied when individuals with the knowledge perform actions requiring the tacit knowledge while others are watching and studying it. This can be exemplified in team work with a people-to-people process. Thus, there is a link between knowledge creation and diffusion/application in the tacit knowledge domain. Organisational tacit knowledge is also diffused and applied within the organisational routines; organisational routines which are not codified in any way are, by definition, tacit knowledge. Explicit knowledge is diffused and applied when training sessions take place, and or when codified knowledge is distributed through knowledge content, and also through team work where a people-to-document process takes place. Thus, there is a link between knowledge creation and diffusion/application in the explicit knowledge domain.

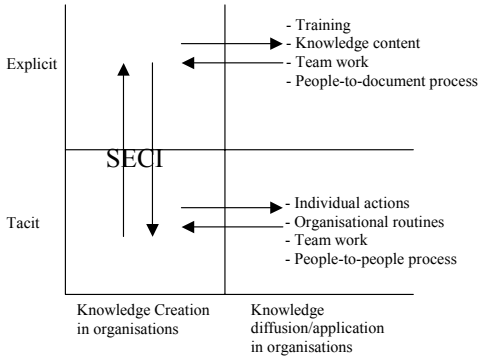


Figure 2-7 Tacit and Explicit knowledge in the organisational knowledge creation and knowledge diffusion/application

In summary, turning knowledge into competitive advantage requires knowledge management that addresses the situation from creation to diffusion of knowledge – the knowledge life-cycle – and takes the interplay of tacit and explicit knowledge into consideration. Not much is known empirically about how to operationalise KMS that support knowledge activities where members of the knowledge communities interact to create, mobilise and diffuse knowledge. This leads to a research subject to empirically find the attributes responsible for a successful implementation of KMS in an organisation.

2.4 Organisational Readiness for Knowledge Management

2.4.1 Knowledge Management as a Capability

As previously discussed in section 2.3.2 knowledge management is considered as organisational capability to create knowledge, mobilise and sustain it for continuous innovation, and to diffuse it to the people who need that knowledge at the place where they need it and at the time when they need it. Alavi and Leidner (2001) and Davenport and Prusak (1998) suggest that IT is required to transport knowledge over wide geographic distances. McDermott (1999) comments that while the knowledge revolution is inspired by IT, it takes people to make knowledge management happen. He further suggests that this is because thinking and information need to be enhanced to leverage knowledge – and to achieve that people need to be motivated.

In response to this view that knowledge management is mainly related to people's motivational and reward factors, Szulanski (1996) contends, based on his study of intra-firm transfer of best practices, that there appears to be a need to look beyond motivation and rewards for knowledge activities, and to focus scarce

resources and managerial attention on developing the capabilities of the organisation. His argument is supported by the results of further research such as, for example, by Bock and Kim (2002) and Huber (2001). Bock and Kim (2002) find that motivational factors were negatively correlated with knowledge sharing in a study of four Korean organisations. Likewise, Huber (2001) questions the view of some practitioners and scholars that motivation is the key to effective knowledge management. He suggests that more studies need to be carried out as what we know about the transfer of knowledge is greatly exceeded by what we do not know. In other words we need to understand further the capabilities organisations need to address to make knowledge management effective.

The perspective on developing organisational capabilities for knowledge management is expanded by Gold et al. (2001) who postulate that such capabilities were necessary pre-conditions for effective knowledge management to flourish, and without which, launching a knowledge initiative, however well-intentioned, might be "doomed before it begins" (2001:208). Gold et al. (2001) further suggest that there are two areas of capabilities that need to be addressed: Infrastructure and Process capabilities.

In order for organisations to leverage their knowledge they must develop absorptive capacity – the ability to use prior knowledge to recognise the value of new information, assimilate it, and apply it to create new knowledge and capabilities (Cohen and Levinthal, 1990). As Nonaka and Takeuchi (1995) argue in their SECI theory, in essence new knowledge is created through two generic processes: combination and exchange. For this combination and exchange of knowledge to take place will require the presence of social capital – social capital is the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by a social unit (Lesser and Storck, 2001; Nahapiet and Ghoshal, 1998). Based on these theories Gold et al. (2001) suggest that three key infrastructures – technical, structural, and cultural – enable maximisation of social capital. The technical dimension addresses the technology-enabled ties that exist within the firm; the structural dimension refers to the presence of norms and trust mechanism; the cultural dimension refers to the shared contexts. In order to leverage the infrastructure capabilities, knowledge management processes need to be present in order to create, mobilise, and diffuse knowledge throughout the organisation.

2.4.2 Capability and Organisational Readiness

Siemieniuch and Sinclair (2004), in their research for the CLEVER project, find that organisation readiness is one important facet to which managers need to pay attention when embarking on knowledge management initiatives. The CLEVER Project is a two year project funded by the UK Government's Engineering and Physical Science Research Committee concerned with the development of a cross-sectoral process framework for knowledge management. Siemieniuch and Sinclair (2004) stress that, as with any capability, organisations must be prepared for knowledge management initiative introduction if they are to make profitable use of this capability.

Their opinion is further supported by Taylor and Wright (2004) who conducted their research in the public sector to identify Factors that influence the readiness of an organisation to share knowledge effectively. In their discussion of the need to prepare organisations for a knowledge management initiative, Siemieniuch and Sinclair (2004) suggest looking at fourteen Factors that must be addressed for organisations to be in a prepared state. These factors are shown in Table 2-4 in a comparison with the work of Taylor and Wright (2004). Taylor and Wright (2004) have isolated six Factors as a model to assess the readiness of a public sector organisation for a successful knowledge sharing activity. These Factors are also listed in Table 2-4 with my comments in the last column.

Factors for Organizational Readiness Model for Knowledge Management		
Siemieniuch and Sinclair (2004) 14 important issues	**Taylor and Wright (2004) six-factor model**	**Comment**
Build trust through leadership	Open leadership climate	The key message here is the visible commitment from the leadership
Identify and populate "knowledge evangelist"		
Establish "ownership" policies for knowledge	Satisfaction with change process	The message: workers should feel at ease with the change process, i.e. they own it
Identify and implement workable security policies		
Create generic processes and procedures	A vision for change	Siemieniuch and Sinclair categorise different areas with a vision for change. For simplicity, I link it at this level
Amend technical infrastructures and processes to permit easy access, searching, publication, and utilization of knowledge	Information quality	Taylor and Wright meant by information quality the infrastructures and processes in the way Siemieniuch and Sinclair define it.
Review reward policies		
Use personal appraisal procedures to evaluate performance on knowledge management		
Establish personal performance measures for knowledge sharing	Performance orientation	The message: performance-based evaluation
Identify communities of knowledge		
Move to an activity-based costing approach		
Create "stretch-targetting process" within the contractual process		
Amend project review procedures to ensure discussion of capture of knowledge	Learning from failure	The message: capturing and sharing the lessons learned, i.e. the knowledge
Create dynamic knowledge and skills databases		

Table 2-4: A comparison of the results of the work by Siemieniuch and Sinclair (2004) and Taylor and Wright (2004)

2.4.3 Summary and Discussion

That knowledge management bears the connotation as an organisational capability is elaborated in section 2.3.2 and is further emphasised in section 2.4.1. Embarking on a knowledge management initiative is, therefore, developing organisational capabilities that will manifest into transforming knowledge into competitive advantage. Managers

wondering why their knowledge management initiatives eventually deliver little or nothing may look into this aspect of building capabilities. Gold et al. (2001) claim that managers must first assess the underlying knowledge capability of the firm before setting milestones and expectations for the knowledge management effort.

Knowledge management without KMS may be inefficient and probably, for most, ineffective. Assessing an organisation's readiness for implementing KMS can, therefore, be a compelling argument that has the potential to complement much of the existing research on the dynamics of interactions between knowledge workers.

Interestingly though, the search for knowledge management literature on 'readiness' subject resulted in only two relevant articles by Siemieniuch and Sinclair (2004) and by Taylor and Wright (2004). Organisational readiness was not among the stated research aims of the first article. However, to comply with the request from the commercial partner who financed the research, the authors addressed the issue and the paper discusses the findings which are distilled from experiences in several studies, not the result of directed research. Therefore, "this document should be read as a discussion paper" (Siemieniuch and Sinclair, 2004:80). The second paper of Taylor and Wright (2004) addresses the knowledge sharing in public sectors. These two articles concerning organisational readiness for knowledge management point to the Factors that need attention: fourteen and six respectively. However, they fail to address how organisations can measure their readiness for knowledge management. This study's development of an instrument to measure organisational readiness for implementing KMS that facilitates the creation, mobilisation, and diffusion of knowledge makes a contribution to the extant literature and the practice of knowledge management.

2.5 Socio-Technical System

2.5.1 Socio-Technical System: the concept and the history

Socio-Technical System (STS): what it is and its role in organisations

Since the 1950s, researchers and managers have acknowledged that technical and social factors interact to influence organisational outcomes. Prior to 1950, work often argued for technological determinism, where technology implementations were expected to have direct effects and to fit people to it (Griffith and Dougherty, 2001; Appelbaum, 1997). For example, if a robotic welding system is introduced on an assembly-line, production throughout will increase.

Trist and Bamforth (1951) countered this deterministic approach for the first time. They noted that human and organisational outcomes could only be understood when social, psychological, environmental and technological systems are assessed as a whole. Trist et al. (1967) further suggested the term socio-technical to describe a method of viewing organisations which emphasise the interrelatedness of the functioning of the social and technological sub-systems of the organisation, and the relation of the organisation as a whole to the environment in which it operates. The

approach described by Trist and Bamforth in 1951 has come to be known as a socio-technical system (STS) perspective (Griffith and Dougherty, 2001; Pasmore, 1995).

Pasmore et al. (1982) state, "the socio-technical system perspective contends that organisations are made up of *people* that produce products or services using some technology, and that each affects the operation and appropriateness of the *technology* as well as the actions of the people who operate it." (1982:1182). STS considers two primary sub-systems in the organisation: the social system and the technical system (Heller, 2001; Majchrzak and Borys, 2001; Pasmore, 1995; Mumford, 1965). These sub-systems are interdependent, what affects one affects the other. Trist and Bamforth (1951) made the following observation during their studies of the British coal industry:

> So close is the relationship between the various aspects that the social and psychological can be understood only in terms of the detailed engineering facts and the way the technological system as a whole behaves in the environment of the underground situation (1951:3).

People perform tasks; these tasks produce the organisation's products and services. Structure results from the communications, authority and workflow systems that operate within the organisation. The technical system includes the technology and the tasks performed to achieve organisational goals. While the same technology may be present in many organisations, the technical system will be different within each organisation (Kavan et al., 1999). Kavan et al. (1999) further explain that the technical system is the result of the social system implementing the technology. Implementation choices are vast, and the social system unique to the organisation. How well the social and technical systems are designed with respect to one another and with respect to the demands of the external environment determines to a large extent how effective the organisation will be (Rogers, 1995).

Because the social and technical elements must work together to accomplish tasks, work systems produce both physical products and social outcomes. In the STS design, the key issue is to design work so that the two parts yield positive outcomes. This is called Joint Optimisation (Emery, 1959 cited in Pasmore et al., 1982). The principle of joint optimisation, which is the goal of socio-technical system intervention, states that an organisation will function optimally only if the social and technological systems of the organisations are designed to fit the demands of each other and the environment. In contrast, many techniques aimed at improving organisation effectiveness concentrate on the social system exclusively, taking the technology of the organisation as constant and unchangeable (Kavan et al., 1999). Pasmore et al. (1982) noted that even the technique of job enrichment, which is closely related to the socio-technical system approach, assumes that the answer to increased organisation effectiveness lies primarily in increasing employee motivation.

Majchrzak and Borys (2001), Appelbaum (1997) and Pasmore et al. (1982) further emphasise that according to STS, while seeing the social system as the target for change in an organisation as useful for some purposes, it is too narrow to explain or predict much about organisational performance. STS interventions differ from socially focused methods in that they do not accept technology as given. Instead, arrangements of people and technology are examined to find ways to redesign each system for the benefit of the other in the context of the organisational mission and need for survival. The result of socio-technical system intervention, therefore, is to bring to bear powerful forces that shape behaviour in ways that improve

organisational performance while enhancing the quality of working life (Griffith and Dougherty, 2001; Pasmore, 1995).

In short, STS focuses on the interdependencies between and among people, technology and environment, to seek to optimise both the social and technical elements in organisations. A brief review of the history and development of STS is provided in Appendix 3.

2.5.2 Socio-Technical System for Knowledge Management

In line with the concept of STS, Bressand and Distler (1995) argue that organisations, societies, the world are actually a network of networks (*«réseau de résaux»*). They argue that the arrival of technologies created not a technology revolution but rather a relationship revolution (*«révolution relationnelle»*). Therefore, organisations should address change in the social relations between workers and culture in an effort to use technologies to obtain the benefits for both the workers and the organisations. Failing to address the social change, that is the change of the network relationship, risks facing the inertia that may cause a failure to take advantage that technologies may bring (McAfee, 2003).

Bressand and Distler (1995) continue with a suggestion that the relationship world is not only concerned with communication; it involves all physical facilities and barriers, rules of the game or juridical law, and cultural aspects. Interaction or relationship starts with a *contact*. Contact means either people make a physical contact, by gestures, or verbally, or through tele-technology, such as information technology, that allows distant contact to happen. Interaction also requires some agreement on how the 'game' is going to be played and how it is structured. Interaction requires a *contract*. Both contact and contract need to be present and they need to be animated by the people. These people have their expectations. However, without the animation by the 'players', both the *contact* and *contract* become futile. People play within the contact and the contract when they feel accepted, that they understand what is expected from them and what they can expect, and that they feel they are contributing. In short, *contact* (in French: contact) and *contract* (in French: contrat) are useful when there is *cognition* (in French: connivence). Bressand and Distler (1995) further suggest looking at the concept in which there are three elements that construct a network: Infrastructure, Infostructure, and Infoculture. These elements link to the contact, contract and cognition, as outlined in Table 2-5.

	Function	Nature	Key Items	Actors
Infrastructure	Contact	Physical	Technology, Policies	Engineers, Management
Infostructure	Contract	Organisational, Juridical	Rules of the game	Management
Infoculture	Cognitive/ Connivence	Strategic	Feeling, routines	Users/ Workers

Table 2-5: The three elements of a Network (adapted from Bressand & Distler, 1995)

The definitions of these three elements are implicitly expressed in this sentence (in French – Bressand and Distler, 1995:190):

> « Un réseau est un ensemble de moyens (“Infrastructures”) et de règles (“infostrutures”) permettant aux acteurs qui y on accès d’entreprendre et de mener à bien des projets communs dès lors que ceux-ci sont conformes aux atttentes et usages communs (“infoculture”) du réseau ».

This means,

> “A network is a body of means (infrastructure) and rules (infostructure) allowing people – who have access to it – to undertake and finalise common projects as soon as they are in conformity with the expectations and habits (infoculture) of the network”.

Pan and Scarbrough (1998) elaborate this “network concept” from Bressand and Distler in their work analysing the knowledge-sharing case at Buckman Laboratories. Pan and Scarbrough (1998) concluded that “The socio-technical perspective thus adopts an holistic approach which highlights the interweaving of social and technical factors in the way people work. It also underlines the complex interactions which take place between the subjective perceptions of employees and the objective characteristics of work processes. The major implication of socio-technical analysis is the need to seek the joint optimisation and parallel design of the social and technical subsystems within the organisation” (1998:57).

For Pan and Scarbrough, applying this perspective to knowledge management systems is to reveal the multi-layered nature of such systems, with loosely coupled technological, informational and social elements all interacting over time to determine practical outcomes. They summarise this socio-technical analysis in terms of three major layers of the knowledge management system by adapting the work of Bressand and Distler (1995). A representation of their work is depicted in Figure 2-8.

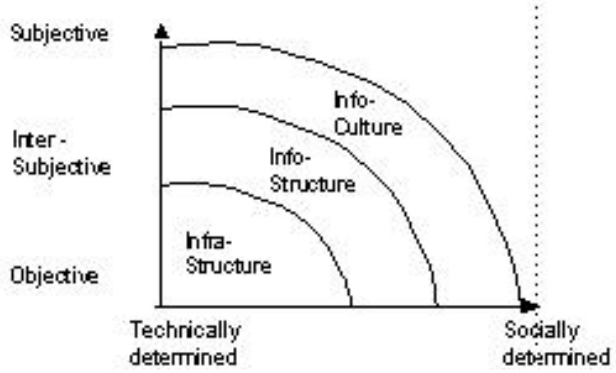


Figure 2-8: A socio-technical perspective on Knowledge Management

Infrastructure is defined as the hardware/software, which enables the physical/communicational contact between network members (Pan and Scarbrough, 1998).

Infostructure is defined as the formal rules which govern the exchange between the actors on the network, providing a set of cognitive resources

(metaphors, common language) whereby people make sense of events on the network (Pan and Scarbrough, 1998).

Infoculture is defined as the stock of background knowledge, which actors take for granted, which is embedded in the social relations surrounding work group processes. This cultural knowledge defines constraints on knowledge and information sharing (Pan and Scarbrough, 1998).

Of itself, the identification of these different levels of the knowledge management systems is a useful heuristic. The analysis is not complete, however, without some recognition of the dynamic evolution and complex interaction between these different levels. Knowledge management systems do not develop spontaneously or in a vacuum (Davenport and Prusak, 1998); they emerge from the context and history of the organisation, and their impact is conditioned by the subjective perceptions of users whose experience is governed by that history. This draws attention to the role of management in developing and linking these constituent elements (Pan and Scarbrough, 1998). Pan and Scarbrough (1998) then used this STS perspective for knowledge management to analyse and argue how these three elements: infrastructure, infostructure, and infoculture have mobilised knowledge for the competitive benefits of the company, in this case Buckman Laboratory. They work, however, does not address how an organisation can prepare itself to embark on knowledge management.

2.5.3 Summary and Discussion

The debate on knowledge management systems as technology implementation or social implementation has been a subject among scholars and practitioners (Gilmour, 2003; Davenport and Prusak, 1998). Many argue that knowledge management is more to do with "social" than "technology" (Wenger, 2000; Nonaka and Takeuchi, 1995). I argue that knowledge management without technology will be limited in its effectiveness and strategic potency. Implementing KMS involves an implementation of a technology system (Weill et al., 2002), both hardware and software, it includes the way people will use the technology (Janz and Prasarnphanich, 2003), and it also encompasses the environment within which the technology and the people will operate (Southon et al., 2002). These three elements: people, technology, and the environment are what STS is based on (Pasmore, 1995).

The work of Pan and Scarbrough (1998) has been able to explain, from the STS point of view, the dynamics and the success of the knowledge management initiative in Buckman Laboratory. It suggests that this organisation represents a particular form of knowledge management – one that utilises various mechanisms for leveraging knowledge towards business advantage. In their research, Pan and Scarbrough (1998) argue that the STS view offers a particularly important approach to examining and exploring the development, processes, and mechanisms of knowledge management within a knowledge-intensive firm.

The conceptual framework developed by Pan and Scarbrough (1998) has implications for both practice and theory. The study suggests that Buckman Laboratory is successful in implementing KMS because, in essence, the executives ensured that their organisation was ready and that they continued to progress within the three STS dimensions in creating the knowledge entrepreneurial enterprise.

Managers embarking on knowledge management initiatives need to place equal emphasis on technology, structures and cultural factors. The same study also describes, in theoretical terms, how one organisation may develop its capability to manage effectively and efficiently knowledge from on-going practice for future events. In essence, the study suggests that for one organisation to benefit from KMS it needs to look at the three STS dimensions for its readiness and keep working to better them. However, Pan and Scarbrough do not develop the STS dimensions into a readiness model. Therefore, my research adopts an STS perspective and adds to current thinking by using the three dimensions: Infrastructure, Infostructure and Infoculture to develop a readiness model for KMS.

2.6 Organisational Development (OD)

2.6.1 Organisational Development Scope

Organisations deal with change on a day-to-day basis, as indeed do people. Change is inherent in contemporary organisations and its management is not only critical to organisational success and survival but is also the crux of the field of organisational development (French and Bell, 1999; Mukherji and Mukherji, 1998).

Scholars have debated various aspects of organisational change, with most of this debate focusing on the ease, or difficulty, of organisational change and the likely performance consequences. Merton and Lerner (1961) argue that change within bureaucratic organisations is difficult because such organisations are inherently conservative and therefore resistant to change, in large part because of the organisation's strict reliance on rules and regulations. Subsequently, Burns and Stalker (1961) describe two types of organisations, mechanistic and organic, that are designed to react differently to the degree of change occurring in the environment. Mechanistic organisations perform well under conditions of environmental stability, while organic organisations can successfully adapt their structures to accommodate changes in the face of dynamic and uncertain environments. This scholarly debate regarding organisational change became polarised in the 1970s with the emergence of the strategic choice and population ecology paradigms in organisation theory (French and Bell, 1999).

Change has different facets; for example, it can be deliberate (planned) or accidental (unplanned), its magnitude, large or small. Since Child (1972) and Hannan and Freeman (1977) began the debate, a variety of assumptions have been made about the ease or difficulty of organisational change and the likely performance consequences of that change. Indeed, most discussions of organisational change begin by attempting to reconcile the diametrically opposing views put forth by population ecologists and strategic choice theories (Bloodgood and Morrow Jr., 2003). However, models and theories of organisational change have also been produced; depicting in both words and pictures the important features of some phenomena, describing those features and variables, and specifying the relationships among the variables. Planned change models are relevant to Organisational Development (OD); the development of planned change models facilitated the development of OD (French and Bell, 1999). The following present a couple of examples of the planned change models:

The "total system change" proposed by Ralph Kilmann (1984) suggests five sequential stages:1) initiating the programme, 2) diagnosing the problems, 3) scheduling the tracks, 4) implementing the tracks, and 5) evaluating the results. The "Burke-Litwin" model (see in Burke, 1994) shows how to create first-order and second-order change. In first-order change, some features of the organisation change but the fundamental nature of the organisation remains the same. In second-order change, the nature of the organisation is fundamentally and substantially altered. The first-order change is also called transactional change and the second-order change transformational change. One of the most important foundations of OD is a participation/empowerment model; increased participation and empowerment have always been central goals and fundamental values of the OD field (French and Bell, 1999).

French and Bell (1999) state that organisational development is planned change in an organisational context. They further suggest that early OD efforts primarily addressed moderate adjustments to the organisation, its people and its processes. Today the demands on organisations are so great that vast organisational changes are required in many instances.

One view of organisations is that they are complex social systems interacting with the environment (Morgan, 1998), and OD efforts usually focus on improving the total organisation, or large parts of it (Porras and Bradford, 2004; French and Bell, 1999). The target of change is the organisation as a system, not its individual members, even though individuals are the instruments of change. French and Bell (1999) conclude that the primary goal of OD programmes is to optimise the system by ensuring that system elements are harmonious and congruent.

Porras and Bradford (2004) suggest that at the beginning what made OD attractive to many people was the excitement and the energy that comes from being involved in transforming people. The focus was definitely more at the personal level. "To see people who were very interpersonally incompetent evolve into ones that are, for example, less defensive, more self-aware, share their power, confront conflict, help others develop and grow was an incredible experience. These people, returning to their places of work would then transform them into more effective systems" (Porras and Bradford, 2004:394). They further suggest, however, that this model was naïve and as experience grew using this perspective, it became clear that the model did not work and the main reason for this was that individuals returned to their home setting and could not overcome all of the existing organisational dynamics that had pushed them to behave in their previous experience ways.

The scope of OD was then expanded from individuals to teams and systems. "we need to teach these processes to work teams, not individuals" (Porras and Bradford, 2004:394). The emphasis then shifted to developing the team as a whole in a system. They further state that the two desired outcomes of effective OD interventions are organisational performance improvement and individual personal growth. "Long-lasting organisational effectiveness will only occur when there are long-lasting improvements in individual well-being and abilities. The individual has to gain in the long term for the organisation to gain in the long term. That is the basic belief that OD has had from its origins, and it is still very relevant today" (Porras and Bradford, 2004:401).

Most researchers and experts on the subject of OD agree that the discipline of OD has a tremendous future as its basic foundations and characteristics are well developed (Mukherji and Mukherji, 1998). One of the criticisms of OD has been that its focus has been strongly social in the overall socio-technical framework of

organisations. This means that emphasis has been primarily on human resource systems and less on the overall strategic content of business. This criticism has been supported by Bennis (1969), French and Bell (1999), and Porras and Bradford (2004) in that the most serious handicap of OD has been its preoccupation with the human and social dynamics of organisations to the detriment of attending to the task, technical and structural aspects and their interdependencies. Porras and Bradford (2004) further suggest that OD also has to change the context in which people operate as well as changing people's sensibilities and awareness in order to have any hope of obtaining sustainable new behaviours.

The concept of organisation-wide change has to be revisited in light of the fact that organisations turn themselves into network-like structures (Mukherji and Mukherji, 1998). Traditionally, the OD effort is restricted to the part of an organisation that is recognisable and within a defined boundary. The emerging sophistication of information technology has generated the means by which the organisation's knowledge can be presented in one source to support the decision-making process and support the newly empowered workforce to better manage their activities and processes to ensure achievement of organisational objectives (Braganza and Morgan, 2000; May, Rajguru, Burns, Howes and Matthews, 1997). With the activities of suppliers and customers directly dovetailed into the organisation, in the network environment, the total organisation goes backward into the supplier system and forward into the customer system. OD, therefore, has to enlarge its scope so that the behavioural and cultural changes it is trying to bring about keep the context of performance, outcome and the overall business in mind (Mukherji and Mukherji, 1998).

The history and the future development of OD has been undertaken by many scholars (see for example French and Bell, 1999; Sanzgiri and Gottlieb, 1992). Walter and Marks (1985), for example, have analysed the basic thrusts in the development of OD and have suggested that the discipline has developed in three essential waves. Based on the work of Walter and Marks, Mukherji and Mukherji (1998) present Table 2-6 which summarises the nature and direction of the OD of the future in the context of network organisations. They further argue that OD has been towards impacting on culture and behaviour and its primary thrust should continue to remain in this area – what is needed is to enlarge its scope so as to incorporate the technical aspects of the system and of the organisation, and its scope should be widened.

	First wave	**Second wave**	**Third wave**
Theme	Discovery and description	Proliferation and elaboration	Segmentation and specification
Period	1940 - 60s	1960s-70s	1980s to present
Environment	Stable	Unchanging	Unstable and dynamic
Training	T groups and groups	Sensitivity, encounter and simulation	Assertivenss training, life planning, workshops, negotiation training, team building
Focus	Task/activity	Learner/self	Person-task balance
Emphasis	Exploration and experimentation	Application and professional development	Accountability and responsibility
Organization Structure	Machine - bureaucracies	Hybrid/matrix	Network

Table 2-6: Characteristics in the development of OD - from Mukherji and Mukherji (1998)

2.6.2 Organisational Development: Definition and Processes

Scholars have expended considerable energy trying to define OD. However, a common OD definition is yet to be agreed. Schifo (2004) restates the question: "Can we, as a profession, come up with a single definition of OD that non ODers can easily understand?" (2004:74). He further explored how to define OD in ten words and provided the definition "OD is the application of behavioural science to promote system effectiveness through change" (Schifo, 2004:82).

The literature contains numerous definitions of OD. The following are some examples that are widely referred to: Bennis defines OD as "a response to change, a complex educational strategy intended to change the beliefs, attitudes, values, and structure of organisations so that they can better adapt to new technologies, markets, and challenges, and the dizzying rate of change itself" (1969:2); Burke defines "OD is a planned process of change in an organisation's culture through the utilization of behavioural science technologies, research, and theory" (1994:12); French and Bell (1999) define "Organisation Development is a long-term effort, led and supported by top management, to improve an organisation's visioning, empowerment, learning, and problem-solving processes, through an ongoing, collaborative management of organisation culture – with special emphasis on the culture of intact work teams and other team configurations – using the consultant-facilitator role and the theory and technology of applied behavioural science, including action research" (1999:25-26).

The definitions found in the literature overlap a great deal, and contain several unique insights. All authors agree that OD applies behavioural science to achieve planned change. Likewise, they agree that the target of change is the total organisation system and that the goals are increased organisational effectiveness and individual development. Collectively, these definitions convey a sense of what OD is and does. They describe in broad outline the nature and methods of OD. There is no set definition of OD and no agreement on the boundaries of the field, that is, what practices should be included and excluded. These are understandable constraints given that the field is still evolving, and that practitioners share a central core of understanding.

OD Process(es)

All OD programmes have three basic components: diagnosis, action and programme management (French and Bell, 1999). The diagnostic component represents a collection of data about the total system, its subunits, processes, and culture. The action component consists of all the activities and interventions designed to improve the organisation's functioning. The programme management component encompasses all activities designed to ensure the success of the programme.

Schein (1969) identifies three basic models of consultation – the first two are not related to OD, the third model is a description of OD and its process. In the "purchase of expertise model" a leader or unit identifies a need for information or expertise the organisation cannot supply and hires a consultant to meet that need. In the "doctor-patient model" a leader or group detects symptoms of ill health in a unit,

or more broadly in the organisation, and employs a consultant to diagnose what is causing the problem or problems. The consultant, like a physician, then prescribes a course of action to remedy the ailment. In the "process consultation model" the consultant works with the leader and group to diagnose strengths and weaknesses and to develop action plans. Furthermore, in this model the consultant assists the client organisation to become more effective in diagnosing and solving problems.

Adapting the OD process described by French and Bell (1999) a graphical presentation is displayed in Figure 2-9.

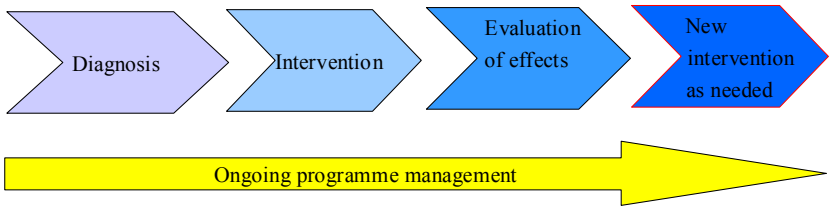


Figure 2-9: Organisational Development Process

OD is at heart an action programme based on valid information about the status quo, current problems and opportunities, and the effects of actions as they relate to achieving goals. An OD programme thus starts with diagnosis. French and Bell (1999) state, "Diagnostic activities – activities designed to provide an accurate account of things as they really are – are needed for two reasons: the first is to know the state of things or "what is"; the second is to know the effects or consequences of actions" (1999:107).

OD interventions are sets of structured activities in which selected organisational units engage in a sequence of tasks that will lead to organisational improvement. Interventions are actions taken to produce a desired result. Evaluation of the effects of intervention is then required. This is followed with a new intervention when required. French and Bell (1999) indicate that typically one of four conditions gives rise to the need for OD interventions. First, the organisation has a problem; something is 'broken'. Corrective actions – interventions – are implemented to 'fix' the problem. Second, the organisation sees an unrealised opportunity; something it wants is beyond its reach. Enabling actions – interventions – are developed to seize the opportunity. Third, features of the organisation are out of alignment; parts of the organisation are working at cross-purposes. Alignment activities – interventions – are developed to put things back 'in sync'. Fourth, the vision guiding the organisation changes; yesterday's vision is no longer good enough. Actions to build the necessary structures, processes, and culture to support the new vision – interventions – are developed to make the new vision a reality.

Like any other programme, OD programmes will need to be managed, too. This is the purpose of Programme Management. Programme management requires practitioners to attend equally to task and process, consider system ramifications of the programme, involve organisation members in planning and execution, create feedback loops to ensure relevance and timeliness, and so forth. Programme management ensures the achievement of the targeted goals. It may be complex, dynamic, difficult and also fun, as Burke writes, "The toughest job is to *manage* the change process. In writing about this management process, I can be logical, rational,

and perhaps convey that dealing with organisational change is indeed subject to management. In reality, however, managing change is sloppy – people never do exactly as we plan. And it follows Murphy's law – if anything can go wrong, it will. Moreover, organisational politics is always present and change, after all, affects us all emotionally" (1994:146-147).

2.6.3 Summary and Discussion

OD is very much related to organisational change and it addresses planned organisation change rather than unplanned (French and Bell, 1999). In its early stage OD addressed more transactional change, or first-order change. However, at a later stage of its development OD is demanded to address the transformational change, or second-order change (Porras and Bradford, 2004; French and Bell, 1999). The target of OD has developed from individuals only to an organisation-wide system. Having individuals transformed does not guarantee that the whole performance of the organisation – which is the targeted objective of OD – will improve. This is because of the fact that when transformed individuals return to their work environment they cannot overcome all of the existing organisational dynamics that had previously existed. The scope of OD, therefore, needs to cover more than the individuals themselves. It needs to cover the organisation system as a whole. The outcome of OD is then expected to be organisational performance improvement and individual personal growth. French and Bell (1999) suggest that the primary goal of OD is to optimise the organisation system by ensuring that the system elements are in harmony.

Scholars suggest different OD definitions; however, there is a great deal of overlap between those different definitions. What emerges from the various definitions is that OD addresses organisational change for improvement, through social interaction among the organisation agents – and recently OD addresses more and more changes related to technology. Consequently, following the above discussion about knowledge management and KMS, I contend that implementing KMS within an organisation falls broadly within the scope and definition of OD. Implementing KMS to facilitate the creation, mobilisation and diffusion of knowledge involves changes in people's behaviour. It involves the organisation itself as a system – some positions may need to be suppressed and some others may need to be created, some processes may need to be modified, suppressed or created.

2.7 Summary of the Literature Review

In this literature review section, I have reviewed extensively the relevant knowledge management literature. I have also reviewed the key concepts of socio-technical systems (STS) and organisational development (OD) related to the implementation of knowledge management systems. I reviewed knowledge management literature because it forms the background of the study, to identify gap in theory such as for example a readiness assessment framework, to understand the theoretical stance from which I base my work on, and to understand the current thinking that I may add on or

contributing further to the body of knowledge. I reviewed STS literature because KM requires both Social and Technological subsystems to be understood, to shape the readiness model so that it takes both the social and technological aspects into account. I reviewed the OD literature because using the readiness model means intervening in an organisation's KM initiative. OD provides useful Guidelines for such interventions. I intend to use OD methods to develop a process for guiding the use of the readiness model I have developed in this study.

In touching on the subject of knowledge management, it is unavoidable that the question of what knowledge is comes to the surface. It is not my intention, at least not for the subject of this thesis, to deal with the debate about what knowledge is. However, a discussion about knowledge is presented in this section to appreciate the relevance of managing it for competitive advantage. The subject of turning knowledge into competitive advantage was very much started in the early 1990s, and the move of knowledge management started at the same time with Information Technology (IT) as its core enabler concept. Soon, both practitioners and academics realised that knowledge management is much more than technology itself. The emphasis of knowledge management scholars then shifted to a more social interaction concept. I argue though that knowledge management requires IT. Successful knowledge management initiatives prove to have addressed both the social-interaction and the technology factors. I depicted this development of knowledge management concept in Figure 2-6. This leads to the review of the STS literature as it is shown to be relevant to knowledge management (Pan and Scarbrough, 1998; Bressand and Distler, 1995). With recent discussions that knowledge management is a capability (Gold, et al., 2001), the extend to which an organisation is prepared to implement KMS is vital if it is to benefit from the knowledge management initiative (Siemieniuch and Sinclair, 2004). Preparing organisations for KMS implementation ultimately links to some sort of a planned organisational change, the heart of OD interventions. In other words, addressing organisational readiness for knowledge management involves activities that address the behavioural changes, the interaction processes, and the technology implementation – very much the subject of STS – of OD.

Knowledge-based theory of the firm suggests that knowledge has replaced the physical assets in providing competitive advantage for an organisation. Therefore, firms who have and manage knowledge will, in the long-term, produce better products and services (Bessant, 2003; Leonard-Barton, 1998). Scholars suggest different strategies to manage knowledge; most of them involve KMS. In this surge towards knowledge management, practitioners still wonder what detail they actually need to address and when they should embark on knowledge management. Siemieniuch and Sinclair (2004) suggest that managers need to prepare their organisations before they implement KMS or otherwise, as Gilmour (2003) points out, their investment may have little or no return. How managers can measure organisational readiness is, however, not addressed in the literature.

The literature discussion has identified that organisational readiness for knowledge management is related to the STS concept; and measuring it is at the heart of OD diagnosis. Consequently, an organisational readiness framework may be presented in the STS dimensions and may be positioned within OD process.

2.8 The Research Questions

The review of the three bodies of literature, Knowledge Management, Socio-Technical Systems and Organisational Development, and the gap in the literature namely the lack of a readiness assessment tool in the knowledge management literature has led to this study's research questions. The discussion in knowledge management literature has indicated that how to manage knowledge is either very much focused on each stage of the knowledge life-cycle (for example knowledge creation or knowledge diffusion) or a high level strategy. Little is known empirically about what attributes are responsible for an effective knowledge management system (KMS) implementation that facilitates knowledge-intensive activities across the creation, mobilisation and diffusion stages of the knowledge life-cycle. Attributes are practical items that an organisation actually creates or where it takes action when operationalising KMS. Thus, the research questions (RQs) are:

RQ 1: *What attributes enable the implementation of KMS for the creation, mobilisation and diffusion of knowledge?*

The aim of the research is to develop an instrument that measures organisational readiness for KMS implementation based on attributes found from RQ 1 in assimilation with the STS dimensions for knowledge management. The second research question is

RQ 2: *What factors and measurement scales constitute organisational readiness for KMS implementation?*

An instrument to measure organisational readiness for knowledge management needs to be operationalised and refined in different business settings. Drawing on the OD literature discussed earlier, the third research question is

RQ 3: *How can the organisational readiness assessment instrument be operationalised in different business settings?*

The research strategy set out in Chapter Three is designed to answer these three questions and, thus, complete the aim of this research which is to develop and field validate a KMS readiness assessment tool.

2.9 Chapter Summary

In this chapter I presented the literature review in the three bodies of knowledge namely Knowledge Management, Socio-Technical Systems and Organisational Development. The gap in the literature is identified, that is the lack of a readiness assessment tool. This leads to the three research questions to be addressed in three projects within the executive doctorate programme. In the next chapter I discuss the research strategy and method applied to the study and the project structure.

CHAPTER THREE: THE RESEARCH METHODS AND PROJECT STRUCTURE

The previous chapter established an understanding of the need for readiness assessment tool to measure the organisational readiness for KMS. The chapter also identified that readiness for knowledge management is related to STS concept and that measuring the readiness is at the heart of OD diagnosis. The discussion has led to three research questions presented in the previous chapter. In this chapter I present the overall research strategy for this study which includes the the choice of the "Abductive" as the research strategy. The chapter explains the Means-End Chain approach with its laddering technique, and the application of this technique to my study. The chapter ends with a description of the way the three projects in my study are structured.

3.1 The Research Method

In this section the choice of the research strategy is elaborated and is compared to others not chosen. The section explains the researcher's role during the research process, the choice of the research site, and the Means-End Chain model with its laddering technique.

3.1.1 The Research Strategy

Research strategies provide logic for answering research questions. The challenge researchers face is that there isn't one best research strategy to follow. Researchers face a variety of options and have to ensure the strategy adopted is appropriate to the research questions. As the management research has developed, a number of views have emerged on research strategy choices (Chia, 2002; Easterby-Smith et al., 2002; Blaikie, 2000). Management research deals fundamentally with the production and legitimisation of the various forms of knowledge associated with the practices of management; and in recent times there appears apparent diversity of philosophical approaches to the logic for answering management research questions (Chia, 2002). A common feature of all these approaches is that they require the researcher to make his or her own position transparent.

From my perspective, reality is a construct based on an individual's perception of a subject. Consensus on that perception within a community becomes a shared perspective of reality. Commonality of subjective realities yields shared objective realities. People live side by side and yet have different interpretations of the same

issue, policy or statistic. An audience listening to two people with competing perspectives will often be swayed one way or another based upon the strength of the argument, quality of oration, past experiences, ideological or value positions, or even such concepts as friendship or community grouping. As a consequence of this sharing of perception, the perspective of reality becomes shared more widely.

Therefore, in my view, reality cannot be separated from human interactions - in which beneath the mystery and individual character of interactions lies the 'grammar' of social life. To gain an understanding of reality, therefore, must involve high levels of interactions to gain knowledge of a situation.Burrell and Morgan (1979) contend that the research philosophical argument can be summarised in four sociological paradigms as shown in Figure 3-1.

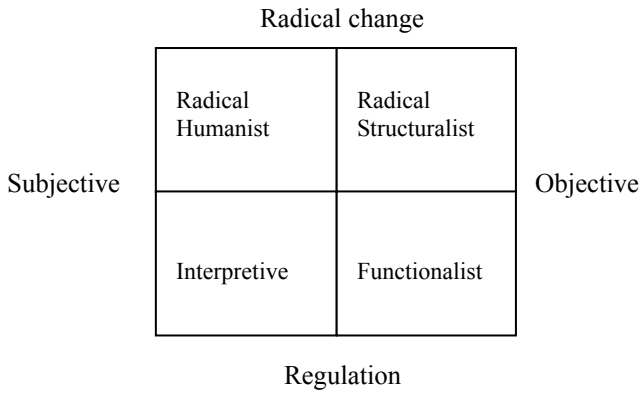


Figure 3-1: Four philosophical paradigms suggested by Burrell and Morgan (1979)

Based on the above argument about how I perceive reality, consequently, the philosophical approach to my research is more control than emancipation, and more inter-subjectivity than absolute truth (Partington, 2000; Tsoukas, 1994). In other words, philosophical stance for my research will be at the regulation - subjective quadrant of Figure 3-1, that is Interpretive.

In short, the philosophy for my research is informed by an interpretive perspective. Within the interpretive tradition, my research is located in the realist approach. An interpretive approach differs from a positivist one which assumes that the social world exists externally and that its properties should be measured through objective methods .The interpretive perspective – Easterby-Smith et al. (2002) call the red corner – approaches reality as construct-based from individuals' perception of a subject (Easterby-Smith et al., 2002). Bhaskar suggests a transcendental realism which assumes that "the ultimate objects of scientific inquiry exist and act (for the most part) quite independently of scientists and their activity" (1989:12). The idea of social construction realism takes the interpretive thread, and incorporates it into the transcendental realist suggested by Bhaskar (Sayer, 2000). This construction realism makes a conscious compromise between the extreme positions: it recognises social conditions as having real consequences, but it also recognises that concepts are human

constructions (Easterby-Smith et al., 2002); the common subjectivities of respondents become objective realities.

Therefore, respondents in my research can express their views in their subjective context because reality is the product of individual cognition. The data obtained from the respondents' every day concept and meaning are then processed with the realist approach in order to discover logical relationships within the data. In other words, the research adopted an ontology that reality is the product of individual cognition; it is subjective and socially constructed. It adopted an epistemology that knowledge can be derived from individuals' every day concepts and meanings.

In comparison to the work of different scholars discussed above, Blaikie (2000) provides systematic research strategies that underpin the logic of enquiry, based on the different ontological and epistemological perspectives. The clarity of Blaikie's argument as to which research strategy to be adopted for a certain research design has lead this researcher to make the choice of research strategy consistently with the philosophy the researcher espouses.

Towards the Abductive Strategy

Blaikie (2000) and Easterby-Smith et al. (2002) suggest that the selection of a research strategy does not predetermine the kind of research design that is adopted. However, the adoption of a interpretive approach involving socially constructed realities may call for a methodology to embrace qualitative enquiry. I consider that, instead of just observing a phenomenon – as the inductivist school suggests (see Table 3 1) – it is important to find out how the actors themselves interpret what they do within their social interactions, to grasp the actors' social reality as they understand it, and to discover the everyday knowledge that they use in their social interaction. Based on the ontological view that reality is socially constructed, and that epistemologically knowledge can be derived from individuals' everyday concepts and meaning, an Abductive research strategy (Blaikie, 2000), which flows from these ontological and epistemological assumptions, is an appropriate choice of research strategy for my work.

Blaikie (2000) describes four research strategies as described in Table 3-1. The four research strategies are based on unique combinations of ontological and epistemological assumptions, even though there are some overlaps. For example, the inductive and deductive strategies both adopt realist ontology. They assume that social phenomena exist independently of both the observer and social actors; it is the regularities of patterns in this reality that social research endeavours to discover and describe, and it is elements of this reality that determine social behaviour. However, while these two strategies may share a common ontology, they differ in their epistemologies and particularly how social reality can be explained. In the inductive strategy, the activity of observing, and the possibility of establishing the truth of a theory, is accepted uncritically, whereas in the deductive strategy, the inherent limitations of observations and the impossibility of knowing whether a 'reality' is true are recognised.

	Inductive	Deductive	Retroductive	Abductive
Aim	To establish universal generalisations to be used as pattern explanations	To test theories to eliminate false ones and corroborate the survivor	To discover underlying mechanisms to explain observed regularities	To describe and understand social life in terms of social actors' motives and accounts
From	Accumulate observations of data Produce generalisations	Borrow or construct a theory and express it as an argument Deduce hypotheses	Document and model a regularity Construct a hypothetical model of a mechanism	Discover everyday lay concepts, meanings and motives Produce a technical account from lay accounts
To	Use these 'laws' as patterns to explain further observations	Test the hypotheses by matching them with data	Find the real mechanism by observation and/or experiment	Develop a theory and test it iteratively

Table 3-1: The logic of Blaikie's (2000) four research strategies

In the Retroductive strategy, the epistemological assumptions of the Inductive strategy are rejected. However, the Retroductive strategy is faced with the same dilemma as the Deductive strategy, namely how to make contact with hypothesised structures and mechanism. The Abductive strategy entails different ontological assumptions from those of the Inductive and Deductive strategies. The Abductive strategy is not only based on a constructivist view of social reality, but the source of its explanatory accounts is also located there. The epistemological assumptions of Abductive strategy differ very much from the Inductive and Deductive strategies and share a great deal with the constructivist version of the Retroductive strategy.

The principal aim in choosing a research strategy is to achieve the best procedure for investigating a research topic, and particularly for answering research questions. Blaikie (2000) further explains and presents a table, reproduced in Table 3-2, showing how the application of different research objectives relate to different research strategies. The research strategies differ in the types of research objectives and research questions they can answer. The Inductive and Abductive strategies are useful for exploration and description, although they each achieve these objectives in different ways and with different outcomes. The Deductive and Retroductive research strategies are suitable for pursuing the objective of explanation. Likewise, they achieve this using different procedures based on different assumptions. The Abductive research strategy supports the objective of understanding phenomena because of its ontological and epistemological assumptions and its logic of enquiry. The Abductive research strategy is also appropriate for change objectives which relate to the how type research questions.

As my intention is to explore the field in order to devise an organisational readiness assessment instrument, the Abductive research strategy provides the greatest

scope for exploring a phenomenon from the first hand accounts of people who have lived through and experienced the phenomenon to be investigated. There are two stages in the Abductive strategy: one, describing the everyday activities and meanings; two, deriving categories and concepts that can form the basis of an understanding or an explanation of the issues at hand. Therefore, it has the added advantage of providing researchers with a framework for collecting data (semi-structured interview, participation observation) and for analysing data (first to second order construct) from which the results can then be obtained. The Abductive strategy is also flexible enough to be used with other data analysis techniques and in this case I use the laddering technique to draw from the data which is essential to the phenomenon.

	Research Strategy				Type of Research Questions
Objective	Inductive	Deductive	Retroductive	Abductive	
Exploration	***			***	What
Description	***			***	What
Explanation	*	***	***		Why
Prediction	**	***			What
Understanding				***	Why
Change		*	**	**	How
Evaluation	**	**	**	**	What and Why
Assess impacts	**	**	**	**	What and Why

** = degree of applicability, the more * the more applicability degree it is.*

Table 3-2: Research strategies, objectives and questions (Blaikie, 2000)

The logical choice for my research is presented in Figure 3-2. The boxes on the right side of Figure 3-2 represent the argument of the research methods choice. The idea of abduction refers to the process used to generate social scientific accounts from social actors' accounts, for deriving technical concepts, and theories, from lay concepts and interpretations of social life. The boxes on the left side of the figure represent the issues derived from the literature. From these issues and with the choice of the research strategy, Project One, Two, and Three are outlined accordingly with the corresponding research question for each project. The circle arrows indicate the iterative process of my thinking during the research period.

3.1.2 Case Method

The aim of the research is to construct an organisational readiness instrument based on an empirical study that may illuminate the attributes responsible for effective KMS implementation. This leads to the exploratory and explanatory nature of the research.

Yin (1994) suggests that case study is one of several ways of doing social science research, management research included. Other ways may include experiments, surveys, histories and the analysis of archival information. Yin (1994)

further recommends that case studies are the preferred strategy for both the exploratory and explanatory nature of research. For this reason, and coupled with the availability of a respectable case, I chose to conduct my research using case study methods. In addition, my research covers contextual conditions to reveal the attributes responsible for effective KMS implementation. This reinforces even more the appropriateness of a case study. The selected case for Project One to reveal the attributes responsible for effective KMS implementation, as outlined in subsection 3.1.4, is the intranet-enabled knowledge management system implemented at Schlumberger, named InTouch. In Project Three, I selected three further cases: Power International, Friends Providents and Schlumberger LMS.

A problem in conducting case study research is where to draw the border line for the research. With a treasure trove of fascinating data researchers face the danger of being dragged off in any one of numerous directions (Harrison, 2002). This leads to the understanding that a very important factor in case studies is the Unit of Analysis. Easterby-Smith et al. (2002) and Yin (1994) say that the fundamental issue in research design is to answer the question, 'What do we study?' The boundary will have to be defined, and that is the unit of analysis. In my research the unit of analysis for each project is business proceses and these will be elaborated in each project report.

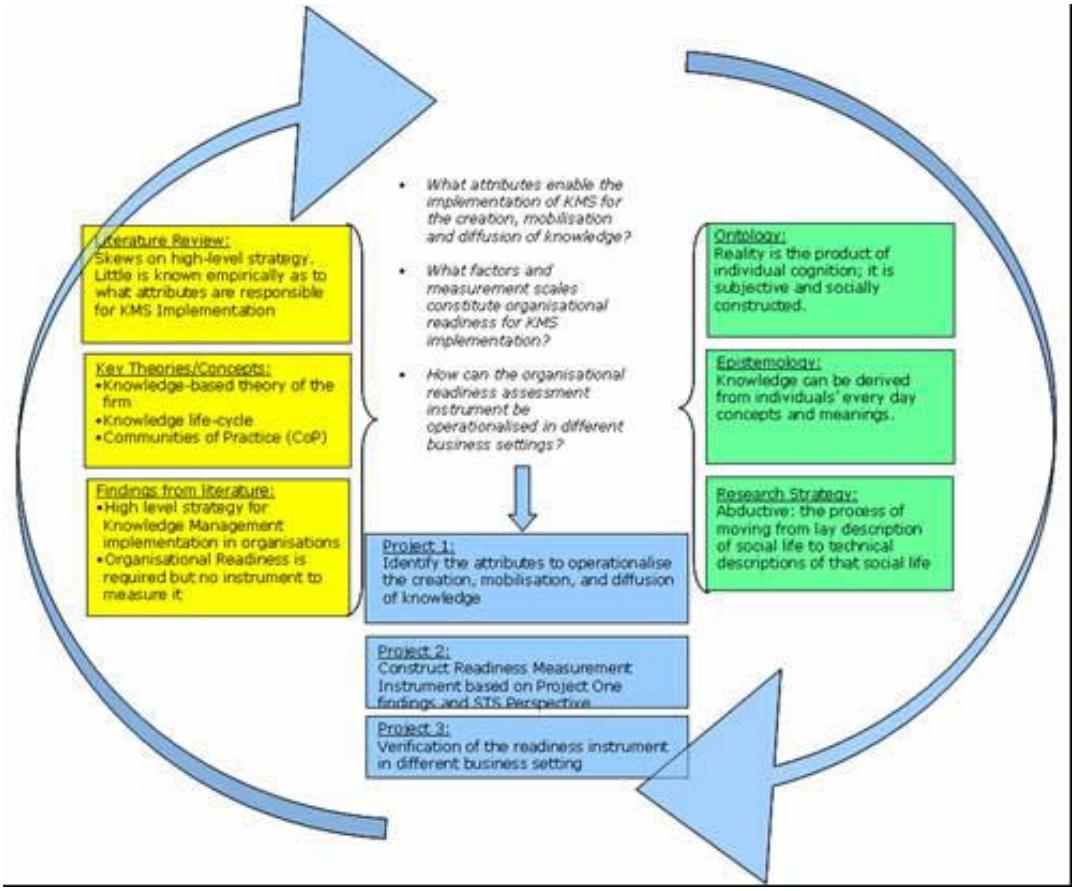


Figure 3-2: The Research Strategy and the Project Structure

3.1.3 The researcher's role

I spent most of my early years' career with Schlumberger, the research site of Project One. I experienced the subject of the research – InTouch, a knowledge management system to facilitate the creation, mobilisation and diffusion of knowledge in Schlumberger's worldwide technical service delivery process. However, I was never part of its development or deployment team. I was involved with the subject prior to the InTouch initiative as a direct contributor to the technical service delivery process. When InTouch was introduced, I was in a general management position and therefore my experience was more as an observer, and partly as a passive user, rather than as a contributor or an active participant. When Project One research took place, I was not involved with InTouch *per se*. As the person in the general management position in Schlumberger I became an empathetic observer of the research subject – at least for Project One. As such I still aimed to achieve some kind of objectivity but was also able to place myself in the social actors' position (Blaikie, 2000).

Because of my in-depth understanding of the technical service delivery process, I brought to the research a detailed understanding of the business and the needs to be met by InTouch, an intuitive view of the questions to pose and information about the cultural and historical background. It is also important to note that most participants involved know me. I realise that this advantage can also turn into a disadvantage when my bias involves the research activities. To neutralise my potential bias, a couple of techniques were applied. One technique relates to the interview during the data collection. The technique is called "mirroring or reflecting" (Easterby-Smith et al, 2002; Easterby-Smith and Malina, 1999). This technique involves expressing in the researchers' own words what the respondent has just said. This may force the respondent to rethink his/her answer and reconstruct another reply that will amplify the previous answer. Practically, I use question statements such as: "What you seem to be saying is ….". Another technique implies the data triangulation. The data from the internal document, emails, project reports, external reports and various presentation materials for conferences were utilised to triangulate the interview data.

3.1.4 Choosing the research site

My research to identify the attributes responsible for an effective KMS implementation is conducted in Schlumberger, a leading oilfield services company, operating in more than 80 countries, with several engineering centres and research centres, multiple divisions, functions and products or services. In order to support its operations in such a way that seamless operations are provided to clients, Schlumberger owns InTouch within which workers create, mobilise, and diffuse knowledge 365 days a year, everywhere and at any time while delivering technical services to clients.

System	Manages knowledge life-cycle	Knowledge intensive community	Survey with > 80% users liking the system	Recognised beneficial results	Award-winning recognition
InTouch	Yes	Yes	Yes	Yes	Yes (Infosys and Wharton award)
Eureka – Self managed COP	No	Yes	No survey	Not measured	No
Customer relationship management (CRM)	Yes	Yes	< 30%	Not measured	No

Table 3-3: Comparison of the three systems in Schlumberger

The choice of research subject and environment follows a theoretical, not statistical sampling method (Eisenhardt, 1989). Based on the literature review and the research question, a number of theoretical criteria are required, besides the fact that the oil industry environment has provided the knowledge-intensive criteria necessary for the research; 1) address the creation, mobilisation, and diffusion of knowledge – the managed knowledge of the research subject needs to show the knowledge life-cycle; 2) the knowledge interaction is performed within communities; 3) there must be an indication that the system is operational and that users like to use it; 4) the research subject must have brought beneficial results to the organisation; 5) to increase the credibility of the research subject, the system should have obtained recognition from both academics and practitioners. Schlumberger's InTouch fulfilled these criteria. This system operates within a knowledge-intensive technical service delivery process in which the creation, mobilisation, and diffusion of knowledge to enable required actions is vital. Table 3-3 shows a comparison of managing knowledge in different systems within the same organisation.

Identifying attributes only from a positive case, that is a knowledge management system that has brought benefits, risks missing attributes that may not be identified from such a case. In order to ensure the indentification of complete attributes a case study based on a positive case needs to be complemented with a study of a negative case, that is a knowledge management system that has met difficulties in its implementation. Therefore, I complement the study on InTouch with a study on CRM. I elaborate further this subject in Chapter Four: Project One, section 4.3: Complementing InTouch Study with CRM Study.

3.1.5 The Means-Ends Chain and its Laddering Technique

Researchers using the Abductive research strategy have a choice of research techniques. In particular, three techniques were examined as they appeared to be appropriate for this study. The strengths and weaknesses are summarised in Table 3-4. Finding the attributes that enable the creation, mobilisation and diffusion of knowledge in a technical service delivery is an activity that has no pre-defined constructs. It relates to the hierarchy of goals and causal relations. Therefore, the repertory grid technique will not be suitable for the research, at least not for Project

One. Both cognitive mapping and the Means-End Chain model can be applied to find the attributes. Because of the geographical situation and the time allocations of the targeted respondents, the expected data collection will probably be based on the individual interviews. In this situation, the strengths of the Means-End Chain model with its laddering technique make this technique the preferred choice for my research. The following are more detailed descriptions of the Means-End Chain model and the laddering technique.

	Repertory Grid	Cognitive Mapping	Means-End Chain Model
What is it?	A research technique based on Kelly's Personal Construct Theory (PCT). The technique elicits constructs which are then rated according to their ratings given by correspondents.	A research technique based on S-O-R model (Jenkins, 2002). This technique attempts to capture a situation through the "eyes" of those organisational actors engaged in interpreting and responding to the situation.	Means-End Chain is a model that seeks to explain how a product or service selection facilitates the achievement of desired end states; *Means* are objects or activities in which people engage and *Ends* are valued states of being (Gutman, 1982). It was first offered, in general, as a research tool for product marketing.
Strengths	Ability to uncover interviewees' understanding of complex issues. And the technique is highly flexible.	Allows researchers to develop a more dynamic representation of managerial cognitive, in that they allow ideas to be linked together and their relationships defined in a causal sense.	Allows researchers to interpret respondents verbatim in the semi-structured laddering concepts. The hierarchical value map (HVM) representing the results is built through a "weighted" implication matrix.
Weaknesses	Because the technique is highly flexible, data collection and analysis are wide open as a research technique.	Relatively open architecture as a research technique.	Mostly, respondents, individually, will not be able to go up more than 1 or 2 ladders.

Table 3-4: Three research techniques for interpretive approaches

What is Means-End Chain model?

The Means-End Chain is a model that seeks to explain how a product or service selection facilitates the achievement of desired end states; *Means* are objects or activities in which people engage and *Ends* are valued states of being (Gutman, 1982). This model was first offered, in general, as a research tool for product marketing. Broadly speaking, the focus of the Means-End Chain theory is on understanding how consumers think about products and actions (Gengler et al., 1999). In this theory,

Reynolds and Gutman (1988) suggested distinguishing among three levels of abstraction, or categories of meaning, that typically are associated with a product. They further described the categories as, 1) product attributes, 2) consequences of product consumption, 3) personal values relevant to the consumer. Product attributes are relatively concrete meanings that represent the physical or observable characteristics of a product. Consequences are abstract meanings and may be defined as any result (physiological or psychological) accruing directly or indirectly to the consumer (sooner or later) from his/her behaviour. Personal values are highly abstract meanings that refer to centrally held, enduring beliefs, or end states of existence that people seek to achieve through their purchase and consumption behaviour (Reynolds and Gutman, 1988).

The Means-End approach focuses on why and how product attributes are important. Why and how are addressed by assessing the sequence of Means-End relations that link product attributes to personal values (Gengler et al., 1999; Reynolds and Gutman, 1988; Gutman, 1997). Figure 3-3 shows this conceptual model.

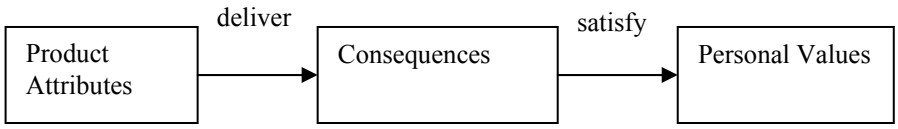


Figure 3-3: Conceptual Means-End Chain model

It is important to note that embodied in this model is the concept of levels of abstraction: lower level attributes link with higher level consequences which, in turn, link with still higher level values (Baker, 2002). Hofstede et al. (1998) suggest that although most models of cognitive structure specify some kind of hierarchical structure, the defining feature of Means-End Chain approach is the specification of the exact linkages between the levels in the hierarchy.

Laddering

Laddering is a frequently used approach for eliciting Means-End Chains (Reynolds and Gutman, 1988; Gutman, 1997). The methodology, offered by Reynolds and Gutman (1988) for assessing Means-End knowledge structures, involves a series of one-on-one in-depth interviews. This approach is most appropriate when the one-to-one interview is perceived to be beneficial, such as interviews related to non-public issues (Gengler et al., 1999). I would also suggest that this approach is preferable if the interviews touch sensitive issues in an organisation where a focus group approach might dilute the discussion.

Open-ended questions are recommended in the laddering data collection procedure (Reynolds and Gutman, 1988). The open-ended questions encourage the interviewees to give answers specific to their particular thoughts in their own words (Deeter-Schmelz et al., 2002; Gengler et al., 1999). The procedure is called "laddering" because it forces the respondent up a "ladder of abstraction" (Baker, 2002). Typically, two or three ladders can be obtained from roughly three quarters of

the respondents interviewed; approximately one quarter of the respondents cannot go beyond one ladder (Reynolds and Gutman, 1988).

Because the goal is to represent categories of meaning that are shared widely by consumers, the researcher should remain true to the interview data and not impose personal idiosyncratic categories; the verbatim responses are then to be classified into these categories of meaning (Gengler et al., 1999). Using the content analysis as a basis, the structural relationships among specific attributes, consequences, and values are aggregated across respondents in an asymmetric implication matrix. Such a matrix bridges the gap between the qualitative and quantitative aspects of the laddering technique by displaying the number of times each element (attribute, or consequence, or value) leads to another element (Deeter-Schmelz et al., 2002; Reynolds and Gutman, 1988). The implication matrix reveals both direct and indirect relationships, which facilitates the identification of linkages in the ladder across respondents. The implication matrix is then used to draw a hierarchical value map (HVM) as a means to illustrate the relationships among constructs.

Means-End Chain model suggests a hierarchy of meanings behind consumer product knowledge; laddering provides a method for targeting the most self-relevant and abstract meanings consumers associate with product knowledge (Wansink, 2003; Claeys et al., 1995).

Examples of researches that utilise the Means-End Chain Model and Laddering

A number of marketing research studies utilise this method. For example: Wansink (2003) used the laddering technique to investigate a Means-End model to uncover the key values that consumers most frequently associate with products, i.e. brand equity; Botschen and Hemetsburger (1998) explored the relevance of the Means-End Chain model for marketing programme standardisation and revealed that a detailed analysis of individual cognitive positioning of products makes it possible to determine the degree of potential standardisation of product, pricing, and promotion decisions across Austria, Germany, and Italy; Claeys et al. (1995) used the Means-End Chain model, integral with the laddering technique, to measure cognitive structures associated with "think" and "feel" products.

While it is true that the Means-End Chain model and the Laddering technique were originally offered for product marketing research – to describe consumers' product and brand perceptions (Walker and Olson, 1991), the method has been used for different purposes, too. Deeter-Schmelz et al. (2002) applied the Means-End model, integral to the laddering method, to reveal the key attributes of effective sales managers and the subsequent linkages of those attributes to consequences and underlying values or goals held by respondents. Bagozzi and Dabholkar (2000) investigated how the Means-End Chain model and the laddering can be used to represent people's reasons for supporting, or not supporting, abstract products such as ideas, goals or perceptions. The specific empirical context used to illustrate the approach was the public's perceptions of President Clinton. Gengler et al. (1999) used the Means-End Chain model and the laddering technique to reveal mothers' motivations to initiate and terminate breastfeeding in their qualitative study. The results of the study helped improve promotional campaigns and training programmes by reinforcing the benefits of breastfeeding. Langerak et al. (1999) used the laddering approach in conducting their research in reducing the cycle time of New Product Development.

Applying the Means-End Chain Model and Laddering in this study

My research seeks to develop an understanding of the attributes of an effective knowledge project such as InTouch, and uncover the attributes in operationalising it. Consequently, the Means-End Chain approach with the laddering technique, is appropriate for conducting my research.

The Means-End Chain model is based on the perception and expectation of consumers in choosing the services or products (Gutman, 1997; Gutman, 1982). Thus, there is a flow towards desired ends at successively higher levels of abstraction from the product/service attributes. I suggest that with the same understanding, a Means-End Chain model can represent a hierarchy of organisational goals in a knowledge project or a knowledge management initiative. These goal hierarchies, adapted from Gutman (1997), are grouped into three levels: *action goals* (concerned with the act itself), *outcome goals* (effects of actions), and *results* from the outcomes. Thinking with goal hierarchy is an attractive alternative to the levels-of-abstraction concept, as it is easier and more direct to think of goals being achieved than to think purely of attributes, consequences, and values being achieved (Gutman, 1997); and, importantly, it is more relevant to my work.

I would like to take the same example given by Gutman (1997) first, and later complement it with my own example, to illustrate how I use the Means-End Chain model and the laddering technique. Having a cup of coffee may accomplish the immediate goal of refreshing the coffee drinker, and refreshment may enhance the ability to perform various other acts, such as studying. Of course, studying may help to accomplish the goal of doing well on an upcoming test, for example. However, it is less likely that the coffee drinker would represent or identify the coffee drinking as helping him/her do well on a test, because the test takes place in a different situation at a later point in time and many other factors will make him/her do well in the test, or not. Nonetheless, laddering will elicit a connection among these elements because performance on the test would likely be attributed to studying, which is facilitated by coffee drinking. *Working backwards* with the Means-End model, that is, by using reverse Means-End analysis*,* one may reason that good test performance is dependent on studying; studying is dependent on being alert and refreshed, which in turn is enhanced by drinking coffee. Top-down (means-end) or bottom up (reverse means-end), the question of the intent of the person doing the studying who decides to have a cup of coffee remains.

Let me complement this with an example from my research. An attribute of InTouch, *measurement* – providing and monitoring metrics of knowledge activities – contributes to the accomplishment of having a culture that fosters continuous learning and knowledge-sharing as a consequence of the attribute. This learning and sharing culture, in turn, brings a benefit to improving speed and quality of technology solutions to clients. This result can further be associated with the goal of the organisation to having a competitive advantage, which in turn will potentially increase revenues or reduce cost – the ultimate of any business goal. Knowledge-based theory suggests that knowledge and its management are competitive advantages in the knowledge economy (Grant, 1996; Kogut and Zander, 1992), therefore all benefits resulting from managing knowledge may contribute one way or another to the organisation's competitive advantage. With these reasons, the Means-End model I adopt for my research does not include, in its representation, competitive advantage or financial benefits resulting from the attributes and outcome goals or consequences.

Following Gutman (1997; 1982) I used the Means-End model to conceptualise the hierarchy of organisational goals in managing knowledge. In my research environment, the Means-End Chain model, integral to the laddering method, focuses attention on the linkages between: 1) activities in which Schlumberger management and InTouch support engaged themselves into (the attributes of InTouch), 2) the consequences or outcome goals from certain activities or from certain InTouch attributes, and ultimately, 3) benefits resulting from the outcome goals or consequences, see Figure 3-4. The boxes are conceptual representations and are not meant to be linear relations. The bottom box represents the attributes of knowledge management; these, in turn, produce consequences that represent high level strategy elements of knowledge management; and these in turn produce beneficial results, exemplified in the third box, which ultimately converge into the creation, mobilisation and diffusion of knowledge. This model is adapted to guide the data collection and analysis to find the attributes.

In the conceptual model depicted in Figure 3-4, *Attribute* is understood as the practical item which the company actually created that became a feature or where it took action when operationalising InTouch within the technical service delivery process. *High level Strategy Element* is understood as the consequence of what a certain attribute can lead to. The title indicates that knowledge management literature often refers to this level when suggesting implementation of managing knowledge in organisations. *Beneficial Result* is understood as the benefits resulting either directly from the attributes or through the consequences, i.e. high-level strategy elements.

Applying the Laddering Technique

Both working forwards and backwards in the Means-End analysis for my research are required to reveal the attributes of InTouch. Probing respondents may need to start from the beneficial results that InTouch has brought to the organisation and then work backwards to obtain the attributes; at the same time identified attributes may contribute to different beneficial results. Therefore, in applying laddering technique, questions toward both directions are used – laddering down and up. In the laddering interview, I begin with the identified beneficial result and ladder down. In this situation, a series of probing questions typified by "What makes that happen?" or "What did you do that let you have that?" will guide the interview. When the interview leads to probe the laddering up, a series of probing questions are typified by "Why is that important to you?"

The verbatim response of the respondents formed the first-order constructs. I interpreted these to form second-order constructs, which according to Blaikie (2000) form concepts that researchers can use to construct theoretical models. I categorised the second order constructs in terms of their purpose within the Means-End Chain model. In analysing the data, the initial task is to content-analyse all the constructs (or so called elements by Reynolds and Gutman, 1988) from the ladders. The first step is to record the entire set of ladders across respondents and then classify all responses into three basic levels: attributes, consequences and values. Numbers are then assigned to each of the elements. These numbers are then used to score each element in each ladder producing a matrix with rows representing all elements and columns representing consequences and values elements. This matrix is called the implication matrix that pictures the structural relationships among elements. This implication

matrix is then used to draw a hierarchical value map (HVM) as a means to illustrate the relationships among elements. Further detail of data collection and analysis are discussed within each project report in Chapter Four, Chapter Five and Chapter Six.

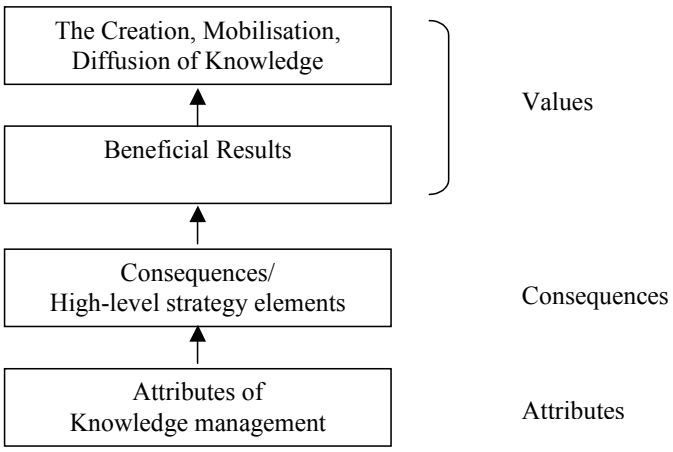


Figure 3-4: The conceptual Means-End model representation for knowledge management

3.2 Triangulation

Section 1.3.1 discusses how research can withstand external scrutiny that includes terms such as validity, reliability and generalisability (Easterby-Smith et al., 2002). One item that may influence this scrutiny is a bias that exists along the course of the research. A technique to mitigate this bias is called triangulation. It is, therefore, important to recognise the potential bias that may exist within the research setting; and to design a procedure for the triangulation.

A few aspects of my research may create some potential biases during the research period. Four main potential biases are identified and the triangulation associated with each of them is explained in this section. One, it is the potential for a cultural bias. My research involves knowledge management systems that are implemented across geographical boundaries. Data collection in Schlumberger, Power International and Friends Provident, therefore, involves users who work in different parts of the world. While this data collection design brings rich insights, it also carries a potential cultural bias during the data collection. Two, it is the organisational politics bias. The research subject involves KMS that, in general, is a sensitive issue to discuss within organisations due to the possible dichotomy of opinions and the amount of funds invested in KMS. Interviewees may be very cautious in answering questions. Three, it is the researcher's bias. I was a senior manager in Schlumberger when the Project One took place in the research site even though I was never part of the InTouch development and/or deployment team. This situation may bring some advantages such as access to data and interviewees; and at the same time this situation carries disadvantages that I may assert my bias during data collection and data analysis. Four, it is the interviewees' personal bias. When interviewees are very much involved in the research subject they have in-depth knowledge that is required for an exploratory nature of the thesis; at the same time they may exercise a certain bias toward the research subject depending on their position related to it.

Table 3-5 lists these potential biases and the techniques to address each of them, including triangulation.

The potential bias	The situation in the research setting	The techniques to mitigate the bias
Cultural bias	The research subjects are KMS used across the globe. Therefore, potential bias exists in data collection from different geographical areas.	The design of data collection includes interviewees from different geographical locations across the globe: Asia, Europe, Africa, America, Pacific. In Friends Provident case, interviewees are from the United Kingdom only because the KMS is used locally. However, this approach creates another issue of the cultural bias from each interviewee. Two areas are particularly addressed in the attempt to overcome this bias: 1) all interviews are focused on a common unit of analysis, i.e. the business process. Therefore, cultural bias is reduced because the practices within the process are standardised across the globe; 2) documents such as the KMS technical descriptions, the Infosys/Wharton award document, and SPE publication are used to confirm or reject culturally-biased data.
Politics bias	Knowledge management is a sensitive subject in companies. Therefore, interviewees may apply politics bias when answering questions.	Interviewees are selected from different ranks and different functions in each of the participating companies. Most of the data collection is conducted through individual interviews. This reduces the tendency of organisational script where each respondent says the same thing. Data from the anonymous internal InTouch surveys are used to triangulate the data in the attempt to overcome this politics bias.
Researcher's bias	The researcher was a senior manager in Schlumberger when Project One took place. Significant challenges for bias may be: 1) Pre-understanding; 2) Role duality; 3) Organisational politics that refers to the potential threat the researcher-manager may bring to the organisation.	A technique "mirroring or reflecting" is applied during data collection (see section 3.1.3). A statement prior to beginning the interviews that the data is solely used for academic research should reduce the bias from both the researcher and the interviewees. Verification of the transcription of the interview data by the interviewees also reduces this bias. In Project Two, the researcher bias is also avoided by referring back to the interviewees for futher interpretation of the data previously collected in Project One. The researcher's bias is very much avoided by applying triangulation. Both internal and external reports are examined to confirm the researcher's analysis or reject it when items are conflicting and suggesting that the researcher's bias is involved.
Interviewees' personal biases	Respondents in data collection are very much involved in the Knowledge Management Initiative, the research subject, and, therefore, they may have certain personal biases toward the subject.	Interview technique includes repeating the search for answers from the interviewees through different questions. The personal biases of the interviewees are also addressed through triangulation. Extract of data from different interviews are cross-checked to each other. In the case that the data is unique it is then cross-checked with the technical description of the KMS, the survey data, the clients' presentation and, when available, the external documents. In the case that triangulation does not confirm support the collected/analysed data; a further discussion is conducted with different respondents.

Table 3-5: Techniques applied in the research to mitigate biases

As shown in Table 3-5, the available data in the company's archives used for triangulation include internal documents such as technical descriptions for the KMS, clients' presentations and the internal survey data in Schlumberger and Power International. The external documents that are used for triangulation include Infosys/Wharton award document and Society of Petroleum Engineers (SPE) publication about InTouch, the Schlumberger KMS for its technical service delivery process.

The procedure I followed to carry out the triangulation can be described with examples as follows:

1. A couple of respondents from Schlumberger claimed that the success of InTouch had very little things to do with Information Technology (IT). They claimed that with traditional telephone technology the system should also function well. This claim is interesting as the majority of the respondents agree that IT contributes significantly to InTouch operations, exemplified by one respondent who suggested that "Technology is the price of admission since we would not get far without it". The first triangulation for such a claim is to compare this claim with the data from other respondents which differ in opinion. In addition, the data from the Infosys/Wharton award document explicitly stated that the Schlumberger intranet technology played a critical role for InTouch. Furthermore, several minutes of the meeting documents dated 1993 to 1998 explicitly show the effort made in aligning intranet to InTouch operations needs. Therefore, the data that claim IT is not significant have to be rejected.
2. Training was mentioned as one critical attribute by all respondents. I also learned that Training is one aspect that Schlumberger puts a lot of attention to. At the same time, the researcher is also a believer in training. Therefore, mentioning training can be considered as both organisational script and also a response that the researcher would like to hear. The question is whether training is really a critical attribute for operationalising InTouch. I went through the internal documents and verified the numbers of training conducted related to InTouch and I found that in average, three training sessions per week were conducted in each site during the period of 1993 to 1998. The data from the InTouch user survey also indicated the importance of training in operationalising InTouch. With this triangulation, a decision was made that Training is one important attribute for InTouch operations.
3. Operationalising KIAT in Power International showed that the Director of the Software Services claimed that leaders in Power International walk the talk as far as Knowledge Management System (KMS) is involved, "we really have the commitment from the management, and they keep talking and promoting this". The issue is that the director himself is one of the top management and, therefore, it raised the question of the interviewee's personal bias. This particular item was then triangulated with the extract from the other six respondent interview data. These six respondents were KMS users. The data confirmed that the leaders in Power International support fully the company KMS.

3.3 Project Structure

This research is structured in accordance with the requirements of Cranfield's Executive Doctorate Programme. The Executive Doctorate structure requires students to complete three projects and a linking commentary which is a synthesis of the whole research project. The research project structure is presented in Figure 3-2. The three projects are structured in response to the three research questions (RQ) outlined in section 2.8. Project One is designed to answer RQ 1: What attributes enable the implementation of a knowledge management system for the creation, mobilisation and diffusion of knowledge? Project Two is designed to answer RQ 2: What factors and measurement scales constitute organisational readiness for KMS implementation? Project Three is designed to answer RQ 3: How can the organisational readiness assessment instrument be operationalised in different business settings?

The objective of Project One is to identify the attributes responsible for an effective implementation of KMS in Schlumberger. In this study the related KMS is InTouch. Means-End Chain model with its Laddering technique is applied for this purpose. The outcome of Project One is a set of attributes that made InTouch become successfully implemented in Schlumberger.

These evidence-based attributes from Project One reflect the practical items that Schlumberger created or where it took action in operationalising InTouch. This implies that the attributes that made InTouch effectively operational are indeed linked to the very core of the STS perspective that organisations are made up of people (the social system) using tools, techniques and knowledge (the technical system) to produce goods or services valued by customers, who are part of the organisation's external environment (Griffith and Dougherty, 2001; Pasmore et al., 1982). Migrating these attributes into an organisational readiness framework that conceptualises how an organisation can approach a knowledge management initiative through its measured readiness, therefore, requires STS to form the basis for a further organisational development in getting the organisation to develop itself to implement KMS. This is the core task accomplished in Project Two in order to achieve its objective, that is to produce an organisational readiness assessment instrument.

Pan and Scarbrough (1998) have dealt with the STS dimensions for knowledge management in their earlier research. Pan and Scarbrough's work and the findings in Project One form the basis for Project Two. Project Two starts with exploring the relationships between the STS dimensions for knowledge management and the evidence-based attributes, and ends with an instrument to measure the organisational readiness to implement KMS that facilitates the creation, mobilisation and diffusion of knowledge. This readiness framework depicts the fair interweaving roles of social and technical factors, to measure the organisational readiness for knowledge management, in the way that technology is designed and redesigned by processes of social construction and that social structure relating to the technological system is technologically influenced.

The assessment instrument produced from Project Two is applied in different business settings to develop a process to operationalise this instrument. Therefore, Project Three deals with the application and analysis of the assessment instrument in a few different organisations and different business processes.

3.4 Chapter Summary

In this chapter I presented possible research strategies that may be used for the study and the discussion towards the choice of Abductive strategy for my research. The sampling technique applied to choose the research site is presented. The study adopted the theoretical sampling rather than statistical sampling. Some appropriate research techniques are examined and the bases for the choice of the Means-End Chain approach with its laddering techniques to be applied in my study are discussed. The chapter describes how the Means-End Chain approach is applied in the study and how the three projects, required for the executive doctorate study in Cranfield School of Management, are structured to answer the research questions set out in Chapter Two. In the next Chapter, detail of Project One to answer the research question 1 is presented. Chapter Four: Project One is an end project report for the first project of the Cranfield's Executive Doctorate Programme.

CHAPTER FOUR: PROJECT ONE

Chapter Three set out the research strategy, research method and techniques, and the project structure for this study. This chapter uses the research strategy, method and techniques to elaborate the work performed in the first project of the Executive Doctorate Programme. The academic and business context of the project forms the introduction of the chapter. Following this introduction, the detail of the research question for Project One, the research strategy and methods used during Project One are discussed. The chapter futher describes the pilot study was conducted which is followed by the description of how the main study is carried out. The findings and the results of Project One are then discussed in detail.

4.1 Introduction

Practitioners and academics accept that business is increasingly characterised by knowledge intensity (Davenport et al., 2003; Friedman, 2002; Buckley and Carter, 2000). However, when people discuss knowledge management, the conversation often devolves into abstract and philosophical statements (Beazley et al., 2003; Leonard-Barton, 1998), leaving open the question of organisations gaining benefits from their knowledge management initiatives (Gilmour, 2003).

Scientific management, or Taylorism, has replaced heuristics with science and, thereby, arguably, increased efficiency in production (Marglin, 1978; Kouzmin, 1980; Morgan, 1998). It failed, though, to perceive the experiences and judgments of the workers as a source of knowledge. Nonaka and Takeuchi (1995) cite Taylor's view that managers were tasked with the chore of classifying, tabulating, and reducing the knowledge into rules and formulae, and applying them to daily work. Consequently, the progress or the lack of innovative working methods became the sole responsibility of managers who do not really perform the tasks. Therefore, a huge potential knowledge reservoir within an organisation has been completely marginalised. Because products are physical manifestations of knowledge, and their worth is largely – if not entirely – dependent on the value of the knowledge they embody (Leonard-Barton, 1998), organisations that do not understand and manage their knowledge will marginalise themselves in their industry.

Realising the importance of getting workers to contribute to the knowledge of practices, work design and organisation – managers embark on efforts to manage knowledge. However, they quickly realise that many challenges need to be overcome: knowledge has to be turned into actions (Hansen and von Oetinger, 2001; Grover and Davenport, 2001), tacit and explicit knowledge elements need to be considered (Polanyi, 1966), the business processes have to be recognised (El Sawy et al., 2001; Braganza and Lambert, 2000; Tuomi, 1999), knowledge has to be captured in communities of practice and shared within and between communities (Brown and Duguid, 2001; Wenger, 2000), and structural barriers need to be overcome (Brown and Duguid, 1998; von Hipple, 1994).

Knowledge forms the basis for competitive advantage (Grant, 1996) and hence, the capability to manage knowledge becomes critical. Organisations undertaking knowledge management require operational clarity as to what needs to be done so that the programme can be shaped to bring beneficial results. This is a matter of concern to all organisations in both the private and public sectors.

Some organisations find knowledge management a useful practice and the work of "Communities of Practice" has helped organisations to better manage this valuable organisational resource (Blair, 2002; Wenger, 2000). It is establishing itself as a discipline with a number of research studies being pursued by scholars (Birkinshaw and Sheehan, 2002; Buckley and Carter, 2000). Scholars suggest different strategic elements for managing knowledge, for example: leadership that encourages knowledge activities (Bartlett and Ghoshal, 2002; Nonaka and Konno, 1998), a culture that fosters knowledge sharing and continuous learning (De Long and Fahey, 2000; Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995), human resource policies that reinforce knowledge management practices (Hauschild et al., 2001; von Krogh, 1998), technologies that enable knowledge dissemination (Boisot and Griffiths, 2001; Davenport, 1994), and reliable knowledge sources that maintain member confidence (Brown and Duguid, 2001; Brown and Duguid, 2000; Davenport, 1994).

This research illuminates the understanding of knowledge management; however, little is understood about the attributes that enable organisations to operationalise the creation, mobilisation, and diffusion of knowledge. Lack of clarity and the over-promising of benefits risks knowledge management becoming hype rather than a practice or a discipline (Blair, 2002; Southon et al., 2002). There is a gap between theory and implementation in the knowledge management domain: "the growing literature on knowledge management should continue to draw from a rich theoretical perspective, but also deal with the 'how' questions of management" (Grover and Davenport, 2001:12). This Project One research aims to narrow the theory-implementation gap by examining how a knowledge management system (KMS) was implemented in an oilfield services company, Schlumberger. Schlumberger manages knowledge within its technical service delivery process supported by a KMS called InTouch. This Project One study examines the attributes in operationalising the system. Attributes are the practical items that the company actually created which became features, or where it took action when operationalising InTouch. Understanding the attributes responsible for the effective KMS implementation complements the work on managing knowledge from the operational side, i.e. how to realise the theoretically potential benefits of knowledge into reality. Managers implementing KMS will then have a better understanding of what they should focus on and how they can lead their organisations to turn knowledge into competitive advantage.

4.2 The Research Question and Method

4.2.1 Research Question

The research question for Project One is:

> *What attributes enable the implementation of KMS for the creation, mobilisation and diffusion of knowledge in a technical service delivery process?*

4.2.2 The Research Site and the Unit of Analysis

Following a theoretical, not statistical, sampling method (Eisenhardt, 1989) adapted for my research, explained in Chapter Three, the implementation of InTouch – an intranet based KMS within which workers create, mobilise, and diffuse knowledge while delivering technical services to clients – in Schlumberger has been chosen as a subject to study.

The need for managing knowledge is no different in the oil industry from other sectors of industry. Decision makers often need to integrate local knowledge with information from other parts of the organisation. In the oil industry, this is often the case in the exploration of new oilfields and exploitation of producing fields. For example, action taken by field managers in the Middle East will depend on decisions made by executives located in various American, Far Eastern or European cities. In turn, to effectively manage the global organisation, executives need to be familiar with the actions taken in the field while exploration and exploitation work is underway.

The nature of the oil business involves high value assets that incur significant costs. Rapid and accurate decision-making is crucial. Therefore, managing knowledge in the oil sector is business-critical. Organisations serving the oil industry must, consequently, respond to this intensive requirement for shared knowledge.

Schlumberger, a leading oilfield services company, must provide their clients – oil companies – with seamless operations and provide relevant knowledge at the right time. To transform its operations in technical service delivery, Schlumberger created and implemented InTouch to facilitate the creation, mobilisation, and diffusion of knowledge 365 days a year, everywhere and at any time.

Unit of Analysis

Yin (1994) suggests that the definition of the unit of analysis is related to the way the initial research questions have been defined. As my intention is to find and understand the attributes of KMS implementation that may bring benefits to organisations and the medium I use in order to illuminate this is in the Schlumberger technical service delivery process, logically, the unit of analysis of my research is the technical service delivery process and the aspects within the process such as the people and the structure.

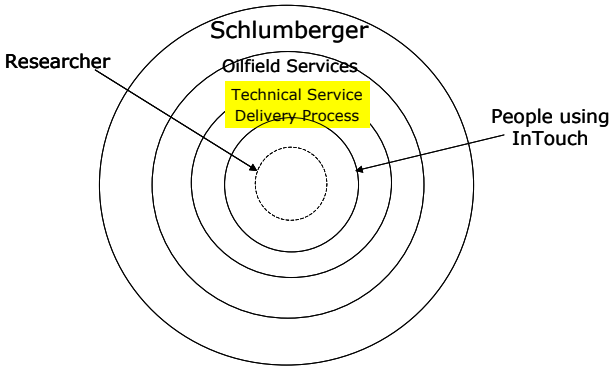


Figure 4-1: The unit of analysis and the researcher's position within the research

With this selection of the unit of analysis, strategy for data collection and data analysis in my research will follow accordingly. The boundary in the data collection and analysis will remain within the technical service delivery process.

4.2.3 Data Collection and Analysis

Data Collection

Data are collected through in-depth semi-structured interviews, following the protocol of principal questions and follow up questions exemplified in Appendix 2: Data Collection Instrument. The principal questions will be asked in order to understand what the interviewees perceive as causing InTouch to bring beneficial results, and the follow up questions are then posed so that the interviewees are required to elaborate and demonstrate what their statements really mean in practical terms. It is important to adopt this technique for the data analysis in order to capture the constructs of attributes to the high level strategy elements. Data collection was held in natural and semi-natural setting interviews. Some artefacts, such as internal notes, e-mails, company presentations, were also used to probe and construct the understanding of InTouch and its implementation.

Interviewees include Schlumberger's InTouch users, middle and top managers, the programme manager and team members of InTouch support. Each interview is guided by probing questions in the Data Collection Instrument. In applying a laddering technique in my research, questions in both directions are used – i.e. laddering down and up. In this situation, a series of probing questions typified by "What makes that happen?" or "What did you do that let you have that?" (laddering down) and "Why is that important?" (laddering up) guide the interviews. The interviews were recorded and transcribed.

Data Analysis

Data analysis follows the Abductive strategy (Blaikie, 2000) based on the grounded theory of Glasser and Strauss, as cited by Partington (2000). Throughout the data analysis, the emergent conceptual constructs are identified. From these conceptual constructs, categories of theme are built. Following Abductive strategy (Blaikie, 2000), these conceptual constructs – referred to as second-order constructs – must be derived from everyday typifications – referred to as first-order constructs – which constitute the participants' social reality.

The structural relationships between specific attributes, consequences, and beneficial results – seen as hierarchy of goals – are aggregated across interviewees in an asymmetric implication matrix (Reynolds and Gutman, 1988). Such a matrix bridges the gap between the qualitative and quantitative aspects of the laddering technique by displaying the number of times each element (attribute, or consequence, or results) leads to another element (Deeter-Schmelz et al., 2002; Reynolds and Gutman, 1988). The implication matrix reveals both direct and indirect relationships, which facilitates the identification of linkages in the ladder across interviewees. The implication matrix is then used to draw a hierarchical value map (HVM) as a means to illustrate the relationships among constructs.

4.2.4 Participant Observation

As explained in Chapter Three about my role in the organisation within which the research takes place, this Project One research is based on participant observation principles where the researchers share social world reciprocity with the interviewees (Singh and Dickson, 2002). The researchers and interviewees are participants in interpreting the environment. This brings both advantages and disadvantages. Advantages include the researchers benefiting from having access to the interviewees for frequent dialogues and discussions, researchers can have a deeper understanding as they are involved in the process, and unspoken needs or demands can be discovered. The major disadvantage is the researchers' potential bias. I have attempted to overcome this disadvantage by using the techniques referred to as "mirroring or reflecting" (Easterby-Smith et al., 2002; Easterby-Smith and Malina, 1999). This technique involves expressing in the researchers' own words what the respondent has just said. This may force the respondent to rethink his/her answer and reconstruct another reply that will amplify the previous answer. Practically, I use question statements such as: "What you seem to be saying is …."

Furthermore, Coghlan (2001) emphasises that there are a number of significant challenges for those managers considering conducting research in their own organisation; they are listed as pre-understanding, role duality, and organisational politics. Pre-understanding refers to such things as the researcher's knowledge, insights and experience before they engage in a research programme. Role duality refers to the individual role as a researcher and as an employee within the organisation. Organisational politics refers to the potential threat the researcher-manager may bring to

the organisation that will increase the level of internal organisational politics. I was in a situation, as a researcher-manager, where these three challenges mentioned by Coghlan could have affected the work. Figure 4-1 shows my position as a researcher manager. Because I was involved in the subject, it would bring to the research a clearer understanding of the business and needs to be met by InTouch, an intuitive view of the questions to pose, and of the cultural and historical background. This pre-understanding and role duality could obviously have created a potential bias. This was mitigated, as explained above. Another different technique was also applied to mitigate the bias of the researcher, i.e. to triangulate data and analysis with the existing available artefacts related to InTouch within Schlumberger.

4.2.5 Pilot Study: Data Collection, Analysis, Results and Discussion

Pilot study data collection

A series of interviews was conducted prior to embarking on the main research. The individual interviews were recorded and transcribed. The objective of the pilot study was to test the research methods. This has brought in-depth knowledge of InTouch and the environment within which it operates. Based on the data from the three pilot interviews, together with the available artefacts within Schlumberger, a pilot analysis was carried out.

The laddering technique was applied with the semi-structured interviews as explained earlier. The three interviewees are coded in Table 4-1:

Name	Years seniority	Position now	Position at early InTouch	Location of interview	Time of interview
AK	16	Programme Director Learning Management System	InTouch Manager at the engineering centre	Paris, France	Sept 2003
CM	31	Programme Manager InTouch North America	Technical Manager D&M Headquarters	Houston, Texas, USA	Oct 2003
RH	06	British Training Centre Manager	Field Engineer	Edinburgh, UK	Oct 2003

Table 4-1: The data of the three pilot interviews

All the interviews lasted around 45 minutes. Respondents were informed that the interviews were solely for research purposes and that they could give their most candid opinion and answers to all my questions. In all three interviews, conversations were also continued after the recorder was turned off. Any additional data or deviations from the recorded data were noted. For the three pilot interviews, no deviations of data were

detected from the recorded interviews. All the acquired data are used for further data analysis.

Pilot study data analysis

The acquired data from the pilot interviews are codified and analysed following the laddering technique (Baker, 2002; Reynolds and Gutman, 1988) and the Abductive research strategy (Blaikie, 2000). The emergent conceptual constructs are identified from the transcripts of the interview data. These conceptual constructs – referred to as second-order constructs – are derived from the respondents' verbatim responses, which constitute the participants' social reality. These constructs become the elements, which can be interpreted as the attributes or action goals, the consequences or outcome goals and the beneficial results.

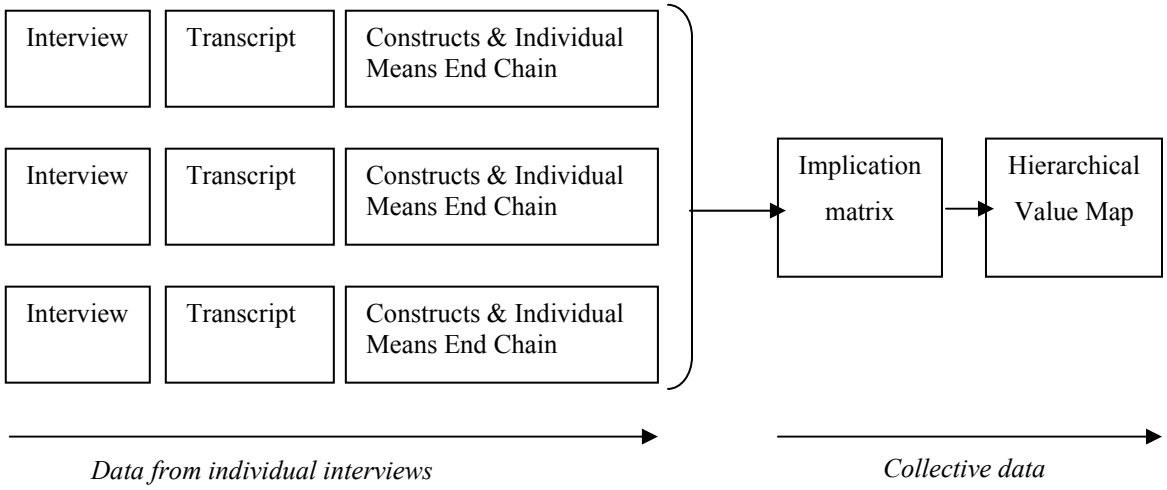


Figure 4-2: Graphical description of data analysis

From each individual interview, relations among the elements are built with the Means-End Chain concept (Reynolds and Gutman, 1988), as explained in Chapter Three. Using this content relation analysis from the individual interview data as a basis, the structural relationships among specific attributes, consequences, and values are aggregated across respondents in an asymmetric implication matrix. Such a matrix bridges the gap between the qualitative and quantitative aspects of the laddering technique by displaying the number of times each element (attribute, or consequence, or value) leads to another element (Deeter-Schmelz et al., 2002; Reynolds and Gutman, 1988). The implication matrix reveals both direct and indirect relationships, which facilitates the identification of linkages in the ladder across respondents. A direct relationship is where one element gives an impact directly to another element. An indirect relationship is where one element gives an impact to another element indirectly through a relationship with a different element. An example of laddering can be presented in Figure 4-3.

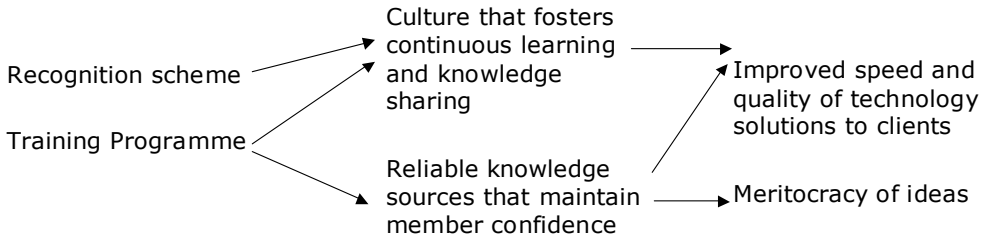


Figure 4-3: Examples of laddering from the InTouch study

The implication matrix was then used to draw a Hierarchical Value Map (HVM) as a means to illustrate the relationships among the constructs or the elements. The HVM for the pilot study is presented in Figure 4-4.

Pilot study results

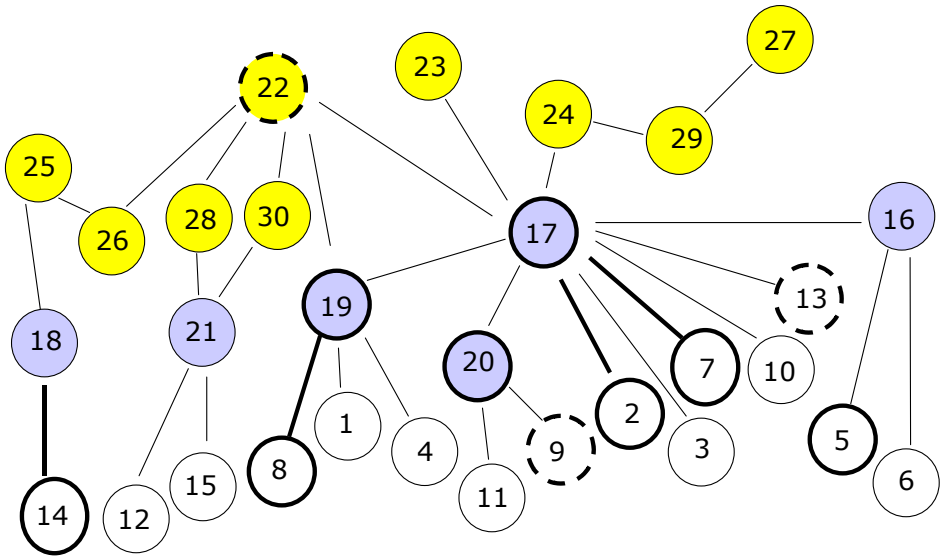


Figure 4-4: Hierarchical Value Map from the pilot study

The bold lines and circles represent the dominant perceptual orientation (Reynolds and Gutman, 1988). The solid line represents the direct relations for the elements and the dotted line represents the indirect relations. For example, "Relevance to Users" ("2" in the HVM map) is a dominant attribute that gives direct relations to consequences; whereas attributes 9 ("Communities) and 13 ("Knowledge Broker") are dominant attributes that give indirect relations to consequences. Elements 17, 19, 20 are dominant consequences and reflect direct relations, whereas element 22 is a dominant result that reflects an indirect relation. Table 4-2, Table 4-3 and Table 4-4 provide a listing of the attributes, consequences and values/results from the pilot study respectively.

Pilot study discussion

The objective of the pilot study was to learn whether or not the proposed research method would provide useful and workable insights to address the first research question. The results show that a meaningful HVM, as the final representation of the findings, can be obtained from the technique chosen for Project One and that conclusions can be drawn from the findings. The results of the pilot study revealed fifteen constructs that serve as the attributes leading to the high-level strategy elements of managing knowledge. These were the practical items that Schlumberger actually created or where it took action in operationalising InTouch. As shown in the HVM, each of the attributes identified is linked to one or more consequences that, in turn, impact on the desired results.

Table 4-2: Attributes of InTouch in the technical service delivery process

Attribute	Description of attribute
01. Targeted knowledge	A specific knowledge domain, e.g. InTouch addresses the operational and technical knowledge within a technical service delivery process.
02. Relevance	The system is relevant to the users' day-to-day activities and within their work processes.
03. Recognition scheme	Recognition, by name, of contributors to the creation, mobilisation and diffusion of knowledge.
04. Governance body	The committee that sets the rules of the game and provides the go/no-go of initiatives.
05. Awareness programme	A programme that reveals the benefits to the users and the management. It is a communication campaign.
06. Training programme	A structured training programme addressing different type of users or roles.
07. Measurement	Metrics that are created within the system and are communicated to the organisation.
08. Visibility	The profile of the knowledge project that can be easily felt and seen by management.
09. Communities	People getting together to collaborate and to come up with a solution to a problem.
10. Knowledge champion	A person in the delivery site that acts as 'cheer-leader' and is knowledgeable in his/her duties as well as the knowledge project.
11. Validation process	A process to validate a proposed solution prior to its diffusion throughout the organisation.
12. Knowledge broker	A person assigned to link the people who need the knowledge and the people who have the knowledge, e.g. in InTouch, it is the InTouch Engineer.
13. Accessibility	The way users can reach the knowledge and its friendliness.
14. People mobility	Employees from one function to another and/or from one geographical area to another.
15. Content management	The way the content of knowledge is structured within a system.

Table 4-3: Consequences – High level strategy elements of implementing InTouch

Consequences – High level strategy elements
16. Self-interest (WIIFM – What's In It For Me) that is well addressed.
17. Culture that fosters continuous learning and knowledge sharing.
18. Human resources policies that facilitate knowledge activities.
19. Leadership that facilitates and encourages knowledge activities.
20. Reliable knowledge sources that maintain member confidence.
21. Technologies that enable mobilisation and diffusion of knowledge, and friendly accessibility to users.

Table 4-4: Beneficial Results from InTouch

Beneficial results
22. Improved speed and quality of technology solutions to clients.
23. Identification of patterns of problems and common lessons learned.
24. Improved/maintained service quality level despite less experienced personnel.
25. Job enrichment to employees.
26. Knowledge is made transferable to the next generation.
27. With the efficient and effective links between delivery sites and technology centres: relevant new products are developed, and there is faster introduction of the products.
28. Real time access to knowledge.
29. Meritocracy of ideas.
30. Quick response adjustments through use of metrics.

Following this pilot study, a few minor modifications were made in the interview questions and the Means-End Chain model. Even though the technique showed that from the interview data an analysis and conclusions could be meaningfully derived, there was a 'missing' closed loop in the HVM. The whole study and research question starts and ends with the creation, mobilisation and diffusion of knowledge. Therefore, the attributes of InTouch should conclude with the creation, mobilisation and diffusion of knowledge within the technical service delivery process, which InTouch is supporting. For this reason, the Means-End Chain model is modified to include the knowledge life-cycle concept. The modified Means-End Chain model formed the basis of the main study as explained in Chapter Three.

In this pilot study, the respondents did not verify the transcript. Upon recommendation from the doctorate research panel, all transcripts were verified for the main study. This proved to be a very good practice to ensure the credibility of the transcribed data. A verification step was then added to the main study data analysis.

4.2.6 Main Study Data Collection and Analysis

Following the verification of the research method from the pilot study, the research moved to the main study to acquire the data by utilising the laddering interview technique and to analyse that data by applying the Means-End Chain approach within the Abductive research strategy.

Main study data collection

For the study, it was planned to have 20 interviews with Schlumberger employees in their different roles related to InTouch. The interviewees are 7 people from the InTouch core team, 7 people from the InTouch users, and 5 people from top management. One person could not be interviewed due to incompatibility of schedules. Table 4-5 gives the list of the interviewees and their positions in the company. The data collection instrument shown in Appendix 2 was used.

Name	Years seniority	Position now	Position at early InTouch	Geographical Area	Time of interview
AK (core)	16	Programme Director Learning Management System	InTouch Manager at the engineering ctr.	Paris, France HQ	Oct 2003 60 minutes
CM (core)	31	Programme Manager InTouch North America	Technical Manager D&M Headquarters	Houston, US, NSA	Oct & Nov 2003 70 minutes
RH (user)	06	British Training Centre Manager	Field Engineer	Edinburgh, UK	Oct 2003 45 minutes
YTL (user)	07	Service Delivery Manager	Field Engineer	Kuala Lumpur, MEA	Dec 2003 30 minutes
AJ (top)	20	Vice President – MBT Geomarket	Product Champion	Kuala Lumpur, MEA	Dec 2003 21 minutes
JD (top)	30	Vice President – Business Systems	Quality Director	Paris, France HQ	Dec 2003 45 minutes
GA (top)	18	Vice President - Knowledge Mgmt	IT Director	Austin, US, HQ	Dec 2003 45 minutes
LPG (core)	15	KM systems manager	IT services	Paris, France ECA	Dec 2003 90 minutes
SB (top)	21	President – Business Unit	President – Business Unit	London, UK HQ	Dec 2003 30 minutes
PD (core)	19	Programme Director – InTouch	InTouch Product champion	Paris, France HQ	Jan 2004 90 minutes
SC (top)	15	Chief Information Officer	Personnel Manager	Paris, France HQ	Jan 2004 30 minutes
HA (user)	24	Discipline Director	Technical Manager	Houston, US, NSA	Jan 2004 45 minutes
TS (core)	26	Programme Manager	InTouch Champion NSA	Houston, US NSA	Jan 2004 60 minutes
JLP (core)	30	Manufacturing Director	Technical Manager	Houston, US NSA	Jan 2004 30 minutes
MRK (user)	7	Product Champion	Field Engineer	Clamart, France ECA	Jan 2004 45 minutes
LP (user)	23	Technology Centre Manager	InTouch support	Clamart, France ECA	Jan 2004 45 minutes
KR (core)	31	Technology Centre Manager	Technical Manager	Fuchinobe, Japan MEA	Jan 2004 45 minutes
AM (user)	7	InTouch Engineer then Operations Manager	Field Engineer	Perth, Australia MEA	Feb 2004 45 minutes
BA (user)	19	Contract Manager	Document Manager	Paris, France ECA	Feb 2004 30 minutes

Table 4-5: List of interviewees for InTouch case.

Because the study covers an international use of InTouch, geographical coverage is also ensured through the choice of the interviewees. As Schlumberger is divided into three different geographical areas and one Headquarters, the areas where the interviewees come from are also expressed in the same way as Schlumberger's use of geographical terminology. The geographical areas do not represent the nationality of the interviewees but represent the geographical areas where they work. 4 people work in the North and South America area (NSA), 5 people work in the Europe, CIS, and Africa (ECA) area, 4 people work in the Middle East and Asia (MEA) area, and 6 people work in the headquarters (HQ).

Similarly to the pilot study, respondents were informed that the interviews were solely for research purposes and that they could give their most candid opinions and answers to all my questions. Interviews with respondents in the USA, Australia and Japan were conducted by telephone. In 11 cases, conversations were also continued after the recorder was turned off. Any additional data or deviations from the recorded data were noted. These acquired data were used for further data analysis. In one case, as requested by the respondent, a series of written questions was first sent to him and answered by him prior to the allocated interview time for the reason of 'focus' on the discussion during the interview.

Data available in the company's archives used for triangulation in the data analysis can be listed as the following:

- Technical descriptions of InTouch
- Survey data of InTouch 2002 and 2003
- Performance measure from the on line metrics
- Infosys and Wharton award document
- Society of Petroleum Engineers (SPE) publication
- Clients' presentation and Internal correspondents

Main study data analysis

The process for the data analysis follows the same flow as in the pilot study, as shown in Figure 4-2. One additional step was added: that the transcript was sent and verified by the interviewees. This was not done for the pilot interviews. Any correction or misunderstanding was clarified during this verification.

It appeared that handling the data from 19 interviews was much more complicated than handling data from the three pilot interviews. An iterative nature of data analysis in determining the constructs for the elements (attributes, consequences, and beneficial results) was, therefore, introduced:

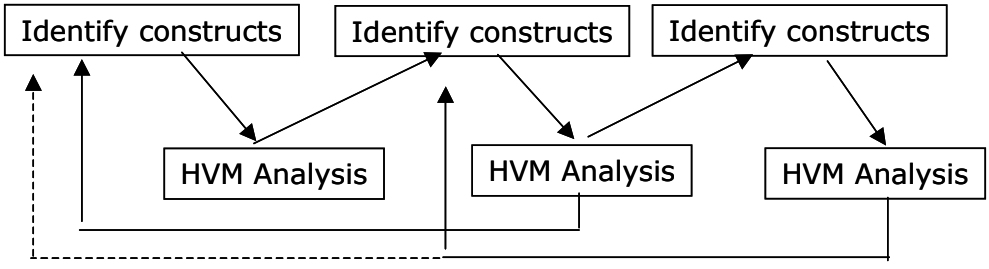


Figure 4-5: Iterative nature of the data analysis

An aggregation of interview data to the implication matrix to build the HVM may or may not need to revisit the previous interview data for any necessary modification of the identified structural relationships among specific attributes, consequences, and values. This iterative process is required to ensure the consistent elements (i.e. attributes, consequences and values) were being produced from analysis of the interview data. On six occasions, interviewees were called back for clarification during the iteration of the analysis. The implication matrix of the study is presented in Appendix 4; and the HVM resulting from the implication matrix is presented in Figure 4-9.

The implication matrix provides the 'blueprint' for drawing up an HVM. Mapping provides a meaningful way of representing subjective data; its main benefit can be summed up in the old adage that 'a picture paints a thousand words'. This graphic device can be used to record and communicate information and can, furthermore, act as a tool to facilitate decision-making, problem-solving, and negotiation (Baker, 2002).

The goal of mapping these hierarchical relations is to interconnect all the meaningful chains in a map in which all relations are plotted with no crossing lines (Reynolds and Gutman, 1988). This results in a map which includes all relevant relations, and yet is easy to read and interpret. Reynold and Gutman (1988) suggest that an arbitrary decision is required to choose the cut-off level of relation value to allow the rich meaning represented in the map and yet be simple enough to be represented and interpreted. I selected a cut-off value of 3 because when there is a ladder, or relations acknowledged only once or twice during all the nineteen interviews these have much less importance. Having selected the level of 3 as the cut-off value, relations are then plotted by working through each row of the implication matrix. In drawing up the HVM, cut-off levels become more of a guideline, as the key is to obtain the best fit of data. Even though Reynolds and Gutman (1988) allow certain relationships to be plotted when they prove to be meaningful, there was no plot made in the InTouch HVM for relations of less than 3. In addition, the criterion for evaluating the ability of the map to represent the data is to assess the percentage of all relevant and meaningful relations among elements accounted for by the mapped elements; a value of more than 70% is recommended (Deeter-Schmelz et al., 2002). The HVM presented in Figure 4-9 accounts for 82.3% of all the direct and indirect meaningful relations. This means that for the InTouch case study only, 112 out of 136 meaningful ladders from the implication matrix are presented in the HVM.

In analysing the data, one set of interview data was not used at all. The interviewee did not really answer the questions or talk about InTouch; therefore, no meaningful data could be derived from the interview.

4.3 Complementing InTouch Study with CRM Study

Challenges of a study based on InTouch only

InTouch provides a perspective that is 'positive-based case'. InTouch has received both academic and industrial recognition which has resulted in beneficial results for both

Schlumberger and its clients. If the study is based on a positive case only, the attributes are merely from the positive perspective, i.e. from the system which was successfully operationalised and which has been well recognised.

One of the challenges in a case study is indeed the choice of cases (Yin, 1994). InTouch was chosen against theoretical criteria for a case that would reveal the answer to the research question, i.e. to find the attributes for the creation, mobilisation, and diffusion stages of the knowledge life-cycle in a technical service delivery process. However, feedback from the Executive Doctorate panel suggested that the positive case needed to be complemented with a case that has a relatively lower level of success and acceptance by its users in order to develop a more rounded set of attributes. Looking into a positive case only would miss some other attributes which may be found in a case where the system is operationalised with lesser success.

I took this comment seriously. I looked into another case that complemented the InTouch study. I decided to take another case in the same organisational setting, Schlumberger, but with a different profile. The case is Client Relationship Management (CRM) implementation in the sales process. The data collected from this case are used to complement the data from InTouch in establishing the evidence-based attributes that are responsible for implementing a system for the creation, mobilisation and diffusion of knowledge.

InTouch and CRM in Schlumberger

While InTouch supports the technical service delivery process in Schlumberger, CRM is intended to support the sales process. The main objectives for implementing CRM are as follows:

a. To capture the knowledge of the sales person in a reusable format in a system accessible to management and other sales people.
b. To have a single source of knowledge about the customers in a system that may be updated according to the sales assigned to the customers.
c. To be able to produce comprehensive sales reports and customer reports in real time.

Schlumberger started the project implementing CRM in 1997. It started with some difficulties mostly related to the technology itself. It was then stopped for six months. After the initial difficulties were overcome, the CRM implementation resumed.

At the end of 2003 Schlumberger conducted a survey for both InTouch users and CRM users. This survey is a part of the yearly evaluation on how the system implementation performs and how it is perceived by its users. However, in this particular survey, questions were included to reveal how many of the users are really committed (i.e. voluntarily use it and will miss it if it is removed), how many are feeling 'forced' to use it (i.e. they have to use it because it is there and they are asked to use it), and how many of the targeted workers do not use it. The rounded-figure results are described in Figure 4-6. There are no forced users in InTouch and only 2% non-users, whereas in CRM there are 40% of forced users and 30% non-users. This shows a significant contrast.

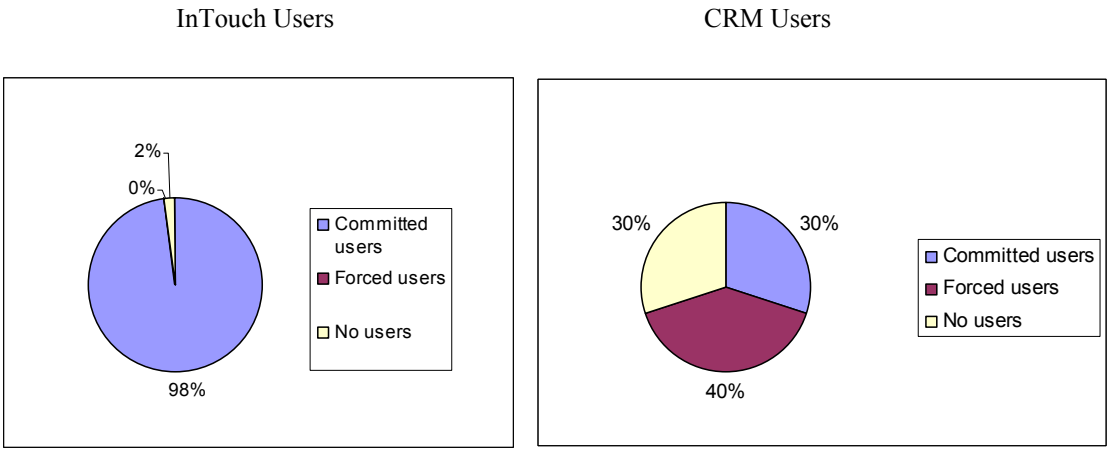


Figure 4-6: Comparison of InTouch users and CRM users

This information confirms the choice of CRM implementation in Schlumberger's sales process as the case to explore, to further complement the findings from the InTouch case.

The Research Question for this complementary study is:

> *"What are the attributes of CRM that are different from those of InTouch that make CRM less recognised and produce more user resistance?"*

Data collection and analysis for CRM case

The same technique, Means-End Chain approach with its laddering technique (Baker, 2002; Reynolds and Gutman, 1988), is used to conduct the semi-structured interviews. The questions posed to the interviewees were focused and around the research question, i.e. to find the different attributes that make CRM results so different from InTouch.

The unit of analysis for this complementary study is the sales process and the aspects within the process, such as people and structure. Therefore, the selected interviewees were the people directly related to CRM. Moreover, because the nature of this complementary study is a comparison of InTouch and CRM, the selected interviewees should also have enough depth of understanding about InTouch. Fortunately, this was not difficult to find because with the people mobility policy within Schlumberger, it is possible to find interviewees: 1) who are currently within the CRM environment and were in the InTouch environment, or 2) interviewees who are currently in the InTouch environment and were in the CRM environment. There are 6 interviewees within category 1 and 5 interviewees within category 2. A total of 16 people were interviewed. The other 5 interviewees are from category 3: headquarters management who are familiar with both InTouch and CRM. The interviewees are listed in Table 4-6.

The complementary study interviews were conducted for an average of about 15 minutes each and all except 3 were conducted by telephone. Interviews were not recorded for two reasons: 1) to allow interviewees to feel at ease to talk about why CRM is not well perceived by users, and 2) because the interviews were mostly by phone. Notes were taken during the interviews and they were typed and sent to the interviewees for verification.

The data from the CRM case were analysed in the same manner as the data from the InTouch case, based on the Abductive research strategy (Blaikie, 2000). The final construction of the implication matrix and the Hierarchical Value Map (HVM) include the complementary data from the CRM case.

Name	Years Seniority	Interviewee Category	Geographical area	Time of interview
BA	20 years	2	Europe, CIS, Africa (ECA)	July 2004 12 minutes
EJ (phone)	23 years	1	ECA	July 2004 20 minutes
AG (phone)	21 years	1	North and South America (NSA)	July 2004 15 minutes
BD (phone)	20 years	2	NSA	July 2004 10 minutes
PD	19 years	3	HQ - Paris	August 2004 10 minutes
KR (phone)	31 years	2	Middle East and Asia (MEA)	August 2004 20 minutes
SB (phone)	21 years	3	HQ – Houston	August 2004 15 minutes
AK (phone)	16 years	2	NSA	August 2004 15 minutes
JD (phone)	30 years	3	HQ - Paris	August 2004 10 minutes
JT (phone)	16 years	2	NSA	Sept 2004 10 minutes
LPG	15 years	3	HQ - Paris	Sept 2004 20 minutes
KM (phone)	23 years	1	MEA	Sept 2004 15 minutes
AJ (phone)	21 years	1	MEA	Sept 2004 15 minutes
CC (phone)	26 years	1	NSA	Sept 2004 15 minutes
GA (phone)	18 years	3	HQ – Houston	Sept 2004 10 minutes
IC (phone)	20 years	1	MEA	Sept 2004 10 minutes

Table 4-6: The interviewees for the complementary CRM case study

4.4 Findings and Results of Project One

4.4.1 Creation, Mobilisation, and Diffusion of Knowledge Before InTouch

The chain of knowledge and information flow prior to the implementation of InTouch is presented in Figure 4-7. When in need of specific knowledge, a field engineer or manager had to escalate their request through the country and geographical area management. In turn, the geographical area management would communicate the request to the product line headquarters that then directed it to the product development manager in the appropriate technology centre. Within this centre, the request would flow down to the subject matter expert. The reverse flow took place to transfer the knowledge from the subject matter expert to the delivery site manager in the field. The turn around time was slow. It could take between two to sixteen weeks to answer a technical assistance request, sixteen weeks to resolve engineering modifications, and more than two years to update documentation.

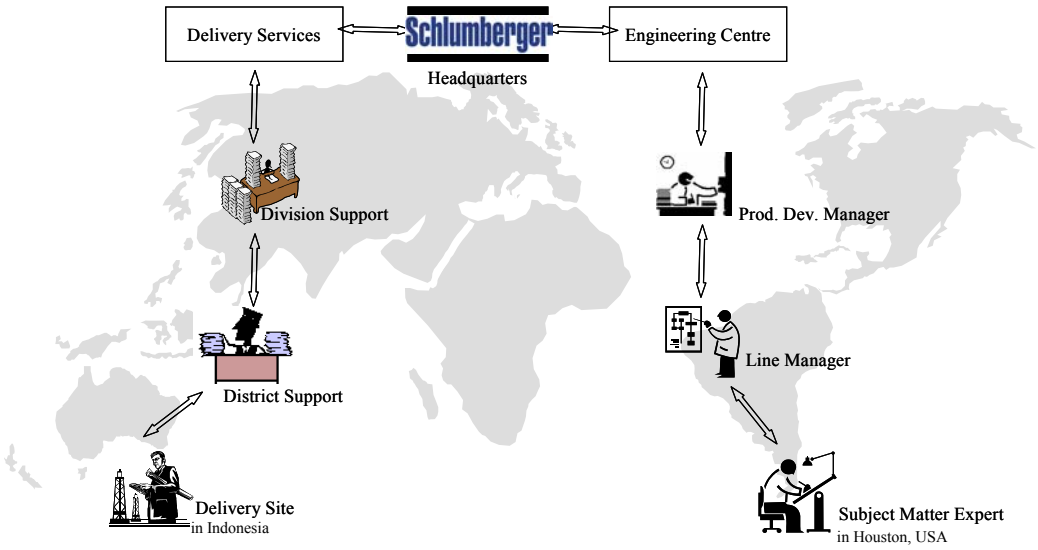


Figure 4-7: The chain of information and knowledge flow prior to InTouch

4.4.2 Creation, Mobilisation, and Diffusion of Knowledge After InTouch

The main role of InTouch is to directly link the field service delivery organisation to the technology centres. InTouch was designed and built to form a framework that facilitates effective knowledge management within the technical service delivery process. The previous process is now disabled and replaced by the direct link system presented in

Figure 4-8. Field users looking for answers will access InTouch on the company intranet and conduct a real-time search for the knowledge they need for a specific activity. When the required knowledge is not found in the InTouch system, delivery site engineers and managers pose questions to the system. In response to those questions, *InTouch Engineers*, located in the various technology centres, will contact relevant subject-matter experts who will then provide the support promptly. Answers are posted in the system and are made available to all users when the system is interrogated. When appropriate, answers may be validated by other field users and experts who are identified as *Applied Community Experts*. This community of applied experts can be the targeted experts of InTouch Engineers when questions are more application oriented. When the knowledge sought from the system is found to be relevant, the field users take and reuse this knowledge for their needs. After reuse, they provide feedback and when appropriate suggest improvements or add their own tacit knowledge and experience to it. Because the InTouch system recognises individual contributors and provides contact information that links to the corporate directory, direct people-to-people interaction is also facilitated.

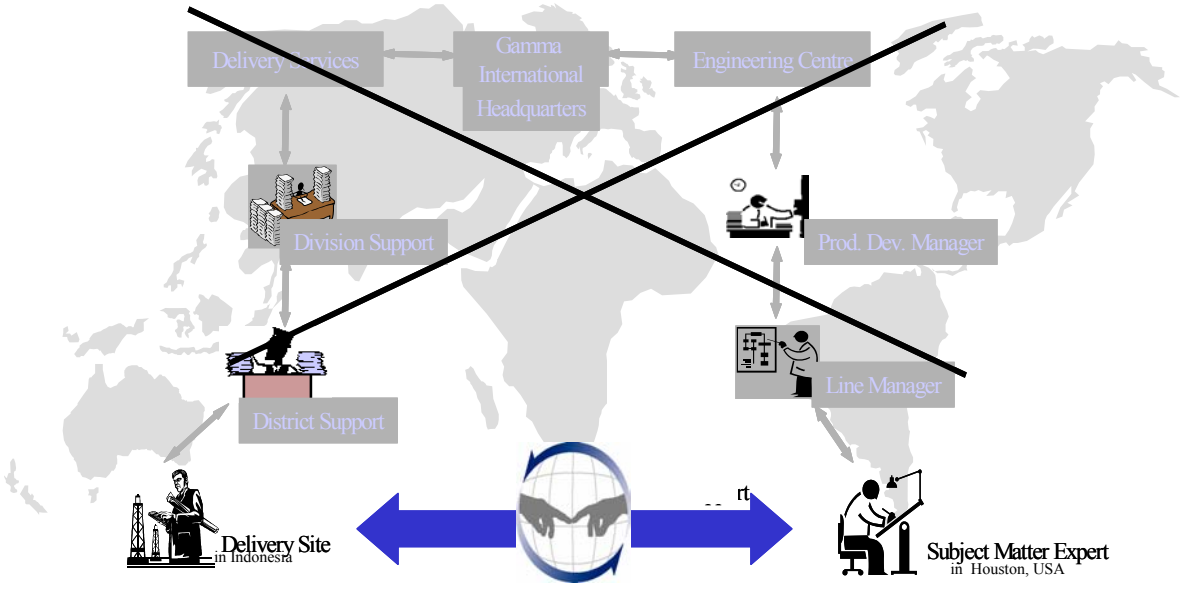


Figure 4-8: InTouch links directly the field delivery site and the technology centres

The main purpose of InTouch is to support the technical service delivery process. Continued knowledge capture and the intensive exchange between different Communities in the delivery process, however, enables InTouch to also contribute to the integration of knowledge creation as part of the new product and service development that occurs in the research and engineering domain.

To enable field users and experts to use the InTouch system, each individual is equipped with a laptop computer loaded with a standard software image. This intranet-based technology allows users to pose queries and receive answers 24 hours a day, 7 days a week, 365 days a year, regardless of global location.

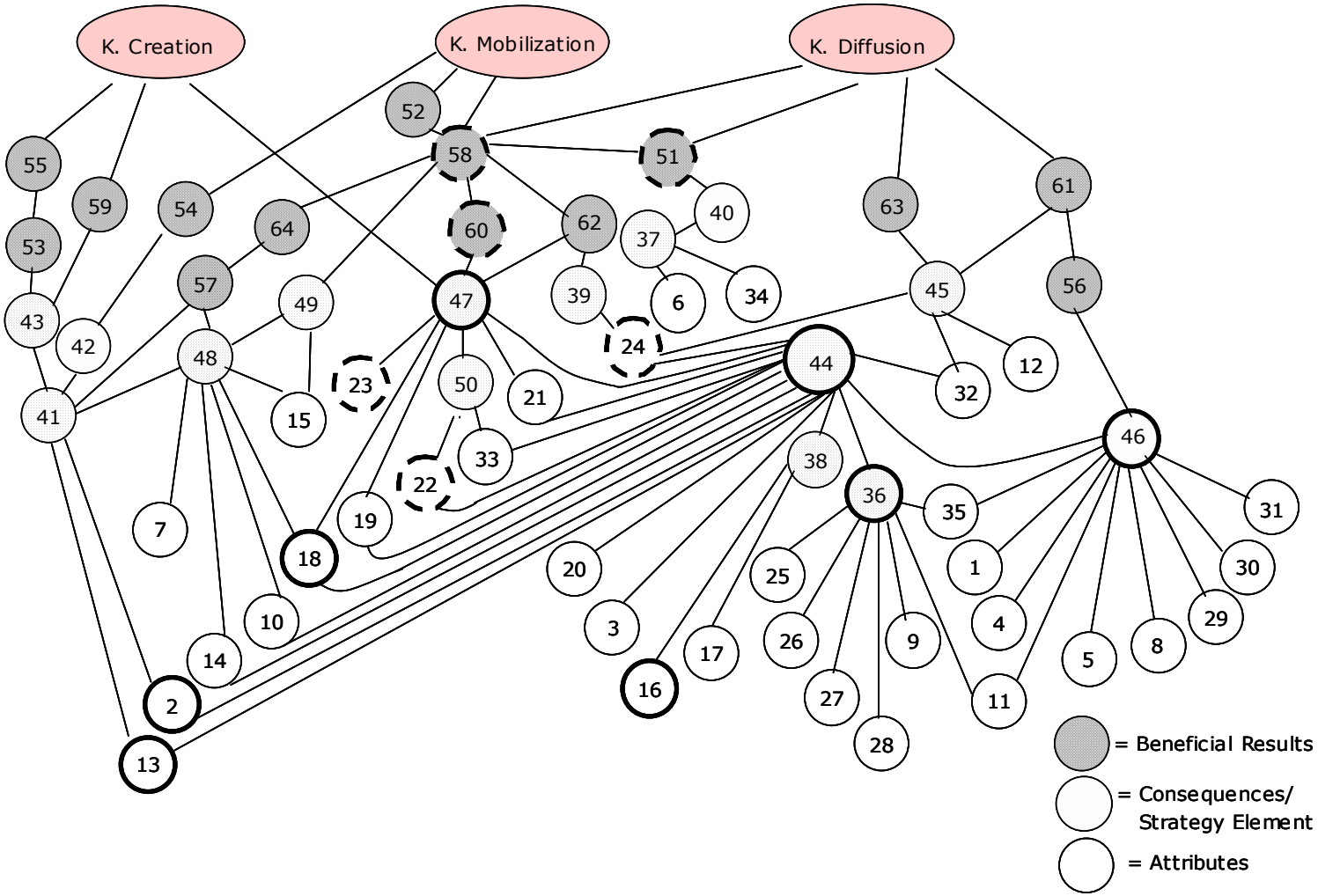


Figure 4-9: The final HVM of attributes, consequences and beneficial results, converging into Knowledge Creation, Knowledge Mobilisation, and Knowledge Diffusion

4.4.3 The Implication Matrix and The Hierarchical Value Map (HVM)

The implication matrix constructed from the InTouch case, complemented with the CRM case, is presented in Appendix 4. From each individual interview, relations among the elements are built with the Means-End Chain concept. Using the content relation analysis from the individual interview data as a basis, the structural relationships among specific attributes, consequences, and values are aggregated across respondents in an asymmetric implication matrix. Such a matrix bridges the gap between the qualitative and quantitative aspects of the laddering technique by displaying the number of times each element (attribute, or consequence, or value) leads to another element (Deeter-Schmelz et al., 2002; Reynolds and Gutman, 1988). The implication matrix reveals both direct and indirect relationships, which facilitates the identification of linkages in the ladder across respondents. A direct relationship is where one element gives an impact directly to another element. An indirect relationship is where one element gives an impact to another element indirectly through a relationship with a different element. Examples of laddering are presented in Figure 4-3.

One example is the 'recognition scheme' has a direct impact upon 'culture that fosters continuous learning' and 'knowledge sharing' whereas it has an indirect impact upon 'improved speed' and 'quality of technology solutions to clients'. In another example, the 'training programme' has a direct impact upon 'culture that fosters continuous learning' and 'knowledge sharing and 'reliable knowledge sources that maintain member confidence' and indirect impact upon 'improved speed' and 'quality of technology solutions to clients' and 'meritocracy of ideas'. The implication matrix is constructed through the laddering analysis of the interview data by counting the number of relationships. Appendix 4 presents row-column frequency matrix indicating the number of times directly or indirectly all row elements lead to all column elements. The numbers are expressed in fractional form with direct relations to the left of the decimal and indirect relations to the right of the decimal. Thus "Recognition Scheme" (element no. 27) leads to "Culture that fosters continuous learning and knowledge sharing" (element no. 44) six times directly and five times indirectly. More precisely, this means that six respondents said element 27 directly leads to element 44, whereas five respondents sequentially related the two elements with another element in between. The implication matrix is constructed by going through all the ladders from the interview data.

The HVM is constructed from the implication matrix. Reynold and Gutman (1988) explained in details how HVM should be constructed. The most efficient way is to start in the first row (element 1) for which there is a value at or above the arbitrary cut-off level (i.e 3 for the research), the first significant value is "element 46" with a value of 4.00 indicating four direct relations and zero indirect relations between these two elements. Next, we move to the "element 46" row and find the first value at or exceeding the cut-off value. The matrix shows that "element 44" is the first that bears the significant value of 3.02 indicating 3 direct relations and 2 indirect relations between elements no. 46 and no. 44. Thus, the chain has now grown to element no. 1 – element no. 46 – element no.44. Continuing in the same manner we will build the chain. Having reached the end of the chain, we then go back to the beginning and verify if there is any duplication of links. After that, the next step is to move to the second row and start the process over again.

The goal of mapping these HVM is to interconnect all the meaningful chains in a map in which all relations are plotted with no crossing lines (as much as possible). This results in a map which includes all relevant relations and is easy to read and interpret. Therefore, some sacrifice in plotting the map may have to take place for some relations. Criterion for evaluating the ability of the map to represent the data is to assess the percentage of all relevant and meaningful relations among elements accounted for by the mapped elements; a value of more than 70% is recommended (Deeter-Schmelz et al., 2002). The InTouch HVM presented in this thesis accounts for 82.3% of all the direct and indirect relations. This represents 112 out of 136 meaningful ladders from the implication matrix which are discernable.

The end result of the data analysis is presented in Figure 4-9 as the HVM of the structural relationships among specific attributes, consequences, and values. With this analysis and representation, the objective of finding the attributes in operationalising Knowledge Management Systems is achieved. The white circles numbered 1 to 35 represent the evidence-based attributes, the dotted circles represent the consequences and the striped circles represent the beneficial results from the KMS implementation which ultimately relate to the creation, mobilisation and diffusion of knowledge.

The bold circles represent the dominant perceptual orientation (Reynolds and Gutman, 1988). The solid bold circles represent the dominant direct relations for the elements and the dotted bold circles represent the dominant indirect relations. For example, “Knowledge broker” (“18” in the HVM map) is an attribute that gives dominant direct relations to consequences; whereas attribute 22 (“Communities”) is an attribute that gives dominant indirect relations to consequences. Elements 36, 44, 46, 47 are dominant consequences and reflect direct relations, whereas elements 51, 58, 60 are dominant results that reflect indirect relations. Table 4-7, Table 4-8, Table 4-9 provide lists of the attributes, consequences and values/results respectively.

In the main study, more attributes are identified than in the pilot study. This better ‘frequency resolution’ of attributes shows more detailed actions that an organisation needs to undertake in shaping knowledge management initiatives or in preparing it to embark on a project of implementing a KMS for managing knowledge.

This HVM has been discussed with Schlumberger InTouch Programme Director and the other four interviewees. There are a couple of particular points that were brought up in the discussions:

1. It was surprising to two interviewees, especially the Programme Director, that “Identification of patterns of problems and common lessons learned” does not have any perceived relation to the “Improved speed and quality of technology solutions to client”. This relation, in fact, was designed within InTouch as a logical flow. The lesson taken by the InTouch team is that this relation may have to be more publicised to generate the correct perception from users and management.
2. In studying the details of the implication matrix, a few relations were not presented in the HVM. This is a consequence of the inability of the map to represent the data at 100% level. The HVM in this study represents 82.3%. Therefore, some relations will have to be sacrificed in drawing the map.

All five interviewees agreed that the attributes and the HVM represent the true picture of InTouch.

Table 4-7: Attributes of implementing InTouch in the technical service delivery process

Attribute	Description of attribute
01. Targeted domain	A specific activity knowledge domain, e.g. InTouch addresses the operational and technical knowledge within a technical service delivery process.
02. Accessibility	The way users can reach the knowledge source, e.g. through Intranet.
03. Standard Language	The lingua franca or media in which the knowledge activity is conducted.
04. PM Reporting	Project Management reporting structure of the knowledge management initiative.
05 Financial Support	Allocated financial commitment.
06. System Feedback	Systematic opportunity of giving feedback for the change or development of the system.
07. Content management	The way the content of knowledge is structured within the system.
08. Governance body	The committee that sets the rules of the game and provides the go/no-go of initiatives.
09. Personalisation	The interaction with the system that can be tailored or personalised by users.
10. User-friendliness	Simple and easy to use by users.
11. Training programme	A structured training programme addressing different types of users or roles.
12. People mobility	Employees from one function to another and/or from one geographical area to another.
13. Single source	There is no other option that can replace the system as such.
14. Embedded process	The use of the system for the knowledge activities is within users' work process.
15. Alert feature	Automatic alert feature within the system.
16. Answer to users' need	The system answers to users' needs such that users can benefit from the system.
17. Problem solving	The system offers problem solving activities.
18. Knowledge broker	A person assigned to link the people who need the knowledge and the people who have the knowledge, e.g. in InTouch it is the InTouch Engineer.
19. Expert Users	Users identified as experts in some products or services who are willing to collaborate within communities.
20. Knowledge champion	A person in the delivery site that acts as 'cheer-leader' and is knowledgeable in his/her duties as well as the knowledge project.
21. Subject Matter Experts	Identified subject matter experts for particular knowledge that is managed within the system.
22. Communities	People getting together to collaborate and to come up with a solution of a problem.
23. Validation process	A process to validate a proposed solution prior to its diffusion throughout the organisation.
24. Measurement	Metrics that are created within the system and are communicated to the organisation.
25. Relevant knowledge	The knowledge in the system must be relevant to users' duties in their work.
26. Awareness programme	A programme that reveals the benefits to the users and the management.
27. Recognition scheme	Recognition, by name, of contributors to the creation, mobilisation and diffusion of knowledge.
28. Knowledge Feedback	A mechanism for users to give feedback to the knowledge being shared.
29. Communication	Direct championing of communicating the knowledge project by the leadership.
30. Campaign	A campaign run by a few people to ensure coverage of users, at least at the beginning of the system being put into operation.
31. Shared vision	Decision to embark on a knowledge management initiative needs to be a shared one between management and the targeted users/workers.
32. Autonomy	Knowledge management initiative needs to create and sustain the workers' autonomy in controlling their time spent at work.
33. Shared benefits	Benefits from the knowledge management initiative need to address both management and the users – these benefits need to be demonstrated accordingly.
34. Streamlined activities	Additional activities resulting from the KMS implementation need to be compensated for with some other users' working activities that need to be removed from their routines prior to knowledge management.
35. Enriching workers' value	KMS that make the workers' existence in the organisation more valuable; that suppress certain positions during pre-KMS and create other positions post-KMS.

Table 4-8: Consequences – High level strategy elements of implementing InTouch

Consequences – High level strategy elements
36. Self-interest (WIIFM – What's In It For Me) that is well addressed.
37. Users feel to have ownership of the knowledge system.
38. Users are encouraged to ask questions.
39. Knowledge that is captured and reused.
40. The life of the knowledge system is ensured.
41. Direct link that is established between the people who need the knowledge and those who have the knowledge.
42. Knowledge users who understand knowledge suppliers and their environment
43. Knowledge suppliers that understand knowledge users and their environment.
44. Culture that fosters continuous learning and knowledge sharing.
45. Human resources policies that facilitate knowledge activities.
46. Leadership that facilitates and encourages knowledge activities.
47. Reliable knowledge sources that maintain member confidence.
48. Technologies that enable mobilisation and diffusion of knowledge, and friendly accessibility to users.
49. Real time access to knowledge.
50. Meritocracy of ideas.

Table 4-9: Beneficial Results from implementing InTouch

Beneficial results
51. Increased user confidence and knowledge, e.g. Schlumberger engineers feel more confident.
52. Increased customer confidence.
53. Improved understanding of Research and Engineering drivers.
54. Faster new product introduction.
55. Appropriate time to market.
56. Streamlined and more efficient organisation.
57. 30% less engineer training duration.
58. Improved speed and quality of technology solutions to clients.
59. Identification of patterns of problems and common lessons learned.
60. Improved/maintained service quality level despite less experienced population.
61. Job enrichment for employees.
62. Knowledge is made transferable to the next generation.
63. Quick response adjustments through use of metrics.
64. Stronger communication links among users in the knowledge activities.

4.5 Discussions and Conclusions

The findings from Project One are that 35 attributes, 15 high-level strategy elements and 14 beneficial results can be discerned from InTouch, Schlumberger 's operational system in to create, mobilise, and diffuse knowledge in its technical service delivery process. The study identified some major differences in community characteristics found within InTouch operations and the defined communities of practice that will be elaborated later in this section.

4.5.1 Discussion of Attributes

In this section each of the 35 attributes is discussed in further detail.

1. Targeted domain

Drucker (1995) argues that managers must know what information and knowledge they need in order to make good decisions. Davenport and Prusak state, "What makes knowledge valuable to organisations is ultimately the ability to make better the decisions and actions taken on the basis of the knowledge" (1998:170). Therefore, as I argue in the literature discussion, it is fundamental to define the scope of organisational knowledge to be managed that will improve decision-making. Schlumberger decided it was the operational and technology centre knowledge domain in its technical service delivery process that would create competitive advantage. According to the Infosys and Wharton award document, InTouch was created to address this domain to both support and excel in the delivery to its clients. Deciding the knowledge domain to be managed is the challenge for the leadership of an organisation.

2. Accessibility

The exchange of knowledge in InTouch, in particular at the diffusion stage, relies heavily on the accessibility of the knowledge repositories. At this stage, the ease of access to knowledge becomes an important factor to gain beneficial results (Birkinshaw and Sheehan, 2002). Grant and Baden-Fuller (2004) argue that accessing is a more important factor than acquiring knowledge. Furthermore, Grover and Davenport (2001) stress that when organisations want to use knowledge in real-time, mission-critical applications, they have to structure the knowledge base for rapid, precise access. Therefore, the need for accessibility translates into the need for a choice of technology that enables users to find the required knowledge in real time.

Schlumberger chose the technology supporting InTouch based on this accessibility need. One interviewee explicitly states:

> "The only contribution of technology to InTouch is to provide the friendly and quick accessibility to the knowledge repositories".

I contend that knowledge workers, not only need to know what knowledge they need in order to make good decisions, but they must also know how to access that knowledge efficiently. Information technology makes it possible to exchange knowledge to a greater extent and at higher speed. Braganza and Morgan (2000) stress that business leaders need to recognise that internet technology will affect their organisation's competitive position. While it is true that technology is not the entire answer to knowledge management, it is, however, critical to extend the reach and enhance the speed of knowledge mobilisation and diffusion. One interviewee makes it clearer, saying:

> "Technology is the price of admission since we would not get far without it".

Schlumberger created InTouch with an intranet-based system that is accessible from anywhere at any time.

3. Standard Language

Exchanging knowledge is facilitated by communication; and research shows time and again that a shared language is essential to productive knowledge exchange (Davenport and Prusak, 1998). Without it, individuals will neither understand nor trust one another. Therefore, the lingua franca becomes a major factor in the effort to manage knowledge. Current research studies, however, neither identify nor elaborate the need for a standard language used in the creation, mobilisation and diffusion of knowledge. That an organisation has a common language across all communities is taken for granted in research studies. Nonaka and Takeuchi's (1995) emphasis on "redundancy" or overlapping areas of expertise and Thomas Allen's (1977) discussion of "cultural mismatch" as barriers to technology transfer both recognise the importance of common ground. Knowledge exchange is far easier and more meaningful when participants speak the same standard language. By language I mean not just English or French or Chinese but also what each term means to the communities within the knowledge activities.

The InTouch team took great care to ensure that the language being used in the system and within the communities is indeed well understood. The InTouch Programme Director explicitly says:

> "It is extremely important to have a standard language. For example, drilling means different things for directional drillers or for tester specialists. This must be reflected in the system and in the communities."

4. Project Manager Reporting

Pan and Scarbrough (1998) claim that creating, mobilising and diffusing knowledge is a multi-faceted and multi-level set of practices, norms and technologies; they further state, "For such qualitatively different factors to evolve in a consistent, mutually reinforcing way, the guiding role of management is crucial" (1998:62). The support of senior management for the knowledge project cannot be underestimated.

Like almost every other type of change programme, knowledge management projects benefit from senior management support. The study revealed that strong support from the executive vice president sponsoring InTouch was critical, in particular at the beginning of the initiative; so much so that the InTouch programme director reported directly to the sponsor. Giving InTouch such a high profile sends a very strong message to the line management. Having a very clear and structured reporting of the programme or project manager to the right management level plays a key role in giving it visibility.

5. Financial Support

Strong support from executives cannot be separated from the financial support for the project. Like any project, InTouch needs funding. Directly allocated funding to InTouch was made available. It was not diluted through any other project(s). Giving a direct funding allocation also underpins its link to the economic benefit to the organisation. InTouch is claimed to have resulted in benefits to both clients and Schlumberger five times more than the investment made. And its annual running cost is claimed to be one seventh of what it has saved for the company.

Because knowledge management can be expensive (Gilmour, 2003); (Davenport and Prusak, 1998) executives need to show support through direct allocation of funding so that, in return, direct measurement can be made.

6. System Feedback

When users are asked to use a system, they need to feel that they own it, too. Since it is the value added by people that transforms data and information into knowledge, it is the ability to capture and manage those human additions that makes the system particularly suited to dealing with knowledge (Ghoshal and Gratton, 2002; De Long and Fahey, 2000). Leadership needs to realise that only users can tell what works and what does not, what can work better and what they do not need. Open feedback mechanism for the development or modification of the system needs to be channelled and taken seriously.

Managers and engineers, in short, all InTouch users, are not only allowed but also encouraged to give their feedback about the system. Schlumberger organised a users meeting, and one of the objectives was to privide with feedback to the system, as they would like to see it. The motto, which came up, was that the users wanted to see the system "cold as titanium". This means that users do not need a pretty presentation (cold look) but need a solid and fast system (titanium). The InTouch team reacted immediately and corrected the system development accordingly.

7. Content management

While it may not be obvious to InTouch users, it requires a conscientious effort for the InTouch support team to manage the content of InTouch in providing a knowledge service to users. During the three years operationalising InTouch, Schlumberger has gone through more than 100 versions of taxonomies. These many versions are mainly caused by "trial and error" at the beginning of InTouch and by the dynamics of the oil and gas industry.

With good content management design, reliability of knowledge sources is perceived by users and they are encouraged to keep learning from InTouch and share knowledge within the system.

8. Governance body

Schlumberger created a governance body for operationalising InTouch. The governance body sets "the rules of the game" for processes and critical issues such as content management, training programme and measurement. This governance approves, asks for reworks, or rejects proposals for changes. High-level management became sponsors of the governance body. With tangible involvement such as this, leadership support for InTouch becomes obvious. And with its charter, governance ensures InTouch becomes the reliable knowledge source that maintains member confidence.

9. Personalisation

People exchange knowledge not without purpose (Ghoshal and Gratton, 2002). I contend that people use knowledge management systems with a particular purpose for themselves. When a system allows users to tailor the structure of the interaction

between themselves and the system, self-interest is then satisfied, and the culture of sharing knowledge through the system is enhanced. InTouch allows users to tailor the way they decide to interact with the system within certain structural relations.

10. User-friendliness

When sharing knowledge is not the people's natural tendency (von Hipple, 1994), dealing with a non-friendly, cumbersome system will only help people to stay away from it and remain happy to keep their knowledge to themselves. Users need to feel at ease in using the system: it should be fast, easy to understand and easy to navigate. InTouch users claim that some of the most interesting features of InTouch are that it is fast, simple, and easy to use and find what they need in real time. It is unfortunate that knowledge-sharing programmes often fail because they make it harder, not easier, for people to do their job (Davenport and Glaser, 2002). InTouch manages to facilitate with precisely the opposite.

11. Training programme

Together with the awareness programme, Schlumberger designs and implements a training programme tailored to address the technical service delivery with InTouch and the generic knowledge management subject. The training programme is targeted at the identified key players with the objective of perpetuating it throughout the organisation. At the same time, all newcomers, as InTouch potential users, are being trained on the subject. This is done in Schlumberger with such rigour that the majority of employees dealing with InTouch are trained either through classroom training or e-learning.

Such a solid training programme shows the support of leadership to InTouch, in strengthening the sharing culture and ensures reliable knowledge sources within InTouch.

12. People mobility

Moving people across functions and across geographies is one human resource policy that Schlumberger adheres to conscientiously. This policy has been in place for more than three decades and has been considered as a significant attribute for encouraging people to share knowledge and continue learning. When an employee is taken out of one particular working environment and assigned to a completely different environment, she or he has no choice but to learn again. Because of this move, employees become more aware that it is important for them to share knowledge if they want people to share knowledge with them. Thus, it helps the knowledge sharing culture.

By moving people from one situation to a different one, they can apply what they have previously learned somewhere else to the place where they are assigned. This improves the quality of the shared knowledge and increases the reliability of the knowledge sources.

13. Single source

The Schlumberger management made InTouch the single source for users to conduct their knowledge activities within the technical service delivery process. The

management conscientiously removed all possible "competitions" to InTouch from the reach of the users. While it was acknowledged as a bold decision, it proved to be a very effective way to operationalise InTouch. This single source established a direct link between the people who need the knowledge and the people who have the knowledge through the technology. One thing that was ensured was that knowledge related to the technical service delivery process can be found mostly, if not all, in InTouch.

14. Embedded in process

El Sawy et al. (2001) and Braganza and Möllenkramer (2000) argue that knowledge management is required to support business processes in a firm. Tuomi (1999) insists that a business process has to be recognised in designing knowledge management. By business process I mean the coordination and integration of activities performed in different functions to create outputs that are of value to one or more stakeholders (Braganza and Möllenkramer, 2002; Hammer, 2002).

If knowledge is to improve decision-making, and that action takes place within business process performance, InTouch has shown that the creation, mobilisation, and diffusion of knowledge in the technical service delivery process are managed within the day-to-day work activities of the users in the service delivery process. This encourages users to keep learning and sharing knowledge, and ensures that the system has reliable knowledge.

15. Alert Feature

In their research in Partners Health Care, Davenport and Glaser (2002) found that "making the knowledge so readily accessible that it cannot be avoided" is an important factor shaping knowledge management initiative to bring beneficial results. By applying the alert feature in InTouch, all users are immediately provided with knowledge relevant to their work. This may sound trivial; however, interviews with users revealed that this alert feature is very important, as the technologies and best practices within their work evolve very quickly so they need to be alerted in real time.

16. Answer to users' needs

Ghoshal and Gratton (2002) suggest that expecting knowledge workers to peruse repositories of knowledge in their spare time, or to share their own knowledge at leisure, is unrealistic. The system must simply answer the users' needs or else the system will remain a beautiful system without the users' souls that make the system alive. It is a waste of both money and time to embark on a knowledge management project that is not clear, whether it answers users' needs or not. InTouch was established in Schlumberger to address the specific gap within the delivery process, i.e. to remove the clusters between the knowledge owners and the knowledge users.

17. Problem Solving

One respondent states clearly:

> "When people ask questions, knowledge creation and exchange start. And people ask questions, normally, either when they are curious or they have

> problems to solve. In delivering services, our engineers ask questions because they either have problems to solve or sometimes because they want to avoid problems coming to them. The knowledge creation, mobilisation and diffusion in InTouch happen because InTouch provides and facilitates problem solving."

Many other respondents directly or indirectly stress the "problem solving" attribute plays an important role in InTouch being popular.

18. Knowledge broker

One action that Schlumberger took from the beginning was to provide InTouch services supported by fulltime, field-experienced experts called InTouch Engineers. This was considered essen-tial. InTouch engineers function as knowledge brokers, as explained in the way InTouch operates. This decision by top management emphasises the leadership support and, in turn, InTouch Engineers foster the learning and sharing culture, and ensure the reliability of InTouch as a knowledge management system.

As brokers, InTouch Engineers make a connection between those who need the knowledge and those who have it. They are located in the technology centres where they are near to the subject matter experts. They are also very well linked and connected to the applied experts.

InTouch Engineers do not only function as knowledge brokers but also approve engineering documentation for the introduction of new services, training users of technology they support and performing audits for service deliveries.

19. Expert Users

Often, operating experts in the field bring operational knowledge that subject matter experts do not have. While the subject matter experts, located in the technology centres, design the equipment that performs the services in the field and have the in-depth related knowledge, expert users complement this knowledge by adding their knowledge specifically in operating the equipment. In the InTouch community, the expert users are called ACEs (Applied Community Experts). Even though expert users are initially identified, their active collaboration in problem solving and best practice is actually voluntary. Identifying specific operational experts and getting them to collaborate in the generation of knowledge will ensure the reliability of the knowledge captured and reused in the systems.

20. Knowledge champion

A significant key is the work of knowledge champions at delivery sites. This part-time role of people near all the users contributes significantly to shaping the culture. In some cases they interact directly with users and in other cases via line managers. Their interaction includes explaining the programme, holding 'lunch and learn' sessions, making visible the knowledge users and sharing in their sites, and encouraging meaningful objectives centred around creating, mobilising and diffusing knowledge through InTouch. These knowledge champions are very well trained not only on the particularity of InTouch but also in knowledge management in general. Schlumberger considers this as a key position in order to operationalise InTouch.

21. Subject Matter Experts

Subject matter experts are normally known as the people who have the knowledge. The people who need the knowledge seek them out for their support. Unless those experts are identified, the mobilisation and diffusion of knowledge will remain as a hope rather than reality. All services performed by Schlumberger in the service delivery have identified subject matter experts, their physical locations, and the InTouch Engineers (knowledge brokers) associated with those services.

22. Communities

InTouch operates with a different organisation concept compared to the traditional hierarchical organisational type. InTouch supports the technical service delivery process through a collaboration of different communities: Subject Matter Experts, Applied Community Experts, InTouch Engineers, InTouch Champions, and InTouch users. These communities interact to solve an operational problem and/or to provide an applicable solution to Schlumberger clients at delivery sites.

While InTouch Engineers are appointed and the process is decided and governed by the governance body, the other players collaborate within the InTouch boundary voluntarily rather than through assignment. Many scholars conclude (for example Heaton and Taylor, 2002; Storck and Hill, 2000; Wenger, 2000), that knowledge reflects practice and therefore the creation, mobilisation, and diffusion of knowledge should be approached through the communities of practice theory. Unfortunately, Communities of Practice defined as a self-organised and 'free' group of employees who share common work practices, interests, or aims (Wenger, 2000) do not really reflect my findings in the communities concept applied within InTouch.

To achieve the intended results, the community in InTouch was designed. Some members of the community were appointed and some collaborated voluntarily. The community was enabled by these two types of membership with the purpose to realising the beneficial results designed to be achieved through InTouch. This is a community for performance, not only of practice. I contend, therefore, that the understanding of "communities" cannot be limited to the definition of communities of practice; and that further theoretical and empirical research needs to be pursued to unveil a better understanding of the underpinning characteristics of a community for performance where its members work and collaborate together to produce business results.

23. Validation process

Grover and Davenport state, "One of the reasons that knowledge is such a difficult concept is because this process is recursive, expanding, and often discontinuous" (2001:8). Many cycles of creation, mobilisation, and exchange of knowledge are concurrently occurring in businesses. The consequence of this is that knowledge within a designated system will become disorganised and unreliable. Schlumberger created the knowledge process that governs how InTouch Engineers support the creation, mobilisation, and exchange of knowledge as knowledge brokers. This process has facilitated the production of reliable content.

24. Measurement

Schlumberger introduced metrics to manage InTouch performance and its impact upon the business. For example, to ensure the knowledge sharing activity, a metric measuring of the number of contributions (shared knowledge) per employee is taken. Another example of a metric is one that will identify the current business-critical issues. The objective of this kind of metric is to ensure a quick-response adjustment to those issues.

In general, scholars agree that execution through measurement of metrics will ensure the implementation of a strategy or an idea (Kaplan and Norton, 2001; Drucker, 1986). However, designing metrics in knowledge management is a matter that is not often mentioned in the literature. It seems, though, that Schlumberger manages to react and provide the necessary actions to InTouch users and Schlumberger clients by taking advantage of having the metrics built into InTouch.

With the metrics exposed to all employees, the culture of continuous learning and knowledge sharing is enhanced. At the same time, metrics are incorporated into the quarterly objectives of managers, and yearly appraisal includes a knowledge-sharing component. This contributes to the human resource policies that facilitate knowledge activities.

25. Relevant Knowledge

Both Schlumberger management and the InTouch support team realised that the knowledge in the system must be relevant to the users' day-to-day job activities in performing the services for clients or in problem solving. Information or knowledge in a certain subject can be abundant; however, not all is relevant to InTouch users. Putting all knowledge into the system may tend to overload users with knowledge that they do not need which is irrelevant to them. Understanding what parts of the knowledge are relevant to users is the challenge in ensuring that users will keep their interest in the knowledge management system.

26. Awareness programme

WIIFM (What's In It For Me) is considered to be an important driving force in getting InTouch accepted by users and middle management. Users become enthusiastic about dealing with InTouch because they feel the need, and management supports it because they see the benefits it brings to them. Users see clearly that, as they share, other people can benefit and that they can benefit by sharing with other people. This is promoted through an awareness programme which shows the benefits to users of sharing their knowledge. This was called a 'communication blitz' in Schlumberger. In this awareness programme, the benefits to management were also revealed. Such benefits were exemplified by the fact that with InTouch, delivery sites delivered the same level or improved service quality, even with a reduction in experience, by more than 30%. This means that the learning curve of InTouch users is steeper and that the real time support InTouch provides can help management optimise human resources. The objective of the awareness programme is to reveal the WIIFM to all relevant personnel. This kind of awareness programme reflects the commitment of leadership and leads to strengthening a sharing culture.

27. Recognition scheme

Schlumberger used trial and error to encourage the targeted people to use InTouch. At the beginning, Schlumberger implemented a reward programme. Each contribution or sharing of knowledge was rewarded with a token. For most contributors a reward was, for example, a Personal Digital Assistant. However, there was no noticeable major increase in knowledge sharing. A recognition scheme was then put into place. The recognition scheme is simple: When a user shares his/her knowledge, his/her name is attributed to the contribution. So, it is known who has shared the knowledge. Together with the awareness and training programme, the recognition scheme encouraged the targeted users to share knowledge and the knowledge sharing activity increased dramatically.

Another type of recognition scheme was linked to the leadership of the local management where users are located. Local management is encouraged to recognise people sharing knowledge with local small social events. At the corporate leadership level, recognition is extended to the promotion of main contributors to the InTouch programme to distinguished posts.

28. Knowledge Feedback

Knowledge exchange is a two-way communication. Normally, the problem with knowledge repository (the knowledge services face of InTouch) is that the knowledge activity is one way: users withdraw the information of knowledge from the system. Such a knowledge management system would become obsolete and users stay away from it as there is nothing more for them. InTouch, on the other hand, provides a mechanism for users to give feedback on the knowledge being shared. This feedback is measured as a contribution to the InTouch knowledge activities. The knowledge broker has a specific responsibility to respond to these types of feedback. Users then feel their interest is satisfied and in turn the system is kept up-to-date and alive.

29. Communication

The term ‘communication’ here means the direct championing of communicating the knowledge project by leadership. Support from leadership must include the leaders’ personal commitment to communicate the importance of both the knowledge being addressed and the project. In short, leadership must ‘carry the flag’, too. During the first years of operationalising InTouch, the top management sponsor and his direct reports always brought the InTouch subject into discussion during any meeting or field visit. With this kind of action, users feel the drive from leadership and the importance of the subject.

30. Campaign

In an international organisation, full coverage is an issue. Therefore, a team of campaigners is needed to ensure that most targeted people are reached. Schlumberger dedicated a few teams of three people who systematically travelled to remote and urban locations to go through InTouch with the people they met. This campaign activity was particularly rigorous during the first year of InTouch introduction.

31. Shared decision

One of the main differences between InTouch and CRM is that the decision to embark on InTouch came from an open discussion between senior management and the field; in fact the field took the initiative first rather than being pushed by senior management – while the decision to embark on CRM solely came from senior management. It was a decision from headquarters. Sales people did not feel there was a need to do so and they claimed that they were not consulted. The consequence is that CRM is not as welcome in the field as InTouch.

Nonaka and Takeuchi (1995) found that neither a top-down model of management nor a bottom-up model is particularly suited to fostering dynamic interactions for organisational knowledge creation. They proposed a new management process called *middle-up-down management*, which integrates the benefits of the top-down and bottom-up models and is the most fitting model for bringing about organisation knowledge creation. My finding is that the more important factor is indeed the involvement of the knowledge workers in the decision making process for a knowledge management initiative. A shared decision such as the one for InTouch has proved to be much more effective than a mere top-down decision such as the one resulting in the CRM initiative.

32. Autonomy

With the implementation of CRM, Schlumberger oilfield services sales force perceive and argue that their activities, and the way they spend their time, are now under scrutiny. This has resulted in strong resistance from them to collaborating and using the system. The fact that they are asked to report their activities to CRM seems to justify their perception even though it has never been the intention of the organisation to do so. This is also linked to the fact that there is a lack of transparent relationship of knowledge to business activities that the workflow for using CRM failed to be established.

Knowledge workers need to perform their duties in the environment in which they feel they have autonomy (Janz and Prasarnphanich, 2003; Hansen and von Oetinger, 2001; Nonaka, 1994). To transform knowledge, which is understood as residing within individuals in an organisation (Friedman, 2002) or within the communities of an organisation (Giroux and Taylor, 2002) into competitive advantage (Wenger and Snyder, 2000; Brown and Duguid, 1991; Nonaka and Takeuchi, 1995) requires workers to have control over their own time. Competitive advantage is understood, in my research context, as quicker decision making in the field and a faster new product/service introduction. Moreover, Nonaka and Konno (1998) propose the concept of *"ba"* as a "space" for knowledge workers to conduct their knowledge activities. It is the leadership's responsibility to provide this work environment and to create the "ba" culture for knowledge activities to flourish.

33. Shared benefits

InTouch produces different reports usable by either users in the field or management. The reporting benefits are felt by users as well as management. CRM was perceived to only produce reports valuable for management. Most sales people did not feel that the reports produced by CRM had any significance for them. This has since been changing after the management team realised it. Reports were for example: customer

profiles, sales volume by customer. These kinds of report are not generally of interest to sales people because they already know these details. However, reports such as backlog, schedules of order delivery, will be very much wanted by sales people as this kind of information gives them greater control over their work.

A knowledge management initiative that is not felt to have brought benefits to users will not live very long (Fahey and Prusak, 1998). Employees do not collaborate in the knowledge activities only for leisure but more for their own use and benefits (Ghoshal and Gratton, 2002). These shared benefits need to be demonstrated by the end results of the knowledge management system which will be reflected in the reports it produces.

34. Streamlined activities

Schlumberger removed certain activities from users when it asked users to embark on InTouch for knowledge activities. The organisation did not do the same thing for CRM. The arrival of CRM was really perceived by the sales people as an additional task for them to do on top of a workload that already filled or overflowed from the available time within a day.

When a knowledge initiative is introduced to workers and the users will have to spend more effort and time to work with it, it is more than likely that users will refuse to collaborate. It is unrealistic to expect workers to engage in more knowledge activities when they already have more things to do than the available time (Bartlett and Ghoshal, 2002). Leadership must be prepared to drop some activities when replacing them with knowledge activities. Leadership, together with the knowledge workers, must streamline business activities and translate this into a business process where knowledge activities are the integral parts of it.

35. Enriching workers' value

When InTouch was introduced, some positions within the technical service delivery process became redundant and Schlumberger relocated the incumbents of those positions into different positions that were created by InTouch implementation. As a matter of fact, users of InTouch claim that this knowledge system has enriched their work. Unfortunately, this was not the case with CRM. Sales people feel that their value to their organisation is actually going to be less when they collaborate to use the system. This actually remains as the main issue today in the implementation of CRM. By sharing information, a sales person makes himself somewhat redundant within the chain of the sales process itself because the information he provides is what makes him different and useful to the organisation (Styhre, 2002). As soon as this information is shared and used it is turned into non-information (Luhmann, 2000).

Mumford (1965) suggests that change is not always resisted. Implementing CRM or InTouch is a change that is probably inevitable. Mumford and Ward state, "The firm wants and needs flexibility if it is to adapt to changing circumstances in its internal and external environment. On the other hand, it also needs stability if it is to organise its day-to-day affairs smoothly and meet its immediate obligations" (1966:245). Mumford (1965) further argues that it is essential to adapt a fundamental approach which will involve, firstly, an understanding of the nature of social relationships within the organisation; secondly an identification of workers' goals and a recognition that these will differ. With this knowledge, a plan for organising and implementing change must be designed so that innovation assists and is seen to assist

the furtherance of as many workers' goals as possible, or negatively, that it hinders the attainment of as few as possible. An organisation handling change this way needs to recognise such variables as the degree of conflict between one occupational group and another, and the likely effect of change on the power structure (Mumford, 1995). Schlumberger managed well in the InTouch initiative and did not manage to pre-empt this in the CRM initiative.

4.5.2 Discussion on InTouch Operations and Communities

While it is true that InTouch physically appears as a structured repository, it also functions as a facilitator for person-to-person knowledge exchange activities. Therefore, the InTouch 'system' serves both as a knowledge service (person-to-repository) and as knowledge support (person-to-person) for the users. The 35 attributes identified in Project One research reflect what Schlumberger created or where it took actions to enable InTouch to operate in its two functions.

It is important to note from this study that the attribute 'communities' does not really correspond well with the definition of 'communities of practice'. Some members of the InTouch community are appointed and some collaborate freely, and all members work and collaborate together to solve problems or to find better solutions for clients. Lesser and Storck (2001) claim that although many authors assert that communities of practice create organisational value, there has been relatively little systematic study of the linkage between communities of practice outcomes and the underlying social mechanisms that are at work. They further argue that the social capital resident in communities of practice leads to behavioural changes, which in turn positively influence business performance.

The InTouch community has brought business results and my findings show that the nature of membership and the interaction between members are not what scholars define as communities of practice. This leads to an observation that the InTouch community differs in its characteristics when compared to communities of practice. This finding merits a separate study that may lead to an understanding of what characteristics and conditions make this type of community – as found in the InTouch community – able to produce business results.

4.5.3 Discussion on the research methods

I found that recording interviews has four significant advantages over the main alternative, taking notes during and immediately after the interview. First, when listening to the tape I realised that the sense and the theoretical implications of a surprisingly large part of what was said were missed at the time. Second, it allowed me to think about and note ideas for further questions during the interview without the need to worry about missing important data. Third, I have the tape ready for repeated listening. Fourth, it allows me to reflect critically on my interviewing style, and thus improve my technique.

Access to interviewees became a non-issue. With the facility of the internal communication tool within Schlumberger, access to the targeted respondents was

made much easier and faster. A slight concern was the schedule and the tight, allocated time, especially for the top management. For this reason, interviews with top management are normally shorter in time and I let them talk more rather than posing numerous questions. In most cases, this tactic worked very well because they really knew what InTouch was all about and they were very eager to share what they knew and what they had learned, too.

Attempting to convert laddering data into a Hierarchical Value Map (HVM) is an iterative process. The critical difference between this analysis methodology and more traditional qualitative research is that the primary output is structurally quantitative in nature in the form of an HVM. As a consequence of the aggregation process, whereby richness is somewhat reduced, the HVM resulting from this research data analysis shows a high confidence with 82.3% coverage of meaningful ladders. For presentation clarity purposes the guideline is to have the coverage at 70%. The success with which the summary HVM is able to represent the laddering and to reveal the attributes is encouraging. Furthermore, the Schlumberger InTouch team has agreed that the attributes and the HVM represent the reality of InTouch.

The Means-End Chain model and laddering techniques appear to be 'costly' in terms of time for the researcher. It is a manually intensive research process; organising and covering fieldwork, transcriptions and managing the processes make significant demands on the researcher.

4.5.4 Summary and Conclusion of Project One

Knowledge management needs to start with a recognised issue within the business where knowledge is a key factor in resolving it. Attacking problematic issues, identifying their knowledge component, and using the business value of resolving them as justification for knowledge efforts are all good ways to circumnavigate in managing knowledge. InTouch started with a recognised business problem which relates to knowledge. It took too long to answer a technical assistance request, to update documentation and to resolve engineering issues. Rapid and accurate decision-making is crucial in today's business environment, in particular within the oilfield industry due to the nature of the oil business that involves high value assets that incur significant cost. InTouch was created to address this need.

This study has shown that translating knowledge into competitive advantage is not simply a matter of putting in place an intranet-based knowledge management system. Nonaka and Takeuchi (1995) highlight the theoretical enablers for knowledge creation; Obstfeld (2002) highlights the importance of training for effective knowledge mobilisation and diffusion. Sawhney and Prandelli (2000) point out that communities facilitate easier knowledge mobilisation and diffusion; Lesser and Storck (2001) look at Social Network theories to support the notion that a unique knowledge source can be more valuable than knowledge sources shared by everyone (Cummings, 2004). This Project One builds upon the work of knowledge management researchers to elaborate attributes that need to be considered for the effective creation, mobilisation and diffusion of knowledge. These 35 attributes provide a useful starting point for any organisation considering implementing a knowledge management system. The responsibility for ensuring that these attributes are addressed for the systems implementation lies with the management team.

Results show the intricacy of implementing a system that enables the creation, mobilisation and diffusion of knowledge. The attributes are neither linear nor discrete and do not neatly fit into different stages of the knowledge life-cycle. There are interdependencies between the strategy elements, between the beneficial results, and across strategy elements and beneficial results. Much of the literature focuses on each independent knowledge life-cycle stage, for example Nonaka's (1994) work on knowledge creation, Storck and Hill's (2000) work on knowledge diffusion. The finding here has shown the need to integrate across the knowledge life-cycle stages to begin understanding how an organisation can prepare itself to shape knowledge management concepts into a specific programme that brings beneficial results. Because these 35 attributes have enabled InTouch to be operational, and to be both academically and professionally recognised as a knowledge management system that has brought benefits to the company, they can be looked into in greater details and based on this a knowledge management readiness framework may be constructed.
The strengths of this Project One research are that the case is professionally and academically recognised, the respondents cover different stakeholders from different geographical areas, the researcher has abundant and in-depth access to data sources, and that this is evidence-based research applying verified research techniques. The limitations are that the research is on a process within one organisation and that the interviewees, while theoretically sampled, are not many in number.

Project One contributes to academic knowledge in the form of the evidence-based attributes of knowledge management, which complement other works related to it, and in the form of extension of the use of the Means-End Chain model into the knowledge management discipline. It has also contributed to practitioners in the form of providing the evidence-based attributes of knowledge management that managers can consider in shaping knowledge management concepts into programmes that will bring beneficial results to their organisations.

In the next chapter, the work of Project Two is going to be presented. Project Two concerns with constructing the assessment tool to measure organisational readiness for KMS.

CHAPTER FIVE: PROJECT TWO

The previous chapter details the study and the results of Project One. This Chapter Five elaborates the work of Project Two in the Executive Doctorate Programme. The academic and business context of the project is introduced at the start of the chapter. Following this introduction, the detail of the research question, the research strategy and the method for Project Two are discussed. The research techniques used for Project Two are dealt with. The findings and the results of Project Two are then discussed in detail.

5.1 Introduction

Knowledge management has rapidly become an integral business function for many organisations as they realise that competitiveness hinges on effective management of intellectual resources (Grover and Davenport, 2001). For many organisations, this notion of managing knowledge as a corporate resource has been looked to as one of the few foundations that promise to deliver sustainable distinctive competencies in the future (Janz and Prasarnphanich, 2003). Even so, organisation executives continue to struggle with how to implement knowledge management initiatives that may bring beneficial results to the organisation (Siemieniuch and Sinclair, 2004; Gilmour, 2003). Gilmour (2003), moreover, claims that $4.5 billion was spent in 2003 in the USA alone on software and other technologies that are expected to foster knowledge sharing, without bringing the expected results.

Project One addressed the search for attributes responsible for operationalising a system that facilitates the creation, mobilisation and diffusion of knowledge in a technical service delivery process. Organisations refer to these evidence-based attributes in addressing their initiatives for managing knowledge. However, as managing knowledge is a capability (Siemieniuch and Sinclair, 2004; Leonard-Barton, 1998) organisations must be prepared for it. An instrument is required to measure the readiness of an organisation to implement knowledge management systems that facilitate the creation, mobilisation and diffusion of knowledge. Based on this readiness measurement, managers can then take the necessary actions to prepare their organisations for the knowledge management initiatives. Gilmour (2003) insists that central to the problem of an investment in knowledge management without a clear return on it, is the organisations' failure to prepare themselves prior to embarking on such an initiative.

Organisations rarely take the time to evaluate whether they are in a position to implement a system that manages the creation, mobilisation and diffusion of knowledge. They often embark on a knowledge management initiative with the conviction that it is a good idea and important for the business (Siemieniuch and Sinclair, 2004; Gold et al., 2001). Unfortunately, this enthusiasm very often ends in a struggle or even disappointment throughout the process or when looking at the end results of the initiative (Taylor and Wright, 2004). The problem that remains is to develop the factors to evaluate and a method to evaluate them which shows the readiness of an organisation. Project Two of this research addresses this problem.

Knowledge management is very often, if not always, linked to the application of technologies (Grant and Baden-Fuller, 2004; McAfee, 2003). Implementing a knowledge system that manages the creation, mobilisation and diffusion of knowledge is surely linked to the technologies that enable it (Birkinshaw and Sheehan, 2002). As a couple of respondents from Project One stated, "IT (Information Technology) is the entry ticket into the knowledge management world even though managing knowledge is actually much more than technologies". Project One affirmed that implementation of a knowledge management system is not merely a technology or technical intervention. It involves, even more, change management in the different work aspects (Cummings, 2004; Majchrzak et al., 2004; Janz and Prasarnphanich, 2003).

Organisations are profoundly affected by technological advancements (Blosch, 2000) but at the same time require a flexible, customised change model to fit the social network of the specific organisation into which technology is being introduced (Appelbaum, 1997; Mumford, 1995). Scholars such as Emery and Trist (1965), Mumford and Ward (1966), Pasmore (1995), Bijker (1995) and Heller (2001) have agreed that it is not possible to separate 'purely technical' aspects of an organisational intervention from 'purely social'. As a result, therefore, the unit of analysis for an organisational intervention is not only the sum of the combination of social and technical factors, but the 'socio-technical ensemble' (Whitworth and De Moor, 2003; Appelbaum, 1997; Pasmore, 1995). Organisation is not determined by technology, nor is technology determined by organisation - both emerge as two sides of the socio-technical coin during the construction of artefacts, facts and relevant social groups. This is the holistic view which recognises the interplay between social and technical factors. Implementing a knowledge management system is, therefore, a case in point of a 'socio-technical ensemble' (Whitworth and De Moor, 2003).

Bressand and Distler (1995) argue and propose that in the current era of knowledge economy, a socio-technical system can be summarised as the following (in French, 1995:190):

> *« Un réseau est un ensemble de moyens ("Infrastructures") et de règles ("infostructures") permettant aux acteurs qui y on accès d'entreprendre et de mener à bien des projets communs dès lors que ceux-ci sont conformes aux attentes et usages communs ("infoculture") du réseau ».*

This means,

> "A network is a body of means (infrastructure) and rules (infostructure) allowing people – who have access to it – to undertake and finalise common projects as soon as they are in conformity with the expectations and habits (infoculture) of the network".

In this summary, it is implicitly stated that infrastructure is the physical subject that establishes the contact, infostructure is the rules of interaction within an organisation as to how contacts are established and infoculture is the social setting that is created and thus conditioned within which activities take place.

5.2 The Research Question and Method

5.2.1 Research Question

The objective of Project Two, to construct an instrument to measure an organisational readiness for knowledge management system implementation, has led to the overarching Research Question for Project Two as,

> *What factors and measurement scales constitute organisational readiness for knowledge management system implementation?*

The evidence-based attributes, as the results from Project One, and the previous research on the socio-technical system perspective of knowledge management form the basis from which to construct the readiness instrument. Therefore, three further sub Research Questions for Project Two are defined as follows:

1. *What are the relationships between the attributes and the socio-technical dimensions for knowledge creation, knowledge mobilisation and knowledge diffusion?*
2. *How does one measure the organisation readiness to implement a system for the creation, mobilisation and diffusion of knowledge?*
3. *What would be the outlined steps to operationalise the instrument?*

5.2.2 Research Strategy and Technique

Research Strategy

Project Two aims to construct an instrument to measure organisational readiness for implementing KMS from the attributes identified in Project One. The research strategy continues to be the Abductive strategy (Blaikie, 2000). This entails the ontological view that reality is socially constructed, and that epistemologically knowledge can be derived from individuals' everyday concepts and meaning. The Abductive research strategy flows from these ontological and epistemological assumptions. Blaikie (2000) further explains that the Abductive research strategy has two stages: 1) describing the everyday activities and meanings, and 2) deriving categories and concepts that can form the basis of an understanding or an explanation of the problem at hand.

The unit of analysis in Project Two remains the same as in Project One, that is the technical service delivery process and the aspects within the process such as InTouch, the people and the structure.

Data Collection and Analysis

The collected data for Project One serve as the main data for Project Two. Additional data to complete Project Two research objectives is collected from interviewees from Project One.

Data analysis follows the Abductive research strategy where the conceptual constructs – referred to as second-order constructs – must be derived from everyday typifications – referred to as first-order constructs – which constitute participants' social reality. In applying this to Project Two, the data from Project One and the additional data, together with the evidence-based attributes, form the first-order constructs. The second-order constructs, as the results of the analysis, become 1) the one-to-one relationships between the attributes and the STS dimensions for knowledge management, 2) the measurement instrument for organisational readiness, and 3) the outline steps to operationalise the instrument.

Pilot Study

A pilot study for Project Two was conducted prior to going into the main Project Two study. The pilot study was to verify if the designed technique would give the intended results to answer the research questions. During the pilot study I went through five attributes and analysed them into the sub-attributes which link to the STS dimensions with one-to-one relationships. Data from Project One was re-used and I conducted phone-call interviews with three respondents of the Project One Study. They are PD (the InTouch Programme Director), LPG (Knowledge Management Systems Manager), and BA (Contract Manager). Details of the process to analyse the data are presented in subsection 5.2.4.

The relationships of the (sub)attributes, now called Factors, with the stages of the knowledge life-cycle (creation, mobilisation, diffusion) were constructed from the analysis of the data. Details of this analysis are presented in sub-section 5.2.4. By applying a linear statistical model, a measurement scale from 1 to 5 was used to present the conceptual organisational readiness for implementing KMS. The pilot results were obtained and were discussed with my supervisor and the panel members. The pilot study confirmed that the Project Two work could continue with the designed technique.

5.2.3 Adapting STS dimensions to Project Two

In Chapter Three, I discuss the STS dimensions for knowledge management – the work of Pan and Scarbrough (1998), based on the concepts introduced by Bressand and Distler (1995). I take this work, together with the findings of Project One, to form the basis for my work in Project Two.

Operationalising knowledge management systems involves change. Mumford (1965) argues that for a technological introduction or change within an organisation, the socio-technical analysis needs to be completed first before devising plans for making change, if the change is to be acceptable and arouse positive attitudes towards it. This

argument, coupled with my argument in Chapter Three that assessing an organisation's readiness for managing knowledge leads to the conclusion that the readiness of an organisation to embark on the initiative to implement KMS that facilitates the creation, mobilisation and diffusion of knowledge may be described by Socio-Technical System dimensions.

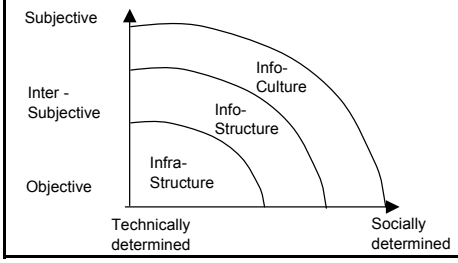
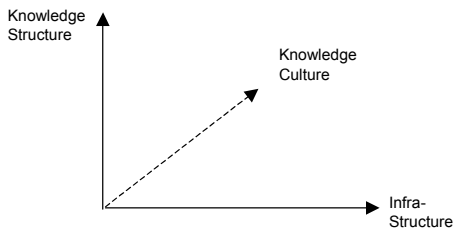
SOCIAL TECHNICAL DIMENSIONS FOR KNOWLEDGE MANAGEMENT	
Pan/Scarbrough definition	**Tanudjojo's application for Project 2**
Infrastructure: the hardware/software which enables the physical/communicational contact betweeen network members	***Infrastructure:*** The physical and organisational structures, the policies and the technologies that are required for operationalising a system that facilitates the creation, mobilisation and diffusion of knowledge.
Infostructure: the formal rules which govern the exchange between the actors on the network, providing a set of cognitive resources (metaphors, common language) whereby people make sense of events on the network	***Knowledge Structure:*** The formal structures, rules and facilitation for knowledge being exchanged. They govern the knowledge activities within the system between workers to create, mobilise and diffuse knowledge.
Infoculture: the stock of background knowledge which actors take for granted and which is embedded in the social relations surrounding work group processes. This cultural knowledge defines constraints on knowledge and information sharing	***Knowledge Culture:*** The social setting within which knowledge activities are performed. This culture is normally taken for granted as it is intangible – embedded in the daily routines and the social relations surrounding the work processes between workers in creating, mobilising and diffusing knowledge.
	

Table 5-1: Socio-Technical Systems dimensions for Knowledge Management – Definitions

Table 5-1 summarises how the STS perspective is applied in Project Two. Pan and Scarbrough (1998) maintained the original terms from Bressand and Distler (1995) as Infrastructure, Infostructure and Infoculture. Pan and Scarbrough (1998), however, provided their definitions shown in Table 5-1. I adapted the terms: Knowledge Structure instead of Info Structure, Knowledge Culture instead of Info Culture, and I keep the same term for Infrastructure.

The Concise Oxford Dictionary defines infrastructure as "the basic physical and organisational structures needed for the operation of a society or enterprise". This definition reflects what is meant by infrastructure in Project Two. The Infrastructure defined for the application of STS to Project Two is adapted from this dictionary definition to fit with the subject of my research.

Info Structure and Info Culture contain the meaning Information from the word Info. Literature, discussed in Chapter Three, clearly distinguishes between data, information and knowledge. Transformation of information into knowledge is by no means linear or uncomplicated (Styhre, 2002). Knowledge is the intelligent use of data

and information and the more knowledge is exercised and shared the more it becomes. Adler states that, "Knowledge is a remarkable substance. Unlike other resources, most forms of knowledge grow rather than diminish with use" (Adler, 2001:45).

The subject of my research is Knowledge and, therefore, I believe that it is appropriate to give the terms their correct meaning. I consequently adapted the terms Knowledge Structure and Knowledge Culture. Their definitions are found in Table 5-1.

5.2.4 Relationships: Attributes and the STS dimensions

The technique used to build a one-to-one relationship between the attributes identified in Project One and the STS dimensions is described in Figure 5-1. For each attribute, an in-depth analysis is made to search for any different sub-attributes that may relate directly to any one particular STS dimension. This analysis is conducted through analysing the original interview data from Project One and the additional phone-call interview data to identify a sub-attribute, now called a Factor, which relates directly to only one of the STS dimensions. According to the Abductive research strategy, the interview transcripts and attributes from Project One and additional data gathered during Project Two serve as the first-order constructs. The Factors produced from the analysis are the second-order constructs. This analysis can be exemplified with the attribute *Standard Language*. This attribute is analysed to have three sub-attributes that each relate to one STS dimension and are described in Table 5-2.

I re-contacted twelve of nineteen respondents in Project One to complement the data from Project One, in order to accomplish the objectives of Project Two. Seven respondents that could not be re-contacted were either not available (5 of them) or had already left the company (2 of them).

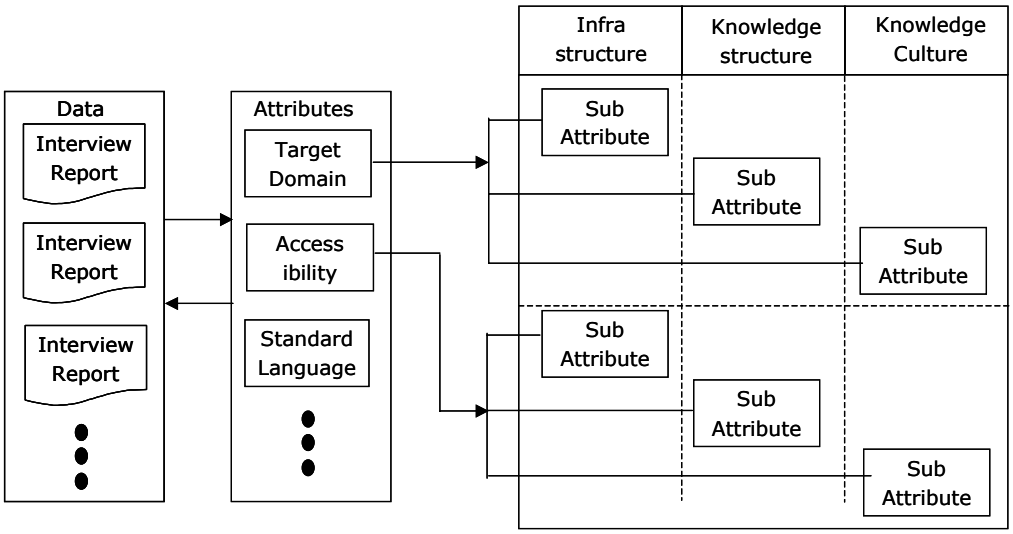


Figure 5-1: Technique to find the structural relationships between the evidence-based attributes and the STS dimensions for knowledge management

Attribute	Factor (sub-attribute)	Relationship with the STS Dimension
Standard Language	Organisation's policy for the use of a standard language	This factor relates to the Infrastructure: Organisation policy is an infrastructure dimension of a socio technical system.
	Documentation established in a standard language	This factor relates to the Knowledge Structure: This links to formal standard language (rule) being implemented.
	Workers who communicate and build trust with a standard language	This factor relates to the Knowledge Culture: This reflects an espoused policy that becomes a cultural aspect of the organisation.

Table 5-2: Example of the analysis of the attribute *Standard Language*

The relationships between the factors and the creation, mobilisation and diffusion of knowledge are analysed through in-depth analysis of the data from Project One, the complementary data for Project Two, and the literature. Each of the factor is analysed with a question: 1) to what extent does this factor affect the knowledge creation?, 2) to what extent does this factor affect the knowledge mobilisation?, 3) to what extent does this factor affect the knowledge diffusion?

Figure 5-2 describes this technique. A scale between 1 to 5 is applied to define the extent to which each factor affects the stages of the knowledge life-cycle. A scale 1 refers to none, that is no affect at all, a scale 2 refers to least significant affect, a scale 3 refers to medium affect, a scale 4 refers to significant affect, a scale 5 refers to a full affect or completely. This analysis can be exemplified with the factors derived from the attribute Standard Language as presented in Table 5-3.

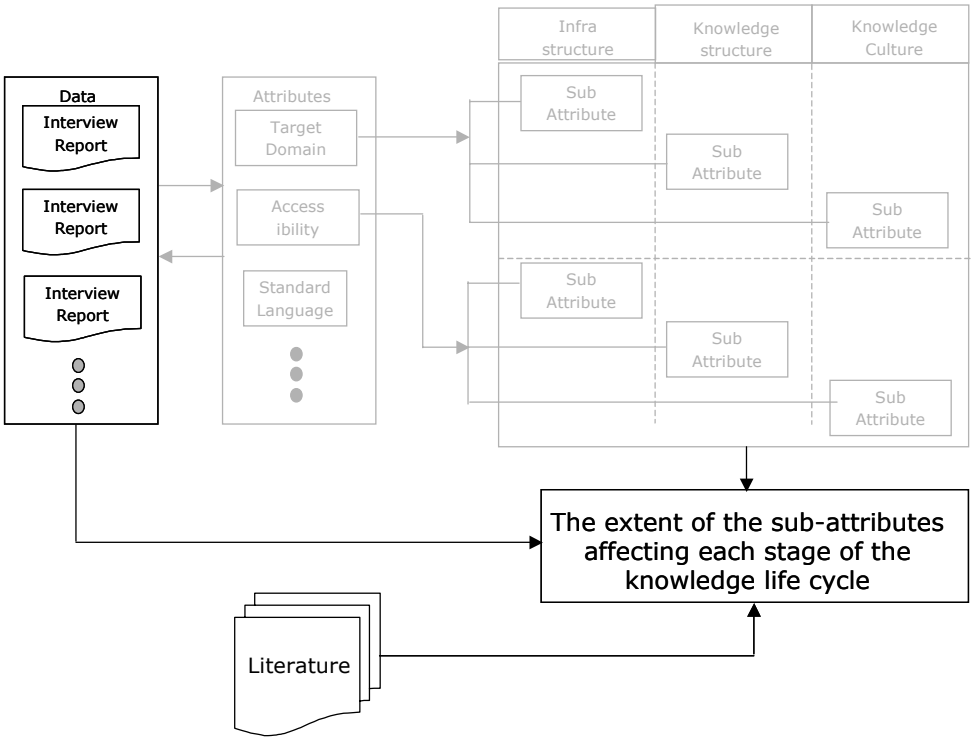


Figure 5-2: Technique to find the relationships between the (sub)attributes/factors and the knowledge creation, knowledge mobilisation and knowledge diffusion

Factor (sub-attribute)	The extent to which this factor affects the:		
	Knowledge Creation	**Knowledge Mobilisation**	**Knowledge Diffusion**
Organisation's policy for the use of a standard language	*1* Policy for standard language neither encourages nor discourages knowledge creation.	*2* Policy for standard language only helps for a small number of people verifying knowledge.	*5* Policy for standard language must exist in diffusing knowledge to establish common ground of understanding.
Documentation established in a standard language	*1* People creating knowledge refer themselves only to the documentation they use.	*2* A small group of people verifying knowledge work in a very close knit. The effect of this factor is minimal.	*5* Diffusing knowledge requires common ground of understanding and, therefore, the related documentation must be in a standard language.
Workers who communicate and build trust with a standard language	*1* Knowledge creation does not really require a standard language. People creating knowledge already have their own 'language'.	*4* In verifying knowledge the small group of people need to build trust through a standard language as a knowledge culture.	*5* Diffusing knowledge requires common ground of understanding and, therefore, the knowledge culture needs to be established that will be possible only if there is a standard language.

Table 5-3: Example of the analysis of relationships between factors and the stages of the knowledge life-cycle.

5.2.5 Measuring Organisational Readiness for implementing KMS

The Factors produced from the analysis described in sub-section 5.2.4 form the core items for the organisational readiness instrument. This study develops an organisational readiness for implementing KMS by using these Factors to evaluate an organisation's scores of the individual Factors. A readiness scale from 1 to 5 is used for the design of the instrument. In measuring the organisational readiness, managers examine each Factor of the instrument and score them according the scale 1, 2, 3, 4, 5 for each Factor. The definitions of the scale are described in the instrument itself in the form of a commentary field in an Excel Spreadsheet (attachment with the file name: Tanudjojo_KIAT Version 1_1_Project3.xls). For example, the scale of 1, 2, 3, 4, 5 of the attribute *Governance body* is described as follows:

1 refers to organisations where projects are neither governed by a process nor milestone check points.

2 refers to organisations where project management processes exist, but checkpoints, at the governance level, do not exist.

3 refers to organisations where a governance body exists and membership is clear. However, this governance body is partially active/involved in projects.

4 refers to organisations where a governance body is a norm in the organisation, and it functions well with clear membership and mandate. Governance board members are well known within the organisation.

5 refers to organisations where a governance body is a norm in the organisation, it functions well with clear membership and mandate, and its members are very well respected within the organisation.

The scale is used to create a descriptive organisational readiness chart for implementing KMS from the organisational readiness instrument as exemplified in Figure 5-3. The presentation depicts a scale from 1 to 5 for each STS dimension for the stages of the knowledge life-cycle. Scale 1 means unacceptable or non-existent, 2 means insufficient, 3 means correct and can be improved, 4 means good, and 5 means excellent. This scale 1 to 5 here has the same meaning as the scale used to evaluate each of the factor explained above. The colour red is an indication that the organisation is not ready for that specific dimension, the colour yellow is an indication that attention is required, and the colour green is an indication that the organisation is completely ready for the specific STS dimension.

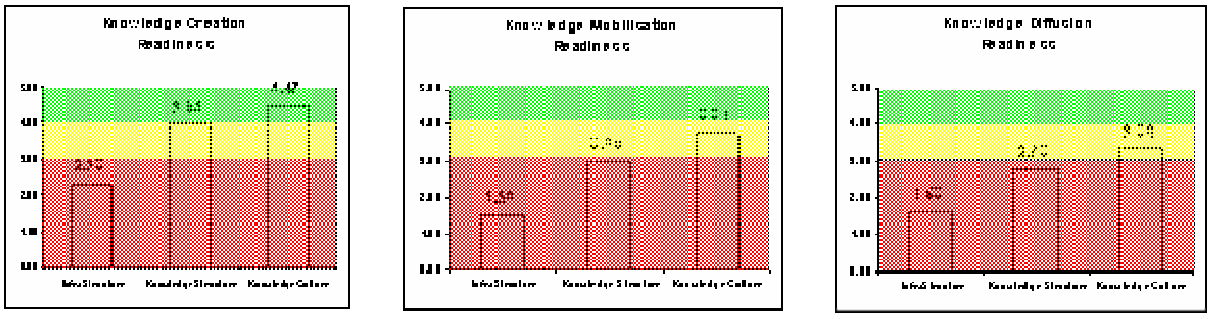


Figure 5-3: Example of the results from an organisational readiness assessment instrument

A linear and average statistical method is used to calculate the scores. A linear statistical model is a model with the assumption that the data falls into a straight line (Field, 2000). In other words, I assume that the contributions of the factors related to a specific STS dimension are equal. My decision to use an average statistical approach is a consequence of the following:

1. The organisational readiness instrument is intended to be a descriptive tool. It, therefore, does not have any objective for any particular prescriptive suggestion for a single factor.
2. Organisations are different from one another. Factors that may carry more weight for one organisation to make it ready for implementing KMS may have less weight for another organisation. The results of the organisational readiness assessment should be considered as indications or descriptions that reflect the snapshot situation of the organisation.
3. Based on 1 and 2 above, the assessment instrument is premised on all factors contribute at the same level to the related STS dimensions. Moreover, according to Field (2000) most of the statistics used in the social sciences are based on linear models.

5.2.6 Structuring the Guidelines to operationalise the organisational readiness instrument

Guidelines to operationalise the organisational readiness instrument are based on an Abductive research strategy. The data from Project One and the complementary data for Project Two are analysed with a focus on how Schlumberger addressed the attributes for developing and implementing InTouch in its world-wide technical service delivery process. The findings from the data serve as the first-order constructs within the Abductive research strategy and the outcome serves as the second-order construct. This outcome is the Guidelines to operationalise the organisational readiness instrument. This approach is depicted in Figure 5-4. The results of this analysis are presented in section 5.3 of this document.

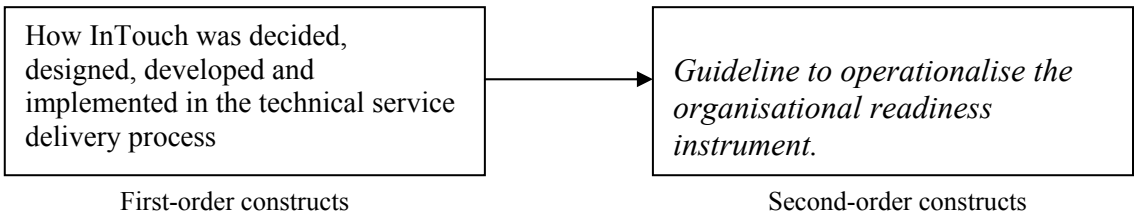


Figure 5-4: The technique to structure the operational Guidelines of the organisational readiness instrument based on the Abductive research strategy

5.3 Findings and Results of Project Two

This section is divided into three further sub-sections where each section is related to the research questions respectively. The research questions are: What are the relationships between the attributes and the socio-technical dimensions for knowledge creation, knowledge mobilisation and knowledge diffusion? (Subsection 5.3.1); How does one measure the organisation readiness to implement a system for the creation, mobilisation and diffusion of knowledge? (Subsection 5.3.2); What would be the outlined steps to operationalise the instrument? (Subsection 5.3.3);

5.3.1 The relationships between the attributes and the STS dimensions for the creation, mobilisation and diffusion of knowledge

The relationships between the attributes and the STS dimensions are tabulated, following the analysis described in sub-section 5.2.4, from page 153 to page 176.

The relationships between the attributes and the STS dimensions

Following the research technique summarised in Figure 5-1, each evidence-based attribute is analysed into Factors, which are linked to Infrastructure, Knowledge Structure, or Knowledge Culture respectively. In the process of establishing the factors from the attributes, I found that:

1. Not all attributes can be analysed into three Factors that link to the STS dimensions.
    a. Some attributes produce three Factors, for example *Accessibility* has the three Factors: Habit of accessing knowledge (Knowledge Culture), Information that is well structured (Knowledge Structure), IT technology (Infrastructure).
    b. Some attributes produce two Factors, for example *Personalisation* has the two Factors: Workers who understand what they need to know to perform (Knowledge Culture), Personalisable IT system (Infrastructure).
    c. Some attributes produce one Factor, for example: governance body (Infrastructure).

2. Some attributes produce Factors which overlap with other Factors produced from different attributes, i.e. they are the same Factors. For example, the Factor *Information that is well structured* is produced by the attributes *Accessibility* and *Content Management*.

These findings show that Factors are the smallest derivatives from attributes that each Factor links distinctively to one STS dimension.

The relationships between the Factors the knowledge creation, knowledge mobilisation, and knowledge diffusion

Following the research technique summarised in Figure 5-2, the extent to which each Factor affects the knowledge creation, knowledge mobilisation, and knowledge diffusion is determined. In the process of establishing this, I found that:

1. Some factors give the same extent of impact across the knowledge life-cycle. For example, the factor *Workers who understand what they need to know to perform* fully affects the creation, mobilisation and diffusion of knowledge.

2. Some factors give a different extent of the impact across the knowledge life-cycle. For example, the factor *Organisation's policy for the use of a standard language* fully affects the knowledge diffusion, but has no impact on knowledge creation and has the least significant impact upon knowledge mobilisation.

These findings show that in preparing organisations for knowledge management managers may examine and select some Factors to address that can better prepare their organisations in the creation, mobilisation and diffusion of knowledge.

ANALYSIS OF ATTRIBUTES TO SUB-ATTRIBUTES AND THEIR LINKS TO THE SOCIO-TECHNICAL DIMENSIONS AND THE KNOWLEDGE LIFE--CYCLE

Attribute	Sub-Attribute	InfraStructure			Knowledge Structure			Knowledge Culture		
The link of the (sub)attributes to the STS Dimensions		Explanation/justification as to why and how this (sub)attribute relates to InfraStructure			Explanation/justification as to why and how this (sub)attribute relates to Knowledge Structure			Explanation/justification as to why and how this (sub)attribute relates to Knowledge Culture		
Level: 1 > None 2 > Least significant 3 > Medium 4 > Significant 5 > Completely		*The extent to which this (sub)attribute affects the knowledge creation*	*The extent to which this (sub)attribute affects the knowledge mobilisation*	*The extent to which this (sub)attribute affects the knowledge diffusion*	*The extent to which this (sub)attribute affects the knowledge creation*	*The extent to which this (sub)attribute affects the knowledge mobilisation*	*The extent to which this (sub)attribute affects the knowledge diffusion*	*The extent to which this (sub)attribute affects the knowledge creation*	*The extent to which this (sub)attribute affects the knowledge mobilisation*	*The extent to which this (sub)attribute affects the knowledge diffusion*
Targeted Domain	Workers who understand what they need to know to perform							Workers perform their work with certain knowledge that they own and develop. This is developed within the social relations surrounding work group processes, and is normally taken for granted.		
								5 Creativity comes when a certain need arises. This is true at least in a business environment.	*5* To be meaningful, discussing and exchanging opinions need to be within a certain context.	*5* Diffusing knowledge requires context

	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.						
					2 The creation of knowledge is not necessarily dictated by business activities	*5* In discussing and verifying the created knowledge, one has to link it with certain activities	*5* Diffusion of knowledge needs to be structured. The link to activities is essential				
Accessibility	Habit of accessing knowledge							Knowledge workers, not only need to know what knowledge they need, but must also know how to access that knowledge. This is a habit that is dictated by the cultural surroundings within the work environment.			
								5 Meaningful creativity is significantly enhanced when workers have the habit of accessing knowledge	*1* Discussion on created knowledge happens within a small number of people for verification. It is normally called for.	*5* Workers need to have the habit of efficient knowledge diffusion	
	Information that is well structured				When organisations want to use knowledge in real-time, mission-critical applications, they have to structure the knowledge base for rapid, precise access.						
					2 Well structured organisation information and knowledge facilitates creativity	*3* Verification and discussion may require certain structured information	*5* Structured information is required for diffusion				

	IT technology	IT infrastructure makes it possible to exchange knowledge to a greater extent and at higher speed.								
		1 IT does not really affect any knowledge creation	*2* IT may help, but within a small community the extent is small.	*5* Diffusion of knowledge requires good IT facilities						
Standard Language	Organisation's policy for the use of a standard language	Organisation policy is an infrastructure dimension of a socio technical system								
		1 Policy for standard language neither encourages nor discourages knowledge creation.	*2* Policy for standard language only helps for a small number of people verifying knowledge.	*5* Policy for standard language must exist in diffusing knowledge to establish common ground of understanding.						
	Documentation established in a standard language				This links to formal standard language (rule) being implemented					
					1 People creating knowledge refer themselves only to the documentation they use.	*2* A small group of people verifying knowledge work in a very close knit. The effect of this factor is minimal.	*5* Diffusing knowledge requires common ground of understanding and, therefore, the related documentation must be in a standard language.			

	Workers who communicate and build trust with a standard language							This reflects an espoused policy that becomes a cultural aspect of the organisation		
								1 Knowledge creation does not really require a standard language. People creating knowledge already have their own 'language'.	*4* In verifying knowledge a small group of people need to build trust through a standard language as a knowledge culture.	*5* Diffusing knowledge requires common ground of understanding and, therefore, the knowledge culture needs to be established that will be possible only if there is a standard language.
Project Manager Reporting	Senior management that shows support through direct reporting and gains respect							The habit of management to show support and the fact that they are respected are the products of the social relations in the organisation environment		
								1 This has no bearing on the knowledge creation	*2* This may help. However, little effect.	*5* Knowledge diffusion as a project requires high visibility to gain an impact
	Organisation reporting structure	This directly links to the infrastructure dimension as this is established through organisation policies.								
		1 The creation of knowledge is normally not affected by the reporting structure	*2* This affects the way knowledge is verified so that it becomes ready for diffusion	*4* Knowledge diffusion is not a function of reporting structure as such. However, it affects its effectiveness.						

Financial Support	Direct funding to individual projects (not diluted) is an organisation policy	As this is a policy within the organisation and the structure within the financial activities of the company, it directly relates to the infrastructure dimension.									
		2 Knowledge creation is not directly a function of the financial support to a project, even though its availability may accelerate it.	*5* The way knowledge is verified through different processes depends on how the initiative is supported financially.	*5* As knowledge diffusion requires significant investment, this aspect completely affects it							
System Feedback	Feedback-response loop is established in the organisation							This is the background of social relations that is normally taken for granted. When this is established, it reflects the culture of the organisation.			
								2 This kind of atmosphere may help facilitate creation only to a small extent	*2* This facilitates to a small extent how efficiently knowledge is mobilised	*5* Without this attribute, ownership of the knowledge diffusion system will not be there	
	The means to channel system feedback	This directly links to the infrastructure dimension as this concerns either IT or other means.									
		2 This helps workers to innovate as a means. However, without it, workers will still innovate.	*4* This becomes more significant when mobilising knowledge for if there is no system ownership the knowledge mobilisation becomes more difficult.	*5* This completely affects the diffusion for if there is no ownership to the system then there is no committed user.							

Content Management	Information that is well structured				When organisations want to use knowledge in real-time, mission-critical applications, they have to structure the knowledge base for rapid, precise access.						
					2 Well structured organisation information facilitates creativity to the extent that it provides help – only small extent.	*3* Verification and discussion may require certain information. Having this information well structured make the validation process easier.	*5* Structured information is required for effective knowledge diffusion because users accessing knowledge follow a certain pattern.				
	Infrastructure that supports content management	This is related to IT capability or capacity of the organisation.									
		2 This helps workers to innovate but not to a significant extent	*3* This becomes more significant when mobilising knowledge as this provides the explicit context.	*5* This affects the diffusion of knowledge as to how easily users will find what they need.							
Governance Body	Ability of the organisation to set up a respected governance body	Governance body is created based on the organisational structure. This facilitates the process and the structure of the knowledge projects.									
		1 This has no bearing on knowledge creation.	*3* This becomes more significant when mobilising knowledge as this provides the explicit "rules of the game" as to how to do it.	*5* This sets the rules of the game which in turn makes the system well targeted and efficient.							

Personalisation	Workers who understand what they need to know to perform							Workers perform their work with certain knowledge that they own and develop. This is developed within the social relations surrounding work group processes, and is normally taken for granted.		
								5 Creativity comes when a certain need arises. This is true at least in a business environment.	*5* To be meaningful, discussing and exchanging opinions need to be within a certain context.	*5* Diffusing knowledge requires context
	Personalisable IT system	Personalisation can only be made when the system is capable of doing so. A capable system is linked directly to the infrastructure.								
		2 This facility helps knowledge creation. Without it, however, creation will not suffer.	*2* In discussing and verifying the created knowledge, this kind of facility will encourage the participation of people to mobilise knowledge.	*5* It is essential for people to exchange knowledge always with purpose, at least in a business world.						
User-friendliness	A system that is fast, real time, and easy to use	This depends on the available infrastructure of the organisation. With up-to-date high speed connectivity and a reliable system, this requirement can be met.								
		2 This facility helps knowledge creation. Without it, however, creation will not suffer.	*2* This factor is nice to have. Without it, knowledge will get mobilised - perhaps slower.	*5* When users need the knowledge, they need it fast. A slow and cumbersome system will turn users away.						

					This links to how the knowledge content within the system is structured.					
	Ease of navigation				*1* This has no significance to knowledge creation	*4* Very important to build the community to mobilised knowledge	*5* Diffusing knowledge requires common structures that are easily navigable. Iterative navigation will discourage users.			
	Workers who understand what they need to know to perform							Workers perform their work with certain knowledge that they own and develop. This is developed within the social relations surrounding work group processes, and is normally taken for granted.		
								5 Creativity comes when a certain need arises. This is true at least in a business environment.	*5* To be meaningful, discussing and exchanging opinions need to be within a certain context.	*5* Diffusing knowledge requires context
Training Programme	Workers who are eager and positive towards becoming trained and sharing what they know							Environment showing workers' eagerness and hopes to continually learn in a social surrounding.		
								5 Creativity comes when people are eager to learn more.	*5* Constructive discussions require an environment where workers feel the need to continually learn.	*5* Diffusing knowledge will not happen when workers do not have the eagerness to learn.

	Training programme that links to people development and business needs	This mainly links to the management decision on how training is incorporated within the organisation policy and structure.									
		4 A clear training structure helps workers to be creative. It gives the basis for it, at least.	*2* In discussing and verifying the created knowledge, clear training structure provides only a guideline for a sense of priority.	*5* Without this workers will feel unable.							
People Mobility	Workers who are eager and positive towards becoming trained and sharing what they know							Environment showing workers' eagerness and hopes to continually learn in a social surrounding.			
								5 Creativity comes when people are eager to learn more.	*5* Constructive discussions require an environment where workers feel the need to continually learn.	*5* Diffusing knowledge will not happen when workers do not have the eagerness to learn.	
	Mobility of workers across geographical areas and/or business units	This links directly to the HR policy of the organisation.									
		2 When workers are put in a different environment, it helps to make them creative - not a must	*3* Workers that individually have different experiences increase significantly the quality of the knowledge mobilisation.	*4* Workers that are put in a different environment have no choice but to find the diffused knowledge.							

Single source	One concentrated reliable knowledge source that links workers who need the knowledge and those who have the knowledge				This reflects the rules of how knowledge is exchanged, i.e. through one media or source.						
					1 This has no contribution to knowledge creation.	*2* When there is only one source, it helps workers to have focused discussions.	*5* A single source ensures the use of it (or the opposite).				
Embedded in Process	Business Process	A defined business process reflects the policy of an organisation as to how things get done.									
		1 It does not really affect any creativity	*2* This may help. But within a small community the extent is small.	*5* Diffusion of knowledge requires it to be within a commonly understood process							
	Adherence to business processes							This reflects how workers adhere to the defined processes; a working culture on how to get things done.			
								1 It does not really affect any creativity	*2* This may help. But within a small community the extent is small	*5* Diffusion of knowledge requires it to be within a commonly understood process	

	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.						
					2 The creation of knowledge is not necessarily dictated by business activities	*5* In discussing and verifying the created knowledge, one has to link it to certain activities	*5* Diffusion of knowledge needs to be structured. The link to activities is a must.				
Alert Feature	Workers who understand what they need to know to perform							Workers perform their work with certain knowledge that they own and develop. This is developed within the social relations surrounding work group processes, and is normally taken for granted.			
								5 Creativity comes when a certain need arises. This is true at least in a business environment.	*5* To be meaningful, discussing and exchanging opinions need to be within a certain context.	*5* Diffusing knowledge requires context	
	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.						
					2 The creation of knowledge is not necessarily dictated by business activities.	*5* In discussing and verifying the created knowledge, one has to link it with certain activities.	*5* Diffusion of knowledge needs to be structured. The link to activities is a must.				

	Alert Feature	This is related to the system capability and the organisation policies									
		1 It does not really affect any creativity	*3* This facilitates the speed of a discussion, esp. in a busy business world.	*4* This is a "forced" diffusion that significantly encourages users.							
Answer to users' needs	Answer to users' needs							This reflects how the organisation takes into account the workers' needs in addressing a knowledge project. This is developed in a social setting within the organisation.			
								3 Creativity is enhanced when the orientation is to answer needs	*3* Mobilisation of knowledge, when related to answering needs, is focused.	*5* Workers become involved only when it answers their need.
Problem Solving	Workers who ask questions							Environment that shows an open question-answer culture encourages workers to ask questions.			
								5 Creativity comes when people ask questions.	*5* Constructive discussions require a "question - answer" environment	*5* Workers tap into knowledge when they have a question to be answered.
	Problem Solving							An atmosphere where the social interaction reflects that solving a problem is important.			
								3 It helps, but creating knowledge is not only to solve problems	*3* Mobilising knowledge for problem solving is made easy.	*4* Workers tap into knowledge to solve or avoid problems.

Knowledge Broker	Workers who are eager and positive towards becoming trained and sharing what they know							Environment showing workers' eagerness and hopes to continually learn in a social surrounding.			
								5 Creativity comes when people are eager to learn more.	*5* Constructive discussions require an environment where workers feel the need to continually learn.	*5* Diffusing knowledge will not happen when workers do not have the eagerness to learn.
	Knowledge broker				Knowledge broker facilitates the workers' interaction in the knowledge activities and ensures the rules of the game are well followed.					
					3 While the creation of knowledge is not dependent on this attribute, KB can well initiate it.	*5* KB facilitates the animation of knowledge discussion.	*5* KB ensures the link between the source and the users.			
Expert Users	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.					
					2 The creation of knowledge is not necessarily dictated by business activities	*5* In discussing and verifying the created knowledge, one has to link it with certain activities	*5* Diffusion of knowledge needs to be structured. The link to activities is a must.			

	Expert users							Expert users are recognised within the social setting of the organisation. As their role is voluntary, it reflects the culture.		
								4 Creation of knowledge is significantly contributed to stimulations initiated by expert users.	*5* At least in a business world the verification from expert users ensures the reliability of the knowledge.	*4* Expert users significantly contribute to the diffusion of knowledge to a large extent but without them knowledge will still be diffused.
Knowledge Champion	Knowledge Champion				This is a facilitator at the delivery site where knowledge is exchanged. A Knowledge Champion provides cognitive resources.					
					3 While the creation of knowledge is not dependent on this attribute, KC may initiate it.	*3* KC may facilitate the animation of knowledge discussion esp. when expert users are involved.	*5* KC ensures the rules of the game are understood and the spirit at the site maintained.			
Subject Matter Expert	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.					
					2 The creation of knowledge is not necessarily dictated by business activities	*5* In discussing and verifying the created knowledge, one has to link it with certain activities	*5* Diffusion of knowledge needs to be structured. The link to activities is a must.			

	Subject matter expert							Subject matter experts are recognised within the social setting of the organisation. As their role is voluntary, it reflects the culture.		
								4 Creation of knowledge is significantly contributed or initiated by subject matter experts.	*5* At least in a business world the verification from the subject matter experts ensures the reliability of the knowledge.	*4* Subject matter experts significantly contribute, but not a 'must' factor.
Communities	Structure of communities				Definition of communities within an organisation and how these communities deal with the knowledge.					
					4 The creation of knowledge is necessarily helped by the structure of communities.	*4* A structured community clarifies and facilitates discussions of knowledge.	*5* In diffusing knowledge, the structure of communities needs to be clear.			
	Working in communities							This is where knowledge is created, mobilised, and diffused in a social setting.		
								4 Creation of knowledge can be greatly facilitated by communities - however not a must	*5* Mobilisation of knowledge is sensible when workers exchange knowledge within communities.	5 Wide exchange of knowledge takes place more naturally in a community setting.

Validation Process	Validation Process				The formal rules that govern how knowledge is to be validated and therefore making it reliable.						
					3 While the creation of knowledge is not directly affected by this factor, validation process may generate ideas.	*5* This attribute ensures the quality and reliability of the knowledge being mobilised and diffused.	*5* This attribute ensures the quality and reliability of the knowledge being mobilised and diffused.			
Measurement	Objectives-based appraisal	Organisation policy that bases the workers' appraisal on objectives.									
		1 The creation of knowledge does not depend on the appraisal system.	*3* Within a community, when sharing the same objectives, this may enhance knowledge mobilisation.	*5* This affects more supervisors to ensure their support in diffusing knowledge.							
	Workers who work through metrics							Metrics oriented working culture is built within a social environment supported by the organisation policy.			
								2 Metrics and objective oriented workers may create more knowledge.	*4* Mobilisation of knowledge works well when members of the community have a common drive to achieve.	*4* This affects more supervisors to ensure their support in diffusing knowledge.

Relevant Knowledge	Workers who understand what they need to know to perform							Workers perform their work with certain knowledge that they own and develop. This is developed within the social relations surrounding work group processes, and is normally taken for granted.			
								5 Creativity comes when a certain need arises. This is true at least in a business environment.	*5* To be meaningful, discussing and exchanging opinions need to be within a certain context.	*5* Diffusing knowledge requires context	
	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.						
					2 The creation of knowledge is not necessarily dictated by business activities	*5* In discussing and verifying the created knowledge, one has to link it with certain activities	*5* Diffusion of knowledge needs to be structured. The link to activities is a must.				

Awareness programme	Organisation communication policy and structure	This reflects directly the policy put in place in the organisation									
		2 This may not affect the creation of knowledge. The lack of it may - but to a lesser extent	*3* Within a community, this may facilitate the knowledge mobilisation further.	*5* This encourages the diffusion of knowledge and a lack of it may jeopardise knowledge diffusion							
	What's In It For Me (WIIFM) awareness							This reflects how workers respond to organisation initiatives.			
								5 Knowledge creation is very much WIIFM in itself.	*5* Mobilisation of knowledge works when workers have their interest satisfied in doing so.	*5* Most, if not all, workers will exchange knowledge if it satisfies their interests, too.
Recognition Scheme	Recognition scheme				This reflects the rules of the game on how recognition for knowledge activities is structured						
					5 Workers expect personal recognition for creating knowledge.	*4* Workers need personal recognition in verifying knowledge to a lesser extent than in creating knowledge.	*4* Workers need personal recognition to become involved in knowledge exchange.				

Knowledge Feedback	Knowledge feedback loop				The rules of the game on how knowledge exchange is governed.						
					5 Generation of ideas for knowledge creation often comes from feedback.	*5* Feedback loop is the essence of knowledge mobilsation	*5* Workers are encouraged when they can give feedback.				
	Two-way communication							A cultural setting within the organisation that dictates how workers behave.			
								5 Knowledge creation is very much generated as a result of two -way communication	*5* Two-way communication is the essence of knowledge mobilisation	*5* Workers' knowledge exchange is made possible when they can practice two-way communication
Communication	Leadership who walk the talk							Commitment from leadership reflects how the social setting is developed within an organisation.			
								2 Knowledge creation may be enhanced by this factor - but it will not stop or initiate it.	*3* Knowledge mobilisation may be enhanced by this factor - but it will not stop or initiate it.	*5* Like any organisation initiative, workers will use knowledge system when they see the apparent commitment from the leadership.

Campaign	Organisation communication policy and structure	This reflects directly the policy put in place in the organisation								
		2 This may not affect the creation of knowledge. The lack of it may - but to a lesser extent	*3* Within a community, this may facilitate the knowledge mobilisation further.	*5* This encourages the diffusion of knowledge and a lack of it may jeopardise knowledge diffusion						
	Structured team to promote knowledge initiative				This shows the facilitation of the knowledge activities. It is a resource for people to be able to make sense of them.					
					2 Knowledge creation is helped by the promotion. However, it is not a critical factor.	*4* Through this team, workers involved in mobilisation of knowledge understand better the rules of the game.	*5* Essential because this team make the diffusion of the initiative/system happens.			
	Reaching all							Openness to reach all is a reflection of how the social setting is shaped within an organisation.		
								1 Knowledge creation is not affected by this attribute.	*3* Mobilisation of knowledge may be helped by this attribute – but it will neither stop nor start it.	*5* For a full coverage this plays a critical role because the absence of it may cause significant consequences.

Shared decision	Identification of important knowledge that comes from workers				The structure of the knowledge to be managed that comes from the workers rather than from management. This is a design of the knowledge initiative requirement which then affects the knowledge structure.						
					4 This attribute will focus the generation of knowledge on what is important for the organisation.	*3* This may affect the prioritisation, but not the spirit.	*5* Workers will deal with the knowledge that they think is important				
	What's In It For Me (WIIFM) awareness							This reflects how workers respond to organisation initiatives.			
								5 Knowledge creation is very much WIIFM in itself.	*5* Mobilisation of knowledge works when workers have their interest satisfied in doing so.	*5* Most, if not all, workers will exchange knowledge if it satisfies their interests, too.
Autonomy	Workers who control their own time							This is a social setting that creates the atmosphere of how workers spend the time under their control.			
								5 Creating knowledge needs "space".	*5* Knowledge exchange activities need some "redundancy".	*5* Knowledge exchange activities need some "redundancy".

Shared benefits	Knowledge Structure that addresses both the organisation's and the workers' benefits				This factor relates directly to how the knowledge is structured and how the rules of the game are set up to benefit both parties. This is a structure concern.						
					5 If the system only provides one way benefit, knowledge creation is unlikely.	*5* Workers will verify knowledge which will give them benefits.	*5* Workers will exchange knowledge that is useful for them.				
	Two-way communication							A cultural setting within the organisation that dictates how workers behave.			
								5 Knowledge creation is very much generated as a result of two -way communication	*5* Two-way communication is the essence of knowledge mobilisation	*5* Workers' knowledge exchange is made possible when they can practice two-way communication	
	Answer to users' needs							This reflects how the organisation takes into account the workers' needs in launching a project. This is developed in a social setting within the organisation.			
								3 Creativity is enhanced when the orientation is to answer needs	*3* Mobilisation of knowledge, when related to answering needs, is focused.	*5* Workers become involved only when it answers their needs.	

Streamlined activities	Relationship of Knowledge to Business Activities				Domain of knowledge for each different activity within an organisation needs to be well understood to establish the formal knowledge that needs to be addressed. This aspect relates directly to establishing the knowledge structure.					
					2 The creation of knowledge is not necessarily dictated by business activities	*5* In discussing and verifying the created knowledge, one has to link it with certain activities	*5* Diffusion of knowledge needs to be structured. The link to activities is a must.			
	Streamlined activities				Activities which are streamlined within the knowledge flow are related to knowledge structure.					
					3 The creation of knowledge is not necessarily dictated by this factor.	*5* Workers will embark on knowledge exchange if the activities are not further burdens for them.	*5* Workers will embark on knowledge exchange if the activities are not further burdens for them.			

Enriching workers' value	Enriching workers' value				This relates to how the knowledge structure can be linked to enrich workers' positions in the organisation.						
					5 Workers need to have confidence in their value in creating knowledge.	*5* Workers will only become involved in the knowledge exchange if they feel that their position is valued.	*5* Workers will only become involved in the knowledge exchange if they feel that their position is valued.			
	What's In It For Me (WIIFM) awareness							This reflects how workers respond to organisation initiatives.		
								5 Knowledge creation is very much WIIFM in itself.	*5* Mobilisation of knowledge works when workers have their interest satisfied in doing so.	*5* Most, if not all, workers will exchange knowledge if it satisfies their interests, too.

5.3.2 KIAT: Knowledge Implementation Assessment Tool

The instrument to assess the organisational readiness to implement a system that facilitates the creation, mobilisation and diffusion of knowledge is presented in Appendix 6. This tool is named *"KIAT"* for ***K***nowledge ***I***mplementation ***A***ssessment ***T***ool. The tool produced in Project Two was KIAT version 1.0. The tool presented herewith is the modified KIAT, i.e. version 1.1, after the Project Three. This tool in a soft copy in a Microsoft Excel spreadsheet format is also presented in the enclosed CD as an integral part of this thesis. The name file is *Tanudjojo_KIAT Version 1_1_Project3.xls*.

This instrument is not intended as a mass survey/questionnaire tool, but rather as an intervention instrument that organisations can use either when commencing or during their endeavours to manage knowledge. Applying KIAT for an organisational readiness assessment for knowledge management requires the assessors to score each Factor.

Those completing KIAT require some explanation of each Factor and the scores (1 to 5). The tool is within an excel spreadsheet, which automatically produces the assessment results graphically as an organisational readiness report exemplified in Figure 5-3. As explained in the previous section, the organisational readiness report provides a snapshot of an organisation's readiness to implement KMS to facilitate the creation, mobilisation and diffusion of knowledge. The organisational readiness report gives a descriptive picture of readiness and provides managers with a basis on which to take informed decisions at the start or during a knowledge management initiative.

5.3.3 Towards a Guideline to Operationalise KIAT

A preliminary Guideline to apply KIAT in an organisational context is presented in Figure 5-5. The Guideline contains a number of steps. First, the unit of analysis has to be decided. Second, the approach, either through a group work or a series of interviews, will then need to be determined in order to apply KIAT. Third, the outlined steps show the iterative manner of evaluating if the group work or interviews have a good representation. This iteration will be satisfied when a decision is made that the collected data are already representing enough coverage for the intended correspondents. Therefore, the fourth step is to decide when the data is already satisfactory. Fifth, once the iteration is satisfied, a final readiness report can be produced. KIAT ends with this report.

Furthermore, Figure 5-6 sets out preliminary ideas for conducting an interview or group work. First, objectives for the interview/group work have to be shared with the participants. This is followed by making participants aware of KIAT's theoretical foundations, the socio-technical system and the stages of the `knowledge life-cycle: creation, mobilisation, diffusion. Then, KIAT's questions and scoring system can be explained to respondents. A validation check of readiness report can be carried out in real time with the correspondents by using the real time readiness report. The interviews or group work end when both the respondents and the facilitator are satisfied with the outcomes. Then, the respondents can begin to analyse the results to reach a consensus regarding the organisation's readiness.

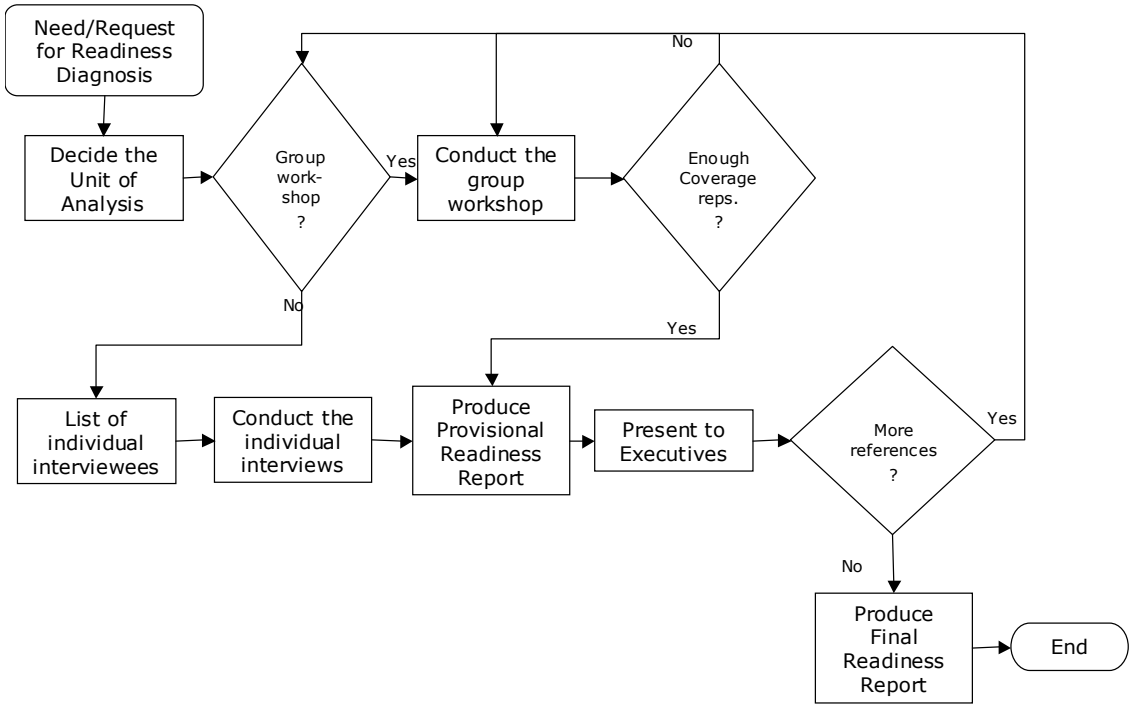


Figure 5-5: The outlined steps to operationalise KIAT

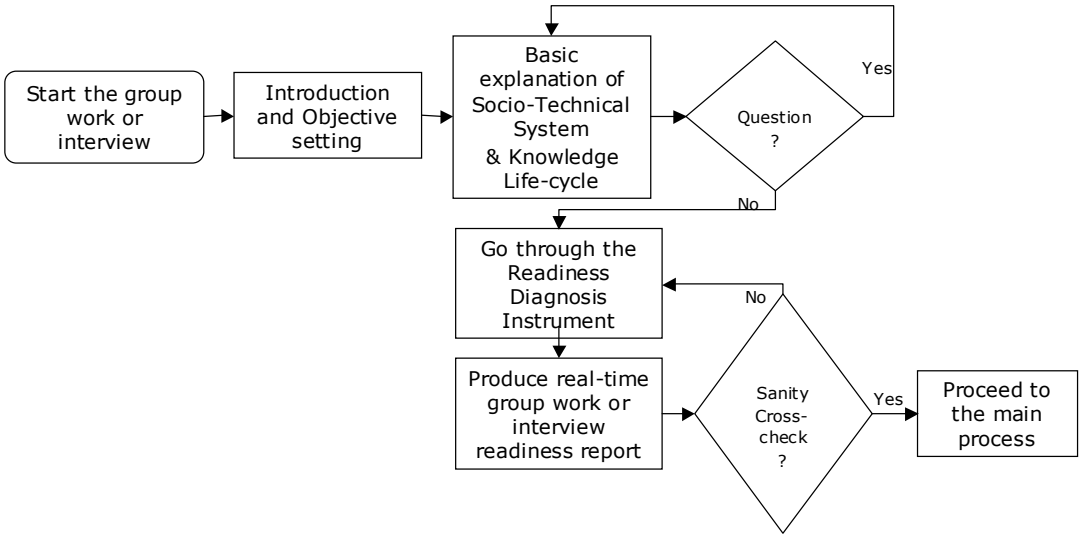


Figure 5-6: The outlined steps to carry out an interview or a group work.

5.4 Summary and Conclusions of Project Two

Project Two of my Executive Doctorate builds upon the results of Project One to develop a readiness assessment instrument for KMS: the Knowledge Implementation Assessment Tool (KIAT). It consists of fifty factors that need to be evaluated within an organisation, and the outline set out steps to operationalise it. Project Two created the first version of KIAT v. 1.0. This version will be modified and developed in Project Three, based on further cases studies. KIAT is an assessment tool, based on a socio-technical approach that provides information to organisations for their descriptive readiness to implement a knowledge management system. Organisations embarking on an initiative to manage the creation, mobilisation and diffusion of knowledge assess their readiness either prior to a decision for or during the implementation of a system to manage knowledge.

The readiness status of the organisation is described and presented in three intertwined axes: Infrastructure, Knowledge Structure, and Knowledge Culture, for implementing a system to manage the three different stages of a knowledge life-cycle: Knowledge Creation, Knowledge Mobilisation, Knowledge Diffusion. KIAT provides information about where to start their organisational intervention.

The results of Project Two complement recent academic work on the subject of organisational readiness for knowledge management in two aspects. One, my findings provide a more comprehensive list of factors and an instrument to measure organisational readiness for managing knowledge than previous research. The comparison is presented in Table 5-4. Two, Project Two contributes to the academic knowledge by extending the STS perspective into the theoretical field of knowledge management.

Project Two has contributed to practitioners by providing an assessment instrument: KIAT. Managers wondering how to get started with managing knowledge may now refer to KIAT in order to first assess their organisation's readiness prior to the decision on an investment for a knowledge management system and during its implementation for the organisational intervention.

The limitation of KIAT is that it is the result of a case study in the oilfield services industry. Therefore, Project Three aims to examine KIAT's applicability to other industries.

KIAT is simple to use and the presentation of the results is easy to understand. This should make it friendly to practitioners. KIAT is constructed from evidence-based attributes and established previous work based on academically widely accepted concepts of STS perspectives This forms a strong base for KIAT.

In conclusion, the results of Project Two have addressed the Research Questions. In constructing the instrument for the readiness model, the Knowledge Implementation Assessment Tool, the Abductive research strategy and the research philosophy remain the pillars to refer to in designing how the instrument is supposed to be operationalised. KIAT is designed to be utilised in a social environment within which the analysis of the assessment is to be carried out.

Project Three is to operationalise KIAT in different business environment and to refine the tool itself. Project Three aims to develop further the Guideline for the use of KIAT. In Project Three KIAT will be applied in three organisations. From these cases KIAT is then refined to become KIAT version 1.1. The next Chapter covers the Project Three report.

Factors for Organisational Readiness Model for Knowledge Management		
Tanudjojo (2005) 50 factors	**Siemieniuch et al. (2004) 14 important issues**	**Taylor and Wright (2004) six-factor model**
Workers who understand what they need to know to perform		
Relationship of Knowledge to Business Activities		
Habit of accessing knowledge		
Information that is well structured		
IT technolgy	Amend technical infrastructures and processes to permit easy access, searching, publication, and utilisation of knowledge	Information quality
Organisation's policy for the use of a standard language		
Documentation established in a standard language		
Workers who communicate and build trust with a standard language		
Senior management that shows support through direct reporting and gains respect		
Organisation reporting structure		
Financial Support		
Feedback-response loop	Establish "ownership" policies for knowledge	Satisfaction with change process
The means to channel feedback		
Infrastructure for Content Management	Create dynamic knowledge and skills databases	
Governance Body	Identify and implement workable security policies	
Personalizable IT System	Create "stretch-targetting process" within the contractual process	
A system that is fast, real time, and easy to use system		
Ease for navigating		
Workers who are eager and positive towards becoming trained and sharing what they know		
Training programme that links to people development and business needs	Amend project review procedures to ensure discussion of capture of knowledge	Learning from failure
Mobility of workers across geographical areas and/or business units		
Single source		
Business Processes	Create generic processes and procedures	A vision for change
Adherence to Business Processes		
Alert Feature		
Answer to users' needs		
Workers that ask questions		
Problem Solving		
Knowledge Broker		
Expert users		
Knowledge Champion	Identify and populate "knowledge evangelist"	
Subject Matter Experts		
Structure of Communities	Identify communities of knowledge	
Working in Communities		
Validation Process		
Objectives-based appraisal	Use personal appraisal procedures to evaluate performance on knowledge management	
Workers who work through metrics	Establish personal performance measures for knowledge sharing	Performance orientation
Organisation communication policy and structure		
WIIFM Awareness		
Recognition scheme	Review reward policies	
Knowledge Feedback loop		
Two-way communication		
Leadership who walk the talk	Build trust through leadership	Open leadership climate
Structured team to promote knowledge inititative		
Reaching all		
Identification of important knowledge that comes from workers		
Workers who control their own time		
Knowledge Structure that addresses both the organization's and the workerss' benefits		
Streamlined activities	Move to an activity-based costing approach	
Enriching workers value		

Table 5-4: Comparison of readiness Factors from Project Two and the previous works by Siemieniuch and Sinclair (2004) and Taylor and Wright (2004)

CHAPTER SIX: PROJECT THREE

The previous chapter details the study and the results of Project Two where a readiness instrument, KIAT, is developed. This chapter elaborates the work of Project Three that is to operationalise KIAT in different business settings. The academic and business context of the project is introduced at the start of the chapter. Following this introduction, the details of the research question for Project Three, the research strategy and the method are discussed. The research method is discussed in detail for each of the three individual cases examined in Project Three. The data analysis technique for multi-case is also presented. The findings and results of the Project Three study are further discussed. The chapter ends with the description of the next step to be taken upon completion of Project Three.

6.1 Introduction

The big idea underpinning the knowledge management phenomenon is that in a fast-moving and increasingly competitive world, a firm's only enduring source of advantage is its knowledge (Davenport et al., 2003; Drucker, 1995). It is increasingly clear that knowledge exchange plays a fundamental role in the effectiveness of organisation (Cummings, 2004; Leonard-Barton, 1998). It is assumed that the ability to invest in knowledge necessarily extends to the capability to manage it (Adair, 2004). In this sense, organisations that do not understand and effectively manage their knowledge as a basis for competitive advantage are at a considerable disadvantage (Grant, 1996). Challenges need to be overcome in order to achieve these market benefits where knowledge is converted into actions (Hansen and von Oetinger, 2001; Grover and Davenport, 2001).

Many companies struggle to derive beneficial results from knowledge management initiatives; implementing knowledge management systems often ends with unsatisfactory results (Gilmour, 2003). Consequently, the usefulness of knowledge management is cast in doubt (Gold et al., 2001). This has initiated some scholars to look into reasons why knowledge management is so difficult and the strategies to make it work (Birkinshaw and Sheehan, 2002; Blair, 2002).

In reality there is a significant gap between theory and actual implementation (Janz and Prasarnphanich, 2003; Grover and Davenport, 2001). Consequently, the literature barely provides a set of coherent attributes that can enable organisations to operationalise the creation, mobilisation, and diffusion of knowledge. Attributes are practical items that organisations actually create or where it takes action when operationalising knowledge management. Project One has narrowed this gap by finding the evidence-based attributes that help organisations have better operational clarity when implementing their knowledge management strategy.

Moreover, scholars (Gold et al., 2001) suggest that a necessary pre-condition for effective knowledge management is required, without which, launching a knowledge initiative might face major obstacles. Siemieniuch and Sinclair (2004) claim that organisations rarely take the time to evaluate whether they are in a position to implement a system that facilitates the creation, mobilisation and diffusion of

knowledge; they often embark on a knowledge management initiative with the conviction that it is a good idea and important for the business. Assessing and preparing the organisational readiness becomes crucial to ensuring that knowledge management initiatives deliver expected results. The findings of the attributes from Project One form the basis for Project Two in developing KIAT, the assessment tool.

KIAT was created from a business process in a single company, Schlumberger, and therefore whether this instrument can be applicable in different industries and/or business processes is evaluated in Project Three. The challenge at hand is to operationalise this instrument in different organisational processes and settings other than the one from which the instrument was created.

KIAT was established from the findings of attributes from Project One and based on a Socio-Technical System perspective. Trist and Bamforth (1951) noted that human and organisational outcomes could only be understood when social, psychological, environmental and technological systems are assessed as a whole. Trist et al. (1967) suggested the term socio-technical to describe a method that emphasises the interrelatedness of the functioning of the social and technological sub-systems of the organisation, and the relation of the organisation as a whole to the environment in which it operates. Therefore, the approach described by Trist and Bamforth in 1951 has now come to be known as a socio-technical system perspective (Griffith and Dougherty, 2001; Pasmore, 1995).

Because the social and technical elements must work together to accomplish tasks, work systems produce both physical products and social/psychological outcomes. In the STS design, the key issue is to design work so that the two parts yield positive outcomes. This is called Joint Optimisation (Emery, 1959 cited in Pasmore et al., 1982). The principle of joint optimisation, which is the goal of socio-technical system intervention, states that an organisation will function optimally only if the social and technological systems of the organisations are designed to fit the demands of each other and the environment. Therefore, for operationalising KIAT in different business settings it is necessary that the approach is with an STS perspective, i.e. one such system approach that focuses on the interdependencies between and among people, technology and environment, to seek to optimise both the social and technical elements in organisations.

The core objective of Project Three is to operationalise KIAT in different socio-technical systems. This can be achieved through operationalising KIAT in organisations different from Schlumberger and/or in Schlumberger's different business processes. As a consequence of the application of KIAT to different organisations and/or processes, it is expected that KIAT might need to be modified or refined. It is then a consequential objective within Project Three to produce a refined KIAT V. 1.1, taking into account the feedback and findings from applying KIAT during the course of Project Three. This project refines the Guidelines, developed in Project Two, for applying KIAT. Learning from the application of KIAT in three organisations the Guidelines of applying KIAT is further discussed in Project Three.

KIAT is also applied in two literature cases: successful and unsuccessful ones. Detailed findings from the literature that reflect the situation of the cases are interpreted into the KIAT instrument and used to answer questions in KIAT, scoring the readiness for each Factor. This literature cases examination is presented in the attached CD of this thesis with a folder titled 'KIAT Application to Literature Cases'.

6.2 Research Question and Positioning of Project Three

6.2.1 Research Question

The discussion in Chapter Three and the objective of Project Three is to operationalise KIAT in different organisations' business processes and to refine the Guidelines for applying KIAT. This leads to the research question for Project Three,

"How can KIAT be operationalised in different business settings?"

6.2.2 Positioning Project Three

KIAT and Organisational Development

Implementing a knowledge management system requires organisations to change (Un and Cuervo-Cazurra, 2004; Alavi and Leidner, 2001). Therefore, when embarking on a knowledge management initiative, an organisation is actually dealing with Organisation Development (OD). It can be considered as the second category of conditions outlined by French and Bell (1999), i.e. the organisation sees an unrealised opportunity; something it wants that is beyond its reach. Enabling actions – interventions – are developed to seize the opportunity.

Organisational change efforts tend to fail if a prescription is applied unilaterally and without proper diagnosis (French, 1969). The OD process described in Chapter 2 calls for a diagnosis as the first critical step. KIAT, the Knowledge Implementation Assessment Tool, is positioned within the OD process as shown in Figure 6-1.

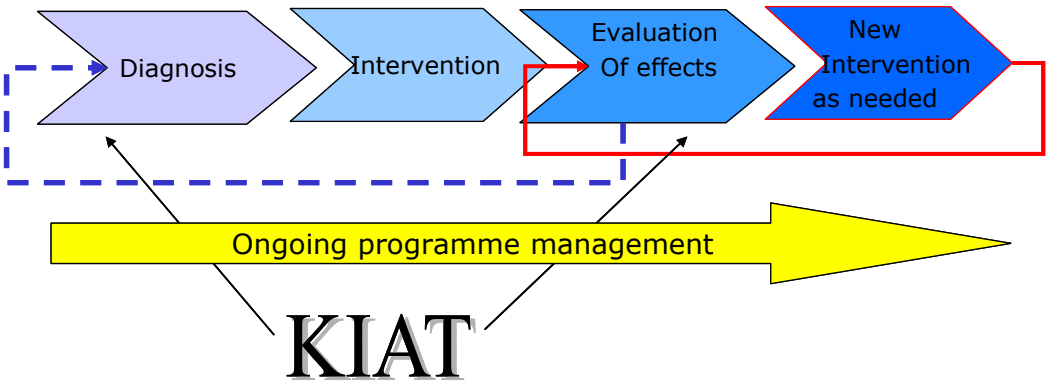


Figure 6-1: KIAT in the OD process

The first step in implementing a KM initiative is to diagnose the state of the organisation system by focusing on its major concerns. Typical diagontic questions

include: What are its strengths? What are its problem areas? What are its unrealised opportunities? Is there a discrepancy between the vision of the desired future and the current situation? The diagnosis identifies strengths, opportunities, and problem areas.

Continual diagnosis is necessary in any planned change effort. Implementation of a knowledge management system is no different. It begins with an audit of 'what is' – the status quo – and then required continual monitoring of the changing status quo over time. KIAT is instrumental at this stage. Comparing 'what is' with 'what should be' reveals the gap between the actual and the desired conditions. Actions plans are developed to close the gap; and the effects or consequences of these actions are continuously monitored to measure progress towards the goal. Diagnosis is basic to all goal seeking activities. KIAT provides the instrument for this diagnosis for a knowledge management initiative implementation.

Operationalising KIAT in different organisational settings and processes requires its application at the diagnostic stage of an OD for knowledge management. Organisations intending to embark on a knowledge management initiative are targets for KIAT application to measure and indicate the readiness to do so.

Tasks to do

Operationalising KIAT requires real organisation cases as described above. Finding organisations considering, or in the process of embarking on, knowledge management implementation is the first task to accomplish for Project Three. The sampling method to select organisations, despite the availability of access, is a subject that is addressed in the research methods section (section 6.2).

Analysis of the application of KIAT in different processes provides insights into the applicability of KIAT and an indication of how KIAT version 1.0 and the Guidelines from Project Two should be modified to make it applicable to different processes in different industries/organisations.The findings and analysis from the organisation cases produce the refined instrument: KIAT version 1.1.

6.3 Research Methods

The choice of the research philosophy for Project Three very much follows and is consistent with the previous two projects. There are two main reasons to stay within the phenomenological approach: one, it stays coherent with Project One and Project Two, and throughout the executive doctorate research scope. Coherency in research philosophy is important (Easterby-Smith et al, 2002) and it helps to streamline the basis for argument. Two, operationalising KIAT requires interviews and/or group work that may follow the same strand of research philosophy.

Abductive research strategy (Blaikie, 2000) remains the core around which Project Three is carried out. Abductive strategy is based on the ontological view that reality is subjective and socially constructed, and that epistemologically, knowledge can be derived from individuals' everyday concepts and meaning. Blaikie (2000) further explains the application of how different research objectives relate to different research strategies detailed in Chapter Three. The Abductive Research Strategy is the

most appropriate for *understanding* and *change* objectives which relate to the *why* and *how* types of research question.

There are two stages in the Abductive Strategy: one, describing the everyday activities and meanings; two, deriving categories and concepts that can form the basis of an understanding or an explanation of the issues at hand. For Project Three, the answers to the KIAT questions serve as the first-order constructs and the categorisation of themes from these first-order constructs become the second-order constructs that will be used for the modification of KIAT version 1.0 to become KIAT version 1.1.

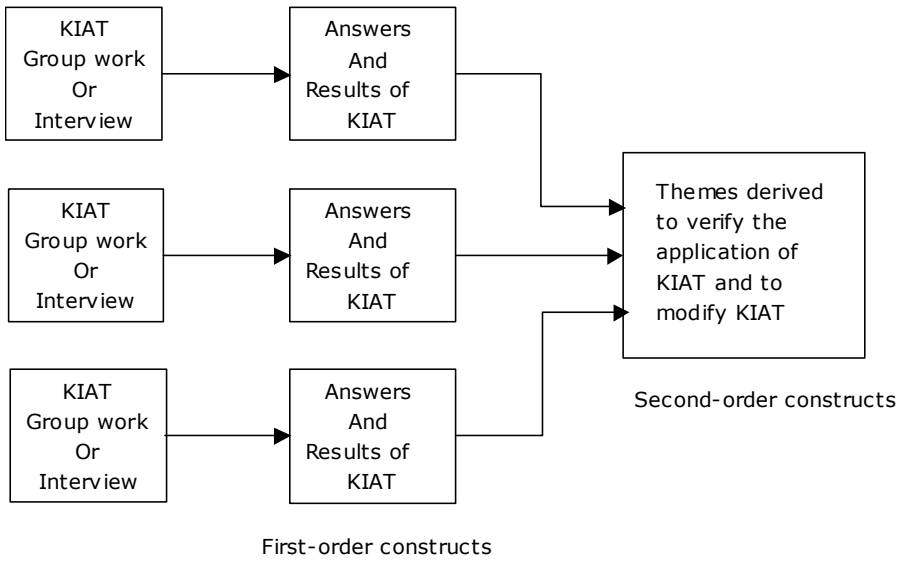


Figure 6-2: Multi-cases analysis

As Figure 6-2 indicates, Project Three deals with multiple-case studies. Each KIAT application in an organisation is the subject of an individual case study with a business process as the unit of analysis, and the study of Project Three as a whole leads to the multiple-case study.

Yin (1994) mentions that multi-case studies have distinct advantages and disadvantages in comparison with single-case studies. The evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust. At the same time, the rationale for single-case designs usually cannot be satisfied by multiple cases. The unusual or rare case, i.e. the critical case, and the revelatory case, are both likely to involve only single cases, by definition. Moreover, the conduct of multi-case studies can require extensive resources and time beyond the means of one research investigator.

The work in Project Three requires KIAT be operationalised in more than one business setting and it naturally falls into the multi-case study technique. The theoretical sampling criteria set forth herein do not require any rare or critical case. Therefore, the multiple cases follow a *replication* logic, which means the logic underlying the use of multi-case studies is the same (Yin, 1994). Yin (1994) further explains that each case is selected so that it either (i) predicts similar results (a literal

replication) or (ii) produces contrasting results but for predictable reasons (a theoretical replication). He also suggests that an important step in all of these replication procedures is the basis of a developed framework.

Figure 6-2 also serves to show the multiple-case approach in Project Three. KIAT is the developed framework. Each individual case study consists of a 'whole' study, in which convergent evidence is sought regarding the facts and conclusions for the case; each case's conclusions are then considered to be the information needing replication by other individual cases. The unit of analysis for all the cases is a business process in the participant organisation. The output of the individual cases will either be similar, i.e. that KIAT is applicable with certain remarks (literal replication), or in contrast, i.e. that KIAT is not applicable with certain remarks (theoretical replication).

The choice of research samples for Project Three follows a theoretical method (Eisenhardt, 1989). A number of theoretical criteria, besides accessibility to the organisations, are defined to determine the organisations in which KIAT is applied: one, the organisations are evaluating or embarking on implementation of a knowledge management system; two, the organisations have clear business processes; three, the organisations are open for group work and interviews with other employees, and not only with a single top management. KIAT is applied to three organisations: Power International, Friends Provident, and Schlumberger LMS.

Power International (a pseudonym) is an international company in the electric energy business. Its operations cover globally more than 50 countries with more than 35,000 employees. Power International is in the process of deciding on the implementation of a knowledge management system in its software services business sector for worldwide application. In particular, it is interested in knowledge management in its Customer Service Process. The initiative is led by the International Director of Software Services, based in their headquarters in Paris, France.

Friends Provident is one of the leading financial services groups in the UK and heavily involved in the insurance industry. It has a history dating back to 1832 and currently employs more than 8,000 employees. Besides a couple of small operations outside the UK, Friends Provident operates mainly in the UK territory. Friends Provident's management is evaluating the feasibility of embarking on a knowledge management project.

Schlumberger is a global oil-field services company. It operates in more than 80 countries with research centres located around the globe employing more than 40,000 people. It has established InTouch – an intranet based knowledge management system in its technical service delivery process. It is currently in the early process of implementing a knowledge management system for its competency development process worldwide. The project is called the LMS project which stands for Learning Management System. The project office is based in Montrouge, France.

The application of KIAT to all these organisation cases follows the draft Guidelines outlined in Chapter Five. In all cases, the semi-structured interview and/or group work technique based on the KIAT instrument is exercised.

The following sub-sections describe the data collection procedure used in each different case, and what actually happened. Following this, the data analysis procedure is also presented.

6.3.1 First Organisation Case: Power International

Data Collection

An initial exploratory interview was conducted with the Director of Software Services (Mr. RW) to understand the organisation's contexts and plans for knowledge management. Power International (PI) has a small knowledge management system operating in North America for its customer service delivery process in the region. The company has an operation across the world but customers perceive the company's service quality as inconsistent with engineers and managers of the company not communicating well enough to serve its customers. PI wishes to implement a wider knowledge management system that will cover an international operation connecting engineers and managers across the world and provide knowledge that can be reached in real time by anybody who needs it.

Subsequently, we conducted an interview to understand his assessment of the organisation's readiness. The interview with the Director in Paris, France was in two sections: the first was to elicit his general perception and the second was to go through the readiness framework. Following this, a couple weeks later, a workgroup discussion was conducted in Amsterdam, The Netherlands, with the targeted users within the Customer Service Process, 3 from the USA and 3 from Europe (see Table 6-1). Group work or focus interviews are effective to validate questionnaires (Easterby-Smith et al, 2002). The results of the group work were communicated to and discussed with the Director.

Geographical Area	Name	Position	Gender
USA	TM	Local Manager	Male
USA	JS	Service Engineer	Male
USA	DM	Service Engineer	Male
France	CF	Service Engineer	Female
Finland	AH	Service Engineer	Male
Romania	YA	Project Manager	Female

Table 6-1: Participants of the Power International group work

The interview with the Director started with a brief explanation about the socio-technical system and knowledge life-cycle, and a couple of questions for him to elaborate: 1) why do you think the knowledge management project you are going to lead will be successful, 2) what challenges do you feel you will have during implementation. The answers to these questions are referred to as the initial perceptions prior to going through KIAT itself.

After this initial perception, KIAT was applied. The unit of analysis was the customer service process. Through a semi-structured interview using KIAT (for the structure and questions of KIAT please refer to the attached .xls file), the Director was asked to score each of the fifty Factors. For each Factor, the Director was asked a couple of times if he understood what the Factor meant and if he was sure with the

score. When we finished going through KIAT, immediate provisional results were delivered to the Director. No iteration was deemed necessary by the Director. A request to record our interview was turned down by the interviewee. However, in return, he provided a number of internal document for use in this project. Detailed notes were taken during the course of the KIAT interview.

The group work in Amsterdam also started with a brief explanation about the socio-technical system and knowledge life-cycle. Once the group understood the subject we proceeded to apply KIAT. The unit of analysis was the customer service process. All six people stayed in one group. Easterby-Smith et al. (2002) suggest that group work or focus interviews should never be entirely without structure. Through a semi-structured group discussion the group was asked to agree and score each of the 50 Factors. When there was a disagreement, a consensus – not a vote – was sought. My role in this situation became a facilitator as Walker (1985) suggests that in group work the researcher or interviewer's role "is not to conduct interviews simultaneously but to facilitate a comprehensive exchange of views in which all participants are able to speak their minds and to respond to the ideas of others" (1985:5). When we finished going through KIAT, immediate provisional results were delivered to the group. No iteration was deemed necessary by the group members. Detailed notes were taken throughout the group work.

Data analysis

The first section of the interview with the Director was to obtain his general perceptions as to why he thought the knowledge management initiative would potentially succeed and what he thought would be the challenges, or in other words what would make the initiative potentially fail. The answers given by the Director were straight forward: a list of Factors – positive Factors for the ones that potentially would make the knowledge management initiative successful and negative Factors for the ones that potentially would make it fail. A matching procedure was conducted from the verbatim for each of these Factors to the Factors in KIAT. A couple of matching examples for each, positive and negative Factors, are described as follows:

Orientation	**Verbatim from the Director**	**KIAT Factors**
Positive	"We really have the commitment from the management, they keep talking and promoting this".	Leaders who walk the talk.
Positive	"We have clear understanding on where we want to implement the system: We have a clear process that our engineers understand it well".	Adherence to business processes.
Negative	"Our IT capability, internationally, may be a challenge for the global implementation".	IT Technology.
Negative	"Some people may feel threatened or uncomfortable".	Addressing worker's value.

Table 6-2: Examples of verbatim from the Director and the KIAT Factors

This initial perception would then be compared to the results from KIAT for finding discussions.

The second section of the interview with the Director and the group work were semi-structured around KIAT Factors and the descriptions. The analysis of the scores for each of the Factors, both from the interview with the Director and the group work, was automatically processed by the KIAT instrument. The descriptions of the Factors that were identified to have caused ambiguities for the Director during the interview and their respective comments were logged for further finding discussions, both for the individual-case and the multi-case. The same procedure was exercised for the group work. The descriptions of the Factors that were identified to have caused ambiguities among the participants were logged with the corresponding comments.

6.3.2 Second Organisation Case: Friends Provident

Data collection

Friends Provident management wanted to better understand how the company was positioned in term of their readiness to implement a knowledge management system. Upon their request, four members from the company received the KIAT instrument and scored each of the 50 factors individually and independently without any facilitation from a researcher. The data were sent to me by email attachment from each participant. The participants were members of the management from different departments of Friends Provident (see Table 6-3).

No.	Name	Department	Gender
1.	BC	Change management	Male
2.	NH	Finance	Male
3.	GH	Customer Service	Male
4.	BG	Sales and Marketing	Male

Table 6-3: Participants from Friends Provident

Six weeks later a meeting was arranged for a group work to focus on the application of KIAT with me, the researcher. The group work was conducted in the Friends Provident office in Salisbury, England. There were three participants for the group work. They were the first three names in Table 6-3.

Despite the fact that they had already gone through KIAT, the group work started from 'fresh', i.e. we followed the outline steps presented in Chapter 5. The issue with the unit of analysis was encountered because Friends Provident had not decided yet in which business process they intended to implement a knowledge management system. Participants of the group work suggested looking into the company as the unit of analysis. The data collection was carried out with this view.

The group work started with a brief explanation about the socio-technical system and knowledge life-cycle. Once the group understood about the subject we proceeded to apply KIAT. Three participants stayed in the group from the beginning

until the end of the session. Through a semi-structured group discussion the group was asked to agree and score each of the KIAT 50 Factors. When there was a disagreement, a consensus – not a vote – was sought. My role in this situation became a facilitator. When we finished going through KIAT, immediate provisional results were delivered to the group. No iteration was deemed necessary by the participants.

Upon completing KIAT with the group work, we then examined the results of each individual answer when they went through KIAT for the first time. Factors with score differences of more than two were revisited. Reasons as to what caused the differences were discussed. The group work session was video recorded and at the same time notes were also taken.

Data analysis

The data analysis for the four individual KIATs were directly processed by KIAT. The analysis of the scores for the 50 factors agreed during the group work was also directly processed by KIAT. The results are presented in section 6.4.

Much more data were obtained during the group work. The descriptions of the Factors that were identified to have caused ambiguities for the participants during the group work, and in comparison with the previous work performed individually, together with their respective comments, were logged for further finding discussions, both for the individual-case and the multi-case.

6.3.3 Third Organisation Case: Schlumberger LMS

Data collection

Contact with the project manager (Mr. BHA) for the LMS project was made in early April 2005 and an interview with him was granted for early May 2005. The LMS was launched worldwide for all business divisions in the same month. A group work discussion for KIAT with 4 participants (see Table 6-4) was granted in August 2005, more than three months after the launch. In both the interview and the group work, the outline steps presented in Chapter Five were followed.

Geographical Area	**Name**	**Position**	**Gender**
France	DM	Field Service Manager.	Male
Italy	IB	HR Administrator	Female
France	GM	Technical Engineer	Male
Scotland	RH	Training Centre Manager	Male

Table 6-4: Participants of the group work from Schlumberger LMS

The interview with the project manager was conducted in his office in Montrouge, France. It started with a brief explanation about the socio-technical

system and knowledge life-cycle. Following this, there were two sections in the interview: the first was to elicit his general perception and the second was to go through the KIAT instrument. For the first section, a couple of questions were asked: 1) why he thinks the LMS project he is leading will be successful, 2) what challenges he feels he will have in its implementation. The answers to these questions will be referred to as the initial perception prior to going through KIAT itself.

After this initial perception finding, KIAT was applied. The unit of analysis was the competency development process. Through a semi-structured interview using KIAT, the project manager was asked to score each of the 50 Factors. For each Factor, the project manager was asked a couple of times if he understood what the Factor meant and if he was sure with the score. When we finished going through KIAT, immediate provisional results were delivered to the project manager. No iteration was deemed necessary by him. The interview was video recorded and notes taken throughout the interview.

The group work started with a brief explanation about the socio-technical system and knowledge life-cycle. Once the participants understood the subject we proceeded to apply KIAT. All four people stayed in one group. Through a semi-structured group discussion the group was asked to agree and score each of the 50 Factors. When there was a disagreement, a consensus – not a vote – was sought. My role in this situation became a facilitator. When we finished going through KIAT, immediate provisional results were delivered to the group. No iteration was deemed necessary by the group members. Detailed notes were taken throughout the group work.

In a separate meeting with the project manager he explained the background of the LMS project. The company has historically a strong commitment to training their employees. As a matter of fact, training is believed to be one of the company's core strategies that create competitive advantage. All newcomers in the company have their training programme outlined and the progress is monitored closely by their supervisors and themselves. Periodically, this is reviewed by the 'powerful' human resources department. With more than one business segment and more than one type of employee population (for example: engineers, technicians, administrators) the training programmes in the company have grown and to manage these programmes is a mammoth task to tackle. Consistency among the programmes is also becoming an issue. The LMS project has been launched to address in particular the following two issues: to reduce the cost to administer the training programmes, and at the same time to enhance the consistency and the easy-to-access training curriculum and training materials. LMS as the knowledge management system is being launched in the company's competency development process.

Data analysis

The data analysis is very similar to the data analysis of the Power International case. The first section of the interview with the project manager was to obtain his general perceptions as to why he thought the LMS would potentially succeed and as to what he thought would be the challenges. The answers given by the project manager were straightforward: a list of Factors – positive Factors for the ones that potentially would make the knowledge management initiative successful and negative Factors for the

ones that potentially would challenge the project. A matching procedure was conducted from the verbatim for each of these Factors to the Factors in KIAT. A couple of matching examples are described as follows:

Orientation	**Verbatim from the Project Manager**	**KIAT Factors**
Positive	“It is at the eyes of top management and in the objectives of all management. They will be evaluated based on this, too”.	* Senior management that shows support through direct reporting and gains respect. * Objectives-based appraisal
Negative	"The first phase of the implementation, the reports will answer more to the management and less to the users. This may create some feeling that users are being 'policed'. However, this is not a major issue".	Knowledge Structure that addresses both the organisation's and the workers' benefits

Table 6-5: Examples of verbatim from the LMS Project Manager and the KIAT Factors

This initial perception would then be compared with the results from KIAT for finding discussions.

The second section of the interview with the project manager and the group work was semi-structured around KIAT Factors and the descriptions. The analysis of the scores for each of the Factors, both from the interview with the project manager and the group work, was automatically processed by the KIAT instrument. The descriptions of the Factors that were identified to have caused ambiguities for the project manager during the interview and their respective comments were logged for further finding discussions, both for the individual-case and the multi-case. The same procedure was exercised for the group work, the description of the Factors that were identified to have caused ambiguities among the participants were logged with the corresponding comments.

6.4 Findings, Results, and Discussions

For each individual case the KIAT findings and results are presented in the attached corresponding .xls file (in the attached CD). Other findings and results throughout the applications of KIAT to diagnose the organisations' readiness are presented in this section. The discussion for each individual case is also presented in this section. The multi-case discussion is presented in section 6.5.

6.4.1 Power International

Findings and Results

Power International started the initiative with a view to solving business problems: 1) customers perceived that the services provided by Power International are not consistently reliable and that 2) the engineers and managers involved in the software services do not communicate well. These problems have been tracked to two root causes: the lack of common support processes, and the lack of common view of the software support knowledge internationally.

The findings and reports or results from operationalising KIAT are captured in the file: *Tanudjojo_PI_RW_Proj3.xls* for the interview with the software services director and in the file: *Tanudjojo_PI_GroupWork_Proj3.xls* for the group work with the six participants. From the first section of the interview with the software services director, he listed nine reasons why the implementation of the knowledge management system would be a success (positive reasons) and seven potential challenges that Power International may face (negative reasons), as his initial perception. All nine positive reasons are identified and matched to the KIAT Factors: 1) Workers are eager and positive towards being trained and sharing what they know, 2) Answer to users needs, 3) Streamlined activities, 4) Senior management that shows support through direct reporting and they gain respect, 5) Leaders who walk the talk, 6) Financial Support, 7) Working in communities, 8) Business Processes, 9) Adherence to business processes. Two of the seven negative reasons are general comments (for example, "Perhaps, some other barriers. I am sure though we will solve them") and are not matched to any KIAT Factor. The matched five Factors are: 1) IT Technology, 2) Addressing workers' value, 3) Identification of important knowledge that comes from workers, 4) Workers who understand what they need to know to perform, 5) Workers who communicate and build trust with a standard language

Two different KIAT reports are obtained from the diagnosis carried out in the customer service process of Power International: Figure 6-3 shows the KIAT report from the interview with the software service director and Figure 6-4 shows the KIAT report from the group work with the six participants.

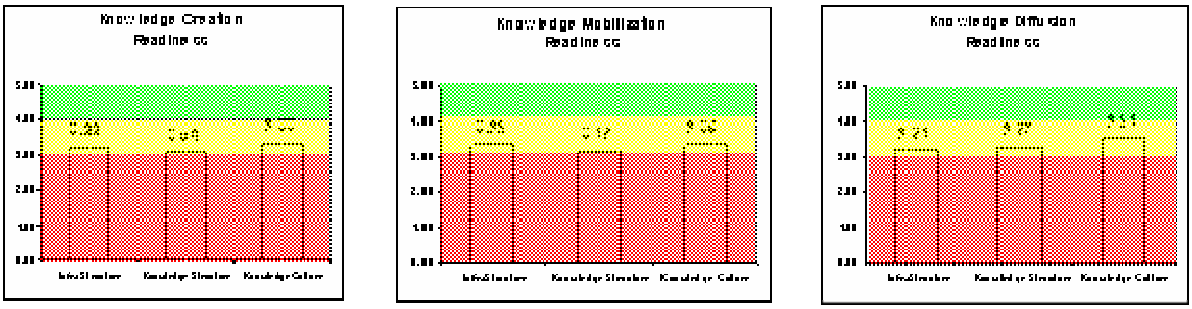


Figure 6-3: KIAT reports from the interview with the service director

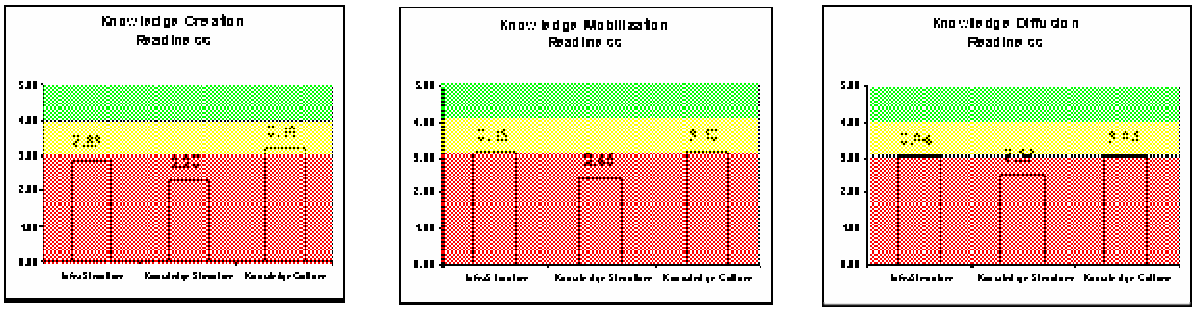


Figure 6-4: KIAT reports from the group work with six participants

KIAT indicates that the differences between the two sets of results are caused by the different scores of assessment for the Factors listed in Table 6-6.

Variances between the management and workers' assessment

	Score (Workers - Mgt.)
Habit of accessing knowledge	-1
Information that is well structured	-2
Workers who communicate and build trust with a standard language	-2
Workers who are eager and positive towards being trained and sharing what they know	-1
Training programme that links to people development and business needs	-1
Mobility of workers across geographical areas and/or business units	-1
Alert Feature	-1
Answer to users' needs	-2
Problem Solving	-1
Knowledge Broker	-2
Structure of Communities	-1
Validation Process	-1
Leaders who walk the talk	-2
Reaching all	-2
Identification of important knowledge that comes from workers	-1
Streamlined activities	-1
Addressing workers' value	-2

Table 6-6: Variances of KIAT scores between the interview with the software director and the group work with the six participants

Upon presenting the two KIAT reports to the software services director, he accepted the result from the group work to be the one that reflects the real situation of Power International readiness to implement a knowledge management system in its customer services process. He stated: "I agree to take the workgroup results as the reference. It helps me to see what I can do more. Obviously, the issue of knowledge structure, and perhaps some Factors in the culture, need to be addressed first. I must address this at the earliest time because I have objectives to meet."

It is important to note that about a month later, a workshop was conducted by Power International and led by the software services director to review the planned knowledge management system implementation and address the readiness Factors.

Discussion

Comparison of the two KIAT reports (Figure 6-3 and Figure 6-4), from the interviews with the director and the group work, shows that while the director's assessment indicates that the organisation is approaching readiness for Power International to purchase and implement a knowledge management system, the potential users' assessment is that the organisation is not yet ready from a Knowledge Structure dimension across all the stages of the Knowledge Life-cycle. The results indicate that Power International needs to pay more attention to the Knowledge Structure prior to embarking on the knowledge system implementation. The use of KIAT directs their attention to intervene by analysing the 16 Factors that constitute the Knowledge Structure dimension, in particular seven Factors that scored two or less. The seven Factors are: Information that is well structured; Single source; Knowledge Broker; Knowledge Champion; Recognition scheme; Streamlined activities; Addressing workers' value.

The director accepted the difference in his and the group's scores. He used group work results as the reference point planning the implementation of PI's knowledge management system. The director accepted it because he acknowledged that the six people in the group work knew what was happening more than he did, as they're at the 'front line' of the operations. Power International conducted a three-day workshop in Amsterdam a month later to find ways for effective implementation of a knowledge management system.

A meeting with the director was held to review the results of the workshop. The workshop was attended by eleven people from different parts of the world. Five of the six participants from the KIAT group work attended the workshop in Amsterdam. The main outcomes of the workshop are presented in three categories: 1) the structure and process as to what and how the knowledge management system would operate. Figure 6-5 shows how Power International viewed the process and where the control of the structure, validation and so forth should take place; 2) the detailed methodologies and implementation plan for accessing knowledge: searching, viewing, browsing, navigating. For each of these access methodologies they further detailed on the 'what' and 'how'; 3) the knowledge management control in which they address what and how they would control the penetration of the knowledge management system into the customer services process. They planned to address the control through a periodic review of the knowledge structure and management (they called it the 'process'), the value of the system through a user survey, the usage level through the number of hits, and the growth of the size through the number of the knowledge articles submitted, reviewed and validated.

Power International continues to implement its knowledge management system. The management is in the process of preparing the organisation in many aspects to ensure success of the initiative. The results of the workshop serve as the starting point to address the weaker Factors identified by KIAT and to strengthen the others. It has delayed its decision on the system choice, hence, the launch date. The decision to delay the launch is an appropriate one to avoid failure by better preparing the organisation. The planned date for the launch is January 2006. The actual launch date is June 2006. As of December 2006, the system is in place and training is on-going. Early feedback indicates acceptance of the system.

For Power International, KIAT results demonstrate a typical situation where management, with its enthusiasm for knowledge management system projects, have a different set of opinions of the organisational readiness from the workers. This suggests that applying KIAT for evaluating organisational readiness needs to include the potential users of the system. Bossidy and Charan (2002) suggest that decisions which are taken based only on the senior management view risk their successful execution. The Power International case indicates that organisations which rely on management perception alone risk potential conflicts, that Factors related to management responsibility are overrated, and Factors that are outside management's direct control are underrated. The director himself made the comment, "It is beneficial to include potential users to go through KIAT, not only management – you can see from the different results." This statement is confirmed by a couple of workshop participants who quote, "This kind of assessment must include users as respondents, otherwise it is going to be management-biased that may create incomplete picture of the organisation's situation".

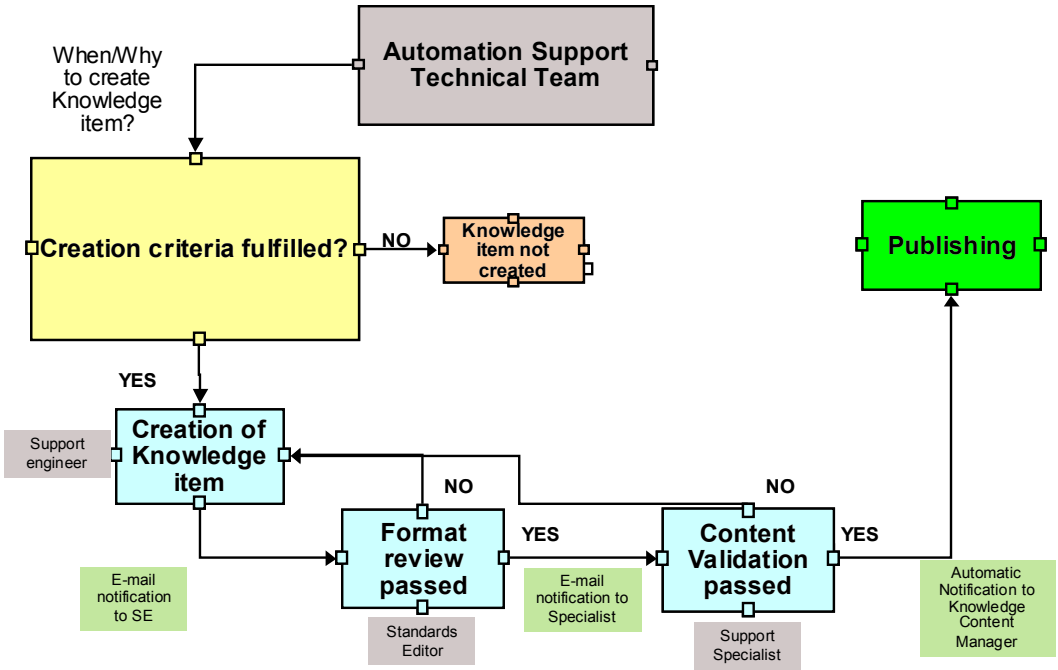


Figure 6-5: The knowledge management system for Power International: the process

Nine positive and five negative Factors were identified by the director prior to operationalising KIAT. A comparison of the Factors that show differences between the director's initial perception and the results from KIAT is highlighted in Figure 6-6.

The analysis shows that four Factors which were initially perceived as high contributors are identified as low contributors to the organisational readiness, and two Factors which were initially perceived as challenges are identified as higher contributors to the organisational readiness.

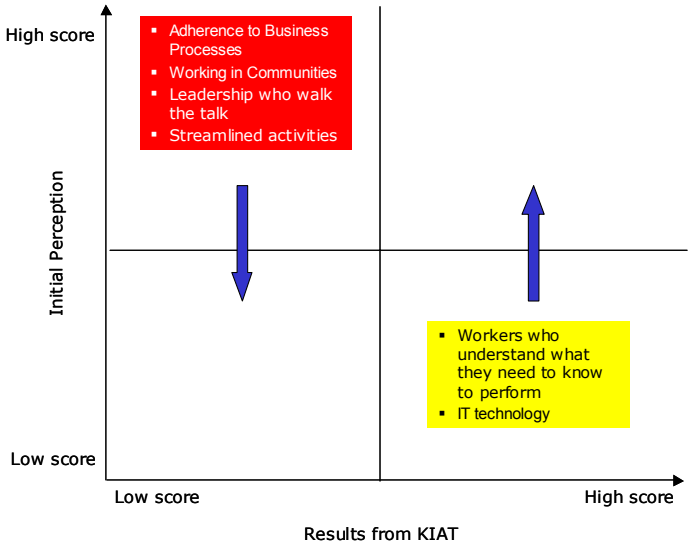


Figure 6-6: The initial perception of the director prior to operationalising KIAT vs. the KIAT Results

Taylor and Wright (2004) and Siemieniuch and Sinclair (2004) suggest that it is the responsibility of managers to prepare their organisation for knowledge management initiatives. Managing knowledge in organisations is a capability that needs to be nurtured and developed (Gold et al., 2001). I contend, therefore, that more importantly, managers taking decisions to implement a knowledge management system in their organisations must know comprehensively what Factors need to be addressed to prepare their organisations for the initiative. When asked, at the beginning, what the positive and negative Factors that the director was facing were, he listed a small subset of Factors – a total of fourteen Factors that may affect the implementation of a knowledge management system compared to the Factors to be evaluated in KIAT. All the Factors mentioned by the directors could be matched to the KIAT Factors. This indicates that the director would need an instrument that could help him comprehensively diagnose the organisational readiness to implement a knowledge management system. KIAT provides a comprehensive instrument for Power International to evaluate its readiness for knowledge management system. The director expressed this simply in one sentence, "The instrument is pretty comprehensive, it covers all that I expected and many more than I never thought of." The workgroup came with a concensus, "KIAT is a complete assessment. We like the fact that it counts the social and technical aspects of the organisation", and " The presentation in the three dimensions: Infrastructure, Knowledge Structure and Knowledge Culture gives an insight at a first glance".

Siemieniuch and Sinclair (2004) argue that rarely does an organisation evaluate its readiness; yet without an instrument that helps to assess readiness, organisations cannot make much progress. In this aspect, therefore, KIAT has

complemented the recent academic work on the subject of knowledge management in the way that it provides a snapshot of the organisational readiness, exemplified by the Power International case. The Power International case gives suggestions for the modification of the KIAT instrument. This KIAT modification will be discussed and addressed in section 6.5 for a multi-case discussion.

KIAT has been usefully applied to Power International. Its results have identified further insights for the company in embarking on its knowledge management project. The Power International case is an example where the KIAT affected executive behaviour. The director is looking for ways to increase the organisational readiness prior to investing in a knowledge management system. Thus, KIAT can support Power International's management take informed decisions.

6.4.2 Friends Provident

Findings and Results

The findings and reports or results from operationalising KIAT are captured in the files: *Tanudjojo_FP_1_Proj3.xls*, *Tanudjojo_FP_2_Proj3.xls* , *Tanudjojo_FP_3_Proj3.xls* , *Tanudjojo_FP_4_Proj3.xls* for the individual work of the respondents from Friends Provident; and in the file: *Tanudjojo_FP_GroupWork_Proj3.xls* for the group work with the three participants.

The four different KIAT results from the department of change management (FP1), finance (FP2), customer services (FP3), and sales and marketing (FP4) are presented in Figure 6-7, Figure 6-8, Figure 6-9, and Figure 6-10 respectively. The results show different snapshots of Friends Provident's (FP) readiness to implement a knowledge management system. They do, however, show a couple of common points: 1) no STS dimension scores at 4 or above for all the stages of the knowledge life-cycle, 2) knowledge structure dimension scores the lowest in each of the results for the stages of the knowledge life-cycle; they score below 3. This implies that FP may have weaknesses in the knowledge structure dimension.

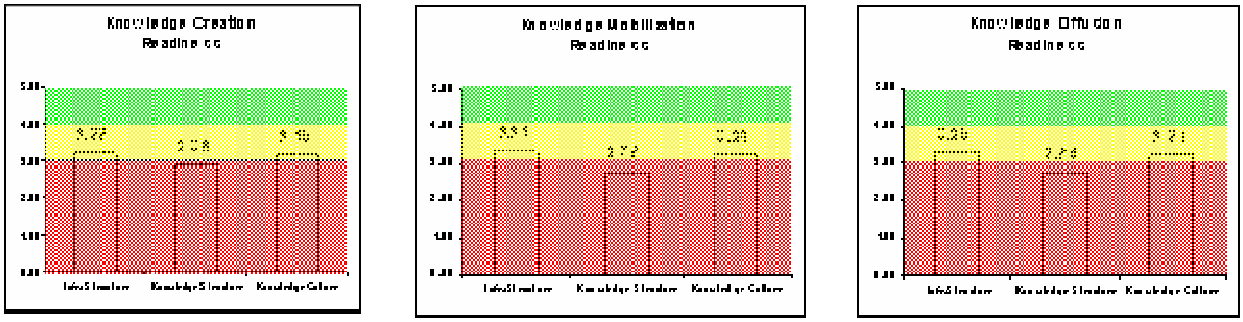


Figure 6-7: KIAT reports from the individual work by the representative from the change management department

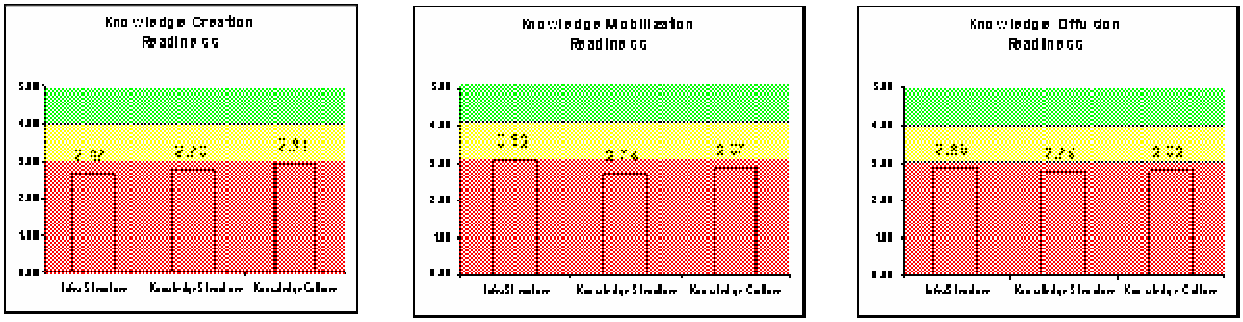


Figure 6-8: KIAT reports from the individual work by the representative from the finance department

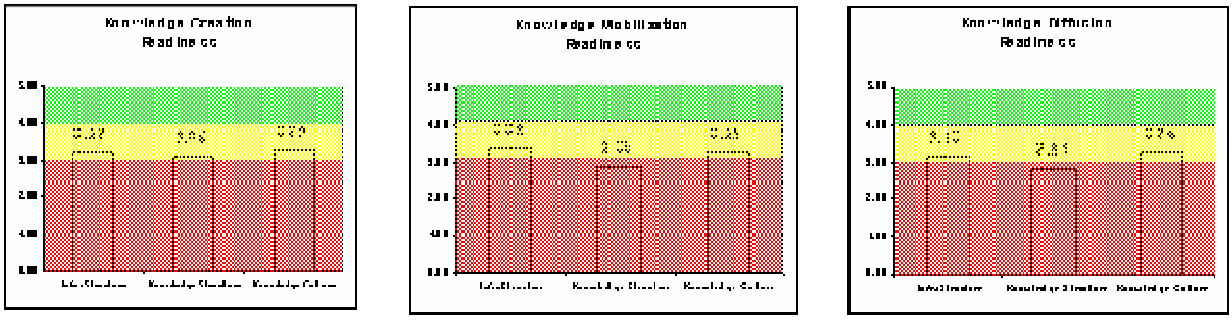


Figure 6-9: KIAT reports from the individual work by the representative from the customer services department

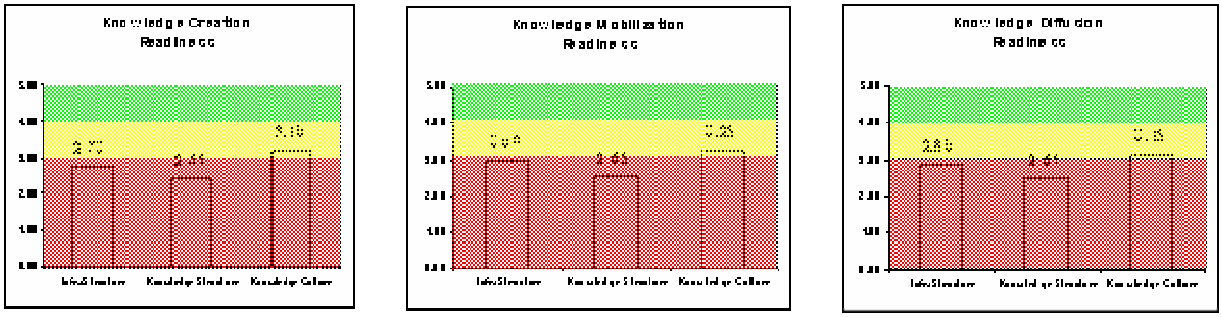


Figure 6-10: KIAT reports from the individual work by the representative from the sales and marketing department

The KIAT results from the group work with the three respondents are depicted in Figure 6-11. The results show that the knowledge structure scores low for all stages of knowledge life-cycle, even though the infrastructure for the knowledge creation readiness shows the lowest in the results. A comparison of the results among the different respondents and the group work is presented in the file: *Tanudjojo_FP_Comparison_Project3.xls*. There are 22 Factors that record a difference of 2 or more points. The reasons as to why the scoring for the Factors is different will be elaborated further in the discussion of the FP case.

In all respondents' and group work results, except one, there is a consistent result that FP has a reasonable knowledge culture readiness for the creation, mobilisation and diffusion of knowledge. This had already been noticed during the group work results discussion with the three respondents. All of them converge on the agreement that within FP one can feel that people love to search for, share and contribute knowledge. The representative from the change management said, "It is encouraging to learn that we score highly on the knowledge culture. It also confirms what I feel about it. FP employees like to share knowledge."

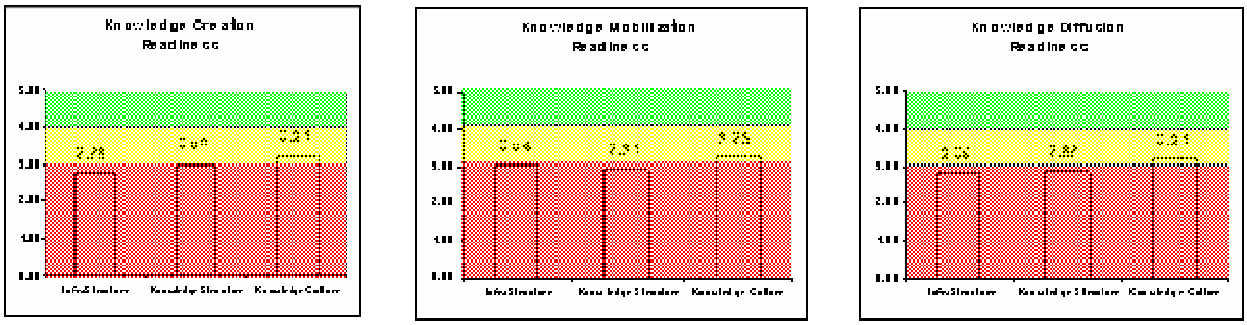


Figure 6-11: KIAT reports from the group work with the three participants

Discussion

The FP case is interesting in that KIAT was applied in a different manner from the other cases. It was actually not in the research design that the four respondents should apply KIAT 'on their own' separately. As explained previously (subsection 6.3.2), upon FP's request, four members from the management assessed their organisation individually and independently without any facilitation from a researcher. The data was sent through electronic mail. However, six weeks later a group work with the researcher was conducted in the Friends Provident office in Salisbury, England. The group work now followed the outlined guidelines in apllying KIAT for organisation assessment. A couple of points can be emphasised for KIAT implementation from this experience: one, that a business process as a unit of analysis is important; two, that KIAT is designed and positioned for a diagnosis within the organisation development process within which the facilitation of such a diagnosis is important.

One fundamental problem dealing with cases is defining what the 'case' is – a problem that has plagued many investigators at the outset of case studies (Yin, 1994). In other words, what is being studied? Without knowing what it is and its boundary, i.e. the unit of analysis, a case study will not lead to any meaningful results (Easterby-Smith et al., 2002; Yin, 1994). Seventeen of the KIAT Factors have been scored with variances of more than two because respondents referred to their own department or silo when making their judgment. This was caused by the lack of a common unit of analysis when they individually applied KIAT. As a matter of fact, all KIAT's 50 factors were scored with their different departments as the different units of analysis.

El Sawy et al. (2001) and Braganza and Lambert (2000) argue that knowledge management is required to support business processes in an organisation. Tuomi (1999), however, insists that a business process has to be recognised when designing knowledge management. A business process is the coordination and integration of activities performed in different functions to create outputs that are of value to one or more stakeholders (Braganza and Lambert, 2000; Hammer and Champy, 1994). KIAT

application with a business process as the unit of analysis requires interviewees or group work participants from the different departments (silos) of the organisation. Examples from the FP case can be demonstrated to illustrate this.

In scoring the Factor 'Validation process', the representative from finance department scored 2 where the others scored 4. The reason for his judgment was that he knew the validation process only happened in the finance department and not in any other department. He scored 2 for FP as a company. The other respondents scored 4 because they knew they have a validation process in their departments. These respondents looked at their own departments as the units of analysis.

In scoring the Factor 'Workers who control their own time', the representative from the change department scored 4, the finance scored 1, and the customer services 3. Quite a difference. Understanding the reasons why this difference occurred reveals that each of them referred to their own departments as the units of analysis when applying KIAT. The finance department representative applied KIAT in a different unit of analysis for this Factor than for the 'validation process' Factor.

Identifying the unit of analysis is a prerequisite in dealing with cases (Yin, 1994). In applying KIAT one needs to ensure the consistency of the unit of analysis: a business process. The importance of the unit of analysis was expressed by the finance department representation after the results comparison discussion, "I guess I overlooked the other departments in my initial answers for some of the Factors," and this is confirmed by the customer services representative, "What we do in customer services may be different from the other departments. I guess what we were missing was the same reference to score KIAT." In other words, they were missing the business process as the unit of analysis.

This discussion on the unit of analysis leads to the core issue that FP really has not defined the objective and the application of the intended knowledge management initiative. Managing knowledge is not meant to manage all knowledge residing in the organisation (McInerney, 2002). Davenport and Prusak state, "What makes knowledge valuable to organisations is ultimately the ability to make better decisions and actions taken on the basis of the knowledge" (1998:170). FP needs to define knowledge that supports its current and future competitive position and decide in which business process it intends to implement a knowledge management system.

KIAT is positioned in the OD process as described in section 6.2.2 of this report. Schein (1969), and French and Bell (1999) mention that the "process consultation model" – the consultant works with the leader and group to diagnose strengths and weaknesses and to develop action plans – is the model to be used for organisation development. This model assists the organisation to become more effective in diagnosing and solving problems (Schein, 1969). Moreover, French and Bell (1999) emphasise that OD uses "the consultant-facilitator role and the theory and technology of applied behavioral science" (1999:26). Therefore, applying KIAT needs a consultant-facilitator role to ensure the consistency of the approach and the analysis. In FP's case, this aspect is illuminated by the inconsistency found in the unit of analysis during the application of KIAT without the consultant-facilitator role. In the group work, however, in contrast, the assessment follows the Guidelines outlined in Chapter Two. The results of the assessment by the groupwork become the reference for a further management discussion in Friends Provident.

KIAT shows that Friends Provident is privileged to have a high score for the Knowledge Culture dimension. Organisational culture is increasingly recognised as a major barrier to leveraging intellectual assets that many scholars deal with it. De Long and Fahey (2000) identify four ways in which culture influences the behaviours

central to knowledge creation, mobilisation and diffusion. First, culture shapes assumptions about what knowledge is and which knowledge is worth managing. Second, culture defines the relationships between individual and organisational knowledge, determining who is expected to control specific knowledge, as well as who must share it. Third, culture creates the context for social interaction that determines how knowledge will be used in particular situations. Fourth, culture shapes the processes by which new knowledge is created. These are all implicit in the definition of knowledge culture (see Chapter Four: Project Two) as *"The social setting within which knowledge activities are performed; this culture is normally taken for granted as it is intangible - embedded in the daily routines and the social relations surrounding the work processes between workers in creating, mobilising and diffusing knowledge."* The higher knowledge culture dimension score is systematically consistent among different data sources. This is one item that organisations struggle with when operationalising a knowledge management system (Cummings, 2004; von Krogh et al, 2001; De Long and Fahey, 2000). Friends Provident appears to be ready on the knowledge culture dimension. Nonetheless, FP's management still need to focus on the Factors with lower scores for knowledge culture and infrastructure.

KIAT has been usefully applied to Friends Provident. Its findings and results have identified insights for the company in its plan for a knowledge management project. Friends Provident needs to define the cross functional business process(es) within which a knowledge management system is to be implemented. Knowledge Culture is one difficult element that normally an organisation struggles with – Friends Provident appears to have a Knowledge Culture that can serve as a base from which to embark on a knowledge management initiative. The management team have to focus their attention on Knowledge Structure and Infrastructure for an effective knowledge management initiative. Specifically, work within the Infrastructure domain that requires more attention is concerned with organisational policies.

6.4.3 Schlumberger LMS

Findings and Results

Schlumberger is implementing LMS to address the gigantic administration tasks required in managing the various training programmes. It also has an objective to enhance the consistency, and the easy-to-access training curriculum and training materials, among these training programmes. LMS as the knowledge management system is being launched in the company's competency development process.

The findings and reports or results from operationalising KIAT are captured in the file: *Tanudjojo_SLB LMS_BHA_Project3.xls* for the interview with the LMS Project Manager and in the file: *Tanudjojo_SLB LMS_GroupWork_Project3.xls* for the group work with the four participants. During the first section of the interview with the project manager, he listed seven reasons why the implementation of the knowledge management system would be a success (positive reasons) and two potential challenges that Schlumberger LMS may face (negative reasons), as his

initial perception. All seven positive reasons are identified and matched to the KIAT Factors: 1) Answer to users needs, 2) Training programme that links to people development and business needs, 3) IT technology, 4) Workers who are eager and positive towards being trained and sharing what they know, 5) Senior management that shows support through direct reporting and gains respect, 6) Objectives-based appraisal, 7) Single source. The two negative reasons are matched with the two KIAT Factors: 1) Knowledge Structure that addresses both the organisation's and the workers' benefits, 2) Structured team to promote knowledge initiative.

Two KIAT reports are obtained from the diagnosis carried out in the competency development process of Schlumberger: Figure 6-12 shows the KIAT reports from the interview with the project manager and Figure 6-13 shows the KIAT reports from the group work with the four participants.

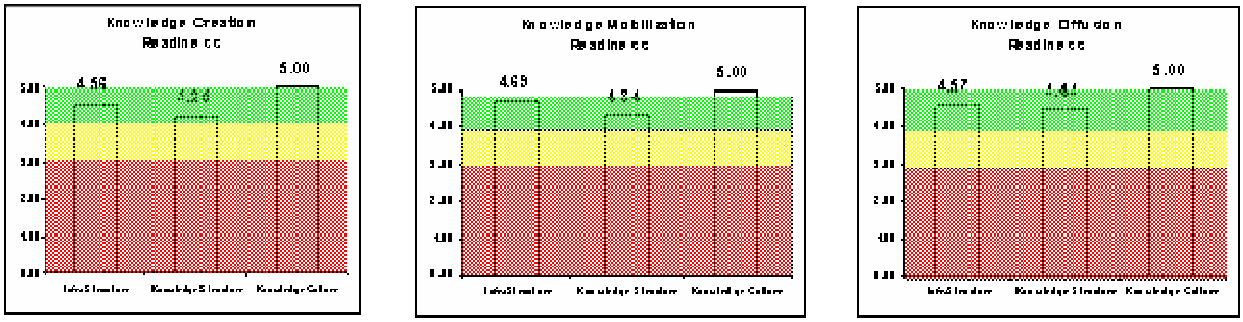


Figure 6-12: KIAT reports from the LMS Project Manager Mr. BHA

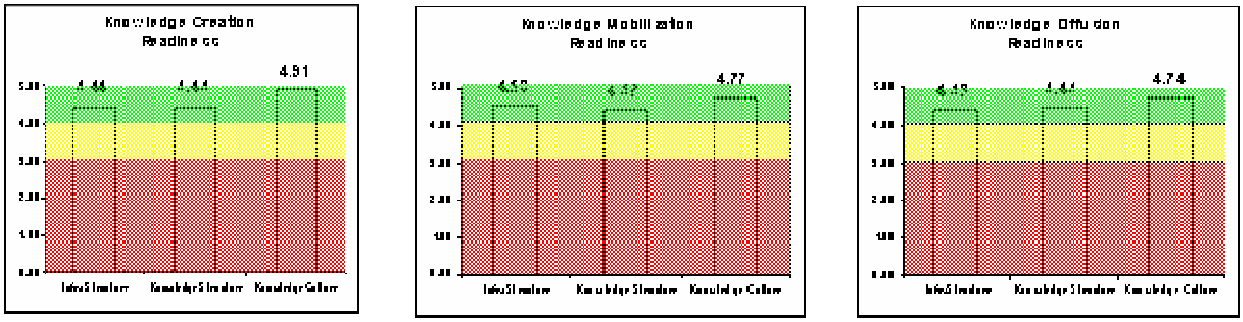


Figure 6-13: KIAT reports from the group work with the four participants

KIAT indicates that the difference between the two sets of results is caused by the different scores of assessment for the Factors listed in Table 6-7.

The score difference between the two for each of the Factors is 1 point except for the Factor "Documentation established in a standard language" which records a difference of 2 points. It is also noted that 3 Factors were scored higher by the group work participants than by the project manager.

Variances between the project manager and the group work participants

	Score (group work - PM)
Organisation's policy for the use of a standard language	-1
Documentation established in a standard language	-2
Workers who communicate and build trust with a standard language	-1
Financial Support	+1
Infrastructure for Content Management	-1
Personalisable IT System	-1
Adherence to Business Processes	-1
Problem Solving	-1
Working in Communities	-1
Validation Process	+1
Reaching all	-1
Knowledge Structure that addresses both the organisation's and the workers' benefits	+1

Table 6-7: Variances of KIAT scores between the interview with the project manager and the group work with the four participants

In both sets of results, Schlumberger LMS appears to have been prepared for the launch of the knowledge management system for its competency development process. The Infrastructure, Knowledge Structure, and Knowledge Culture dimensions all score more than 4 for all stages of the knowledge life-cycle. This means that the diagnosis using KIAT suggests that Schlumberger LMS is ready to implement its knowledge management system.

The interview with the LMS project manager provides a better understanding about the LMS project. Training and learning in Schlumberger has a long history. It dates back more than 30 years ago to the start of a programme called RISE for its engineer training programme. Today, many training and learning programmes are in place in the company such as for example: PEPTEC, ARISE, EXPERT. These programmes illustrate the learning road map for Schlumberger technicians, engineers and inexperienced managers. All these programmes have milestones for each engineer/technician's personal development which both the engineer/technician and his/her manager are responsible for achieving. Learning in Schlumberger is facilitated through different media such as computer-based training, class-room training or net-meeting training. Managing all these training and learning activities becomes a mammoth task. Efficiency and effectiveness from manually managed programmes became a problem to be solved by management. In searching for effective and efficient learning management, coupled with the need for coherency among these different learning programmes in the company, the LMS initiative was launched. In this respect, LMS implements current practices into a system that can be used worldwide and provides consistent, interactive, up-to-date and real time knowledge related to the competency development of Schlumberger's engineers and technicians.

Discussion

Comparison of the two KIAT reports (Figure 6-12 and Figure 6-13), from the interviews with the project manager and the group work, shows that Schlumberger is

ready to implement an LMS system. The results indicate that the project manager has a more optimistic view of the knowledge culture dimension across the stages of the knowledge life-cycle than the group work participants. This is not the case with the other two dimensions.

Upon presenting and discussing the results from the group work to the project manager, he said he was not surprised with the results saying, "I told you that my opinions reflect the users' opinions, you still wanted to talk to them and here it is the results confirm what I said." However, it is still noted that while the project manager scored 5 for the knowledge culture, the group work scored less. Being a project manager, and having more enthusiasm for the LMS project, may have resulted in these biased KIAT reports. When this was pointed to him, the project manager answered,"You cannot remove my bias from my answer. It is true. But, as you are now aware, LMS is really putting what we already practiced into a system that will provide us with easy to access, easy to update, and real time knowledge to what we already followed before LMS. There is nothing new in it. What LMS brings to us is its efficiency and, therefore, the benefits to the company will be a reduction in cost, a more up-to-date knowledge of the employees' competencies, and the consistency of employees' competency monitoring between the employees themselves and the managers."

IT can lead to a greater breadth and depth of knowledge creation, mobilisation and diffusion in organisations (Carlsson et al., 1996; von Krogh et al., 2001). When organisations want to use knowledge in real time, mission-critical applications, they have to structure the knowledge base for rapid, precise access (Grover and Davenport, 2001). Managing knowledge, however, is much more than implementing technology (Davenport and Prusak, 1998). Other related considerations, as outlined in KIAT Factors, need to be put in place; and understanding the target, the objective and the choice of technology is fundamental (McAfee, 2003; Ross and Weill, 2002) because the technology's valuable role in knowledge management is to carry the other considerations across geographical and functional borders and to reduce time delay (Carlsson et al., 1996). Schlumberger appears to have prepared itself a long way back to implement LMS as a knowledge management system to support its competency development process. The implementation of LMS is therefore a 'translation' process from what the company has been doing in the past into intranet-based management of knowledge. The experience with *InTouch* also helps Schlumberger ready to implement LMS because, as revealed by the project manager, 60% of the LMS users are also *InTouch* users.

When asked at the beginning about what the positive and negative Factors were that the project manager was facing, he came up with a small subset of Factors – a total seven positive and two negative Factors, that might affect the implementation of a knowledge management system compared to the Factors to be evaluated in KIAT. All the Factors mentioned by the project manager could be matched to the KIAT Factors. This indicates that an instrument could help project managers to diagnose the organisational readiness to implement a knowledge management system. KIAT has provided a comprehensive instrument for Schlumberger to evaluate its readiness for LMS implementation. KIAT reveals to Schlumberger what it has actually done to prepare itself for the LMS. In other words, KIAT helps Schlumberger LMS project management *to know what they 'already knew'*. The analysis of the first perception of the project manager does not show any anomaly. The seven positive Factors all scored 4 or more and the two negative factors scored 3.

The Schlumberger LMS case suggests a modification of the KIAT instrument. This KIAT modification will be discussed and addressed in section 6.5 for a multi-case discussion. The application of KIAT to the Schlumberger LMS case emphasises the stance that choosing and implementing technology, in this case LMS, must come after other considerations – KIAT Factors – have been rehearsed.

6.5 Multi-case discussion

6.5.1 Operationalising KIAT

Objective and Unit of Analysis

Power International and Schlumberger LMS cases have clear objectives as to what these organisations want to achieve with a knowledge management system. Friends Provident does not appear to have stated objectives at the time of operationalising KIAT. For Power International, the objective of the planned knowledge management system implementation is to provide worldwide common processes and a common knowledge base where engineers and managers can interact internationally to create, mobilise and diffuse knowledge in order to better support the customers. This is considered as essential to establish a credible worldwide capability. Schlumberger's objective to implement the learning management system is to ensure coherency among different business segments in its people competency development process, and to reduce the administration costs of its sophisticated training programmes across the company. In order to have a meaningful knowledge management system organisations need to express explicitly their reasons why a knowledge management system is required.

The KIAT results for Power International and Schlumberger LMS may show differences between different interviews and group work. However, the varieties are not at the same level as the findings and results from the Friends Provident case. See section 6.4 for the details of the results. There appears to be more agreement/coherency between management and users in the Schlumberger LMS case than from the Power International case.

Cross functional business processes is one potential unit of analysis in applying KIAT. Another unit of analysis is the processes *within* a function or vertical silo. The first set of Friends Provident data (individual responses from the four respondents) illustrates this. In scoring the factor *Single Source* respondent FP1 referred to the IT department (score 2) and FP2 referred to the product department (score 4). These two different respondents used two different units of analysis, i.e. two different vertical silos. Using the processes found within a single function or silo as a unit of analysis conflicts directly with the very essence of knowledge management that is cross-functional (Carlsson et al., 1996; Davenport and Prusak, 1998; Brown and Duguid, 1991). Braganza (2004) theorises that organisational knowledge can be managed at the level of business processes that serve customers and the wider set of

stakeholders. This study goes beyond current theories to suggest that the unit of analysis for understanding knowledge readiness is the cross functional business processes. KIAT, therefore, is best applied at the level of cross functional processes rather than those found within vertical silos. This research takes an evidence-based approach to extend current thinking to argue that implementing a knowledge management system needs to refer to a cross functional business process as the unit of analysis.

The objectives described in the different cases suggest that knowledge management systems are implemented to support their operations to compete in the industry within which they operate. The majority of organisations believe that much of the knowledge they need exists inside the organisation, but identifying that it exists, finding it, and leveraging it remained problematic (Carlsson et al., 1996; Cranfield University, 1998). The diagnosis provided by KIAT is aimed at illuminating what Factors organisations need to examine to start a knowledge management initiative and how ready they are in a 'snapshot' situation. Diagnosis is basic to all goal seeking activities (French and Bell, 1999).

Participation from different functions in a group work

As the unit of analysis for KIAT is a cross-functional business process, it is important to ensure that participants in a group work come from different functions. In other words, it has to be a *cross-functional* group. All the group works from the three different cases were represented by different departments or functions. A group work with the participants coming from only one functional department risks a bias of that group and skews the reference for the unit of analysis. The three different cases exemplify the rich discussion among participants during the group works.

Researcher/Consultant facilitation

Operationalising KIAT requires a researcher/consultant facilitation approach. French and Bell (1999) suggest that the process consultation (P-C) approach outlined by Schein (1969) is the appropriate facilitation model for Organisation Development. "P-C is a set of activities on the part of the consultant which help the client to perceive, understand, and act upon process events which occur in the client's environment" (Schein, 1969:9). Moreover, Schein (1969) suggests that P-C involves the client manager and the consultant or researcher in a period of joint diagnosis. This requires, among other things, that the consultant/researcher be expert in how to diagnose and how to establish effective helping relationships with clients.

The Friends Provident case is not only a good example of the need of a unit of analysis, but it also serves as a good description about how a P-C approach is required to operationalise KIAT. In the case of Power International and Schlumberger I served as the 'consultant' profile in the data collection phase. Often, questions had to be iterated and elaborated further to bring out the actual opinions of respondents. An example from the interview with the Schlumberger LMS project manager can illustrate this situation. We were at the Factor *Structured team to promote knowledge initiative*. The project manager was not sure how to answer this. He explained that, "Yes we have the core team to do so – however, the penetration to the field is really more to a 'mushroom' type rather than 'structured' type." After a few exchanges upon

this subject, it became clearer to him that what happens in Schlumberger is indeed 'structured' as what he called 'mushrooming type' really grows on purpose with a structure in mind – not sporadically. In the case of Friends Provident it is even more evident when we went through the comparison of the group work results and the individual ones, as explained in section 6.4.2. The P-C approach is indeed required to operationalising KIAT.

6.5.2 KIAT Results

The use of KIAT for the organisations

The application of KIAT to the three organisations, Power International, Friends Provident, Schlumberger LMS, has brought various different meaningful results for each of them. Power International took the benefits from the results and revised their plan to implement the knowledge system. They identified areas they needed to work on and are currently in the process of addressing them, in particular Factors related to the knowledge structure dimension. Friends Provident learnt that in order to implement a knowledge management system they need to decide the objective and the business process within which the system is going to operate. They also learnt that they have a reasonable readiness for the knowledge culture dimension across the knowledge life-cycle stages. KIAT also reveals what might be an interesting phenomenon in its sales and marketing department (even though it is outside the scope of this research project). Schlumberger LMS now know what they 'already knew' as to why they are ready to implement LMS.

The objective of KIAT is to provide managers with a diagnostic instrument with which they can evaluate how ready their organisation is and what Factors they need to address in order to pursue the implementation of a knowledge management system in their organisation. As exemplified by Power International and Schlumberger LMS, managers' perception of what make them ready or not ready to implement a knowledge management system is limited to a few Factors, i.e. fourteen Factors in the Power International case and nine in the Schlumberger LMS case. Furthermore, literature related to an organisational readiness for knowledge management lists fourteen (Siemieniuch and Sinclair, 2004) and six (Taylor and Wright, 2004) overlapping Factors. In this respect, KIAT widens the range of factors managers need to consider when taking investment decsions, for example, about knowledge management systems. KIAT produces readiness reports based upon socio-technical dimensions – infrastructure, knowledge structure and knowledge culture – to give management teams deeper insights. The extension of this theoretical framework takes the field of knowledge management further than is currently available in the academic literature.

KIAT Results and the knowledge life-cycle

The KIAT results can show major differences in organisational readiness. This can be exemplified by comparing Power International and Schlumberger LMS results (see

sections 6.4.1 and section 6.4.3). They are two different results, even though not the extreme contrasts. The KIAT results demonstrate clear differences between the three socio-technical system dimensions for knowledge management, for each of the cases. For example, in the cases of Power International and Friends Provident, the knowledge structure dimension is singled out to be the weakest among the three STS dimensions. However, for each of the STS dimensions, the KIAT results show that the difference of its readiness across the stages of the knowledge life-cycle does not have the same resolution. The Infrastructure readiness for the knowledge creation stage of the knowledge life-cycle, for example, does not differ much from the infrastructure readiness for the knowledge mobilisation or from the knowledge diffusion stages of the knowledge life-cycle.

Theoretically, KIAT results can show major differences of a certain STS dimension between the different stages of the knowledge life-cycle. However, none the cases presented in this Project Three report show this type of phenomenon. Following his research on the subject of organisational learning, March (1991) describes that there are two general situations involving the creation (development or exploration in March's terms) and mobilisation and diffusion of (use of or exploitation in March's terms) knowledge in organisations. He modelled the mechanism of these two situations that reflect the tension between the exploration and exploitation of knowledge. Furthermore, he argues that the exploitation of knowledge increases the average performance and reliability of an organisation where exploration of knowledge increases the organisation's position or chance to have competitive advantage through innovation. He further states, "Knowledge that simultaneously increases average performance and its reliability is not a guarantee of competitive advantage" (March, 1991:84). Consequently, in theory at least, there should be cases that reflect a contrast of readiness states between knowledge creation and diffusion stages of the knowledge life-cycle.

The tension between exploration and exploitation of knowledge is a reflection of the more fundamental organisational tension between efficiency and innovation that has long been recognised in the organisation literature. March states, "Adaptive systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits. They exhibit too many undeveloped new ideas and too little distinctive competence. Conversely, systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal stable equilibria. As a result, maintaining an appropriate balance between exploration and exploitation is a primary Factor in system survival and prosperity" (March, 1991:71). The challenge at hand for organisations is that there are always scarce resources. Both exploration and exploitation (in March's terms) compete for these scarce resources. The resources are reflected in the attributes in Project One. In either creation, mobilisation or diffusion of knowledge the resources that are available remain the same. Project One reveals the attributes that are responsible for the creation, mobilisation and diffusion of knowledge. The results show that the relationships between the attributes, consequences and beneficial results are interdependent and converge on the knowledge creation, mobilisation and diffusion. This is not surprising as it reflects the effort of the researched organisation to use the resources to balance the creation, mobilisation and diffusion of knowledge.

Whether we could find an organisation that reflects contrasts of its readiness between the creation, mobilisation and diffusion stages of the knowledge life-cycle is yet to be explored. Birkinshaw and Gibson (2004) contend that the current economic

situation has reaffirmed to managers the importance of adaptability – the ability to move quickly towards new opportunities, to adjust to volatile markets and to avoid complacency; however, successful companies have an equally important capability, i.e. what they call alignment – a clear sense of how value is being created in the short term and how activities should be coordinated and streamlined to deliver that value. They further argue that for a company to succeed for the long term, it needs to master both adaptability and alignment – or it is called *ambidexterity*. Applying this ambidexterity concept into KIAT diagnosis means that a knowledge management system needs to support the creation of knowledge for adaptability purposes and to support the mobilisation and diffusion of knowledge for alignment purposes.

Role of IT

Many knowledge management projects rely on Information Technology (IT) as an enabler (Carlsson et al., 1996). KIAT is positioned to diagnose the readiness of organisations planning to implement a knowledge management system. As shown in the discussion of each organisation case, implementing IT for knowledge management is much more than the technology itself. While today's technologies are exciting and clearly improving, it is important to realise their limitations in any programme of knowledge management. Davenport and Prusak state, "Effective knowledge management cannot take place without extensive behavioral, cultural and organisational change" (1998:142). KIAT includes knowledge structure and knowledge cultute as key dimensions to measure the organisation readiness to implement a technology. When the appetite, the skills, and the attention to knowledge are already present in an organisation, technology can expand access and ease the problem of passing the right knowledge to the right person at the right time. This is the case with Schlumberger LMS. Power International will have to work more particularly on their attention to the knowledge structure.

6.5.3 KIAT Version 1.1

Refining the Guidelines on the Steps for applying KIAT

The outlined steps to operationalise KIAT were already elaborated in Chapter 5. The need or request for a readiness diagnosis should be based on the objective of its knowledge management project. This is important because it leads to the decision of the unit of analysis that is required to be referred to when operationalising KIAT. Because a knowledge management system cuts across functional departments, or at times business segments, according to the business process the system is going to support, consequently, the unit of analysis is the business process that is concerned with the system to be implemented.

Whether KIAT is going to be applied in the group work setting or in the interview setting, or both of, depends on the different situations that a facilitator is facing. The experience with the three organisation cases taught me that the discussion and results can be much richer in a group work setting. The objective of the interview or the group work and the objective of the knowledge management project need to be

spelled out and understood by the respondents. This is important in particular to anchor the subject for discussion. The facilitator's role is to ensure that discussions focus on these objectives.

Because the questions and discussions are around the knowledge life-cycle and the socio-technical system dimensions, it is critical to have a common base of understanding about what is to be discussed. Only after understanding this, can KIAT be operationalised.

Going though KIAT Factors and scoring them is a straightforward activity. However, care must be taken that respondents understand each of the Factors and score the Factors with the common unit of analysis as the reference. Failing to do so may result in less meaningful reports from KIAT. Reports from KIAT can be produced immediately upon completion of scoring the KIAT Factors. A sanity check can be carried out here to ensure that the instrument works properly and that all Factors have been clearly understood and scored appropriately. In the case that iteration is required, it has to be carried out.

In line with the P-C approach to operationalise KIAT, an open discussion with management has to take place prior to closing the diagnostic process. A report is then produced and delivered to the related organisations.

Refning the Tool based on findings from the case studies

During the operationalisation of KIAT in Power International three Factors were found to have created some ambiguities in their descriptions and questions as to what they are meant to reveal. These Factors are listed here in Table 6-8 with the corresponding remarks.

FACTORS	DESCRIPTION (KIAT VERSION 1.0)	Remarks
Workers who understand what they need to know to perform	Workers apply their knowledge to perform their work. In doing so, they need to understand what it is that they need to know in order to do their work. Workers who are aware of what they need to know make better decisions and help organisations understand the target domain of knowledge to be managed. Qualified workers who are targeted to be users of a knowledge system play a critical role in knowledge activities in the process within which the system is going to be implemented. How would you rate your organisation in terms of qualified workers' ability to spell out what knowledge they need to know to do their work?	The meaning of qualified workers, i.e. workers who will use and contribute to the knowledge system, needs to be explicitly expressed.
Business Processes	Knowledge activities happen while performing work. Knowledge which is not made available within the work flow will most likely be unusable by workers eventhough important. Organisations without clear business processes will have difficulties in managing knowledge into the workflow. Organisations need to have business processes embedded into their infrastructure in running the business. How would you rate your organisation in spelling out the business processes?	The description and question needs to be revised to reflect that what is being asked and evaluated is how the unit of analysis (i.e. the process in which the knowledge system is implemented) is positioned within the company-wide business processes.
Recognition scheme	A knowledge contributor needs to be recognised by name. By recognising contributors by name, they are encouraged to share knowledge. This recognition can be through an attribution of their contribution and/or through a getting together session where his/her contribution is mentioned and appreciated. How would you rate your organisation in recognising workers' contributions by name?	The question is not very clear if it is targeted only to the knowledge activities or to activities in general. This needs to be qualified further.

Table 6-8: List of Factors that are required for their descriptions and questions to be modified.

During the operationalisation of KIAT in Friends Provident, five Factors were found to have created some ambiguities in their descriptions and questions as to what they are meant to reveal. These Factors are listed in Table 6-9 with the corresponding remarks.

FACTORS	DESCRIPTION (KIAT VERSION 1.0)	REMARKS
Documentation established in a standard language	One piece of evidence when an organisation has commonly understood terms is that it has some sort of a glossary and that documentation used in the business activities contains the standard language. How would you rate your organisation in this respect?	FP1 agreed that 2 is the score for FP. However, he suggests that the description and question be clarified as to what kind of document.
Personalisable IT System	Users interact with a knowledge system for a certain purpose for themselves. A system which provides the capability for users to personalise their interaction with it will encourage users to leverage it for their own purpose. Personalisation can be exemplified as: "personal bookshelf", "a personal or self-tailored organisation of one's interaction with the system". How would you rate your organisation in its infrastructure capacity to provide personalisation for users?	FP does not see the use of it and most if not all existing systems are not personalisable. The question however needs to be clarified to contain two aspects: infrastructure from the company policy as well as the IT. FP1 suggested that he only understood the technology part.
Business Processes	Knowledge activities happen while performing work. Knowledge which is not made available within the workflow will probably be unusable by workers even though important. Organisations without clear business processes will have difficulties in managing knowledge into the workflow. Organisations need to have business processes embedded into their infrastructure in running the business. How would you rate your organisation in spelling out the business processes?	FP has not documented the business processes yet. Comment from participants says that the question orientation needs to be revised because the question should relate to the unit of analysis.
Adherence to Business Processes	Business processes are meaningful when workers understand and adhere to them. These processes are espoused by them in their day-to-day activities in performing their duties. With adherence to business processes, knowledge can then be structured and embedded into the workflow. How do you rate the workers in your organisation for adherence to the business processes?	They do the process but do not necessarily know the before and after. Same remarks from participants for the description/question of this factor.
Leaders who walk the talk	Support from leadership for a knowledge project needs to include the leaders' personal commitment to communicate its importance. Leadership should also carry the "flag". With this kind of action, workers feel the drive from leadership and the importance of the project. How would you rate the leadership of the organisation in their personal commitment to the knowledge project?	There is a difficulty for FP to understand the question/description because they have no experience with a knowledge project. FP2 answered N/A because of this mis-understanding. Description and question need little revision.

Table 6-9: Factors that are identified to need revision from the FP group work

During the operationalisation of KIAT in Schlumberger's competency development process, three Factors were found to have created some ambiguities in their descriptions and questions as to what they are meant to reveal. These Factors are listed in Table 6-10 with areas of concern in the REMARKS column.

FACTORS	DESCRIPTION (KIAT VERSION 1.0)	REMARKS
Business Processes	Knowledge activities happen while performing work. Knowledge which is not made available within the work flow will most likely be unusable by workers eventhough important. Organisations without clear business processes will have difficulties in managing knowledge into the workflow. Organisations need to have business processes embedded into their infrastructure in running the business. How would you rate your organisation in spelling out the business processes?	The description and question needs to be revised to reflect that what is being asked and evaluated is how the unit of analysis (i.e. the process in which the knowledge system is implemented) is positioned within the company-wide business processes.
Problem Solving	Knowledge is often used to address problem solving from which a decision is made. A system that facilitates workers' interaction to create, mobilise and diffuse knowledge should address the problem solving activities. How would you rate the workers in their problem solving activities?	The description and question which are intended to reveal the culture of the workers in approaching their work are not clear enough.
Structured team to promote knowledge initiative	Promoting a knowledge initiative to reach all requires a team that is focused and ready to travel to the necessary geographical areas to promote the subject. How would you rate your organisation in its capability and intention to create a structured promotion team for a knowledge project?	In promoting the knowledge initiative the structured team can also be "teams that are mushroomed" inside the organisation in a coordinated manner.

Table 6-10: List of Factors that are required for descriptions and questions to be modified.

The feedback and inputs from the participants in the three organisation cases were taken into account to modify KIAT. The result is KIAT version 1.1. Appendix 5 shows how the description is changed from version 1.0 to version 1.1. There are a total of nine Factors with the description modified to make them more clearly understood by respondents. The modified instrument is presented in the attached CD, file: *Tanudjojo_KIAT version 1_1_Project3.xls*.

6.6 Summary and Conclusions of Project Three

In Project Three, I have presented the findings, results and a discussion of the operationalisation of KIAT in three different organisations. I have also elaborated the research methods upon which the research in this Project Three was conducted, and the position based upon which KIAT is operated as a diagnostic instrument.

The application of KIAT in different organisations has shown its usefulness in different ways. Power International took the KIAT results to revise their plan to implement a knowledge management system and to start working on the Factors that are shown to be less ready. Friends Provident took the KIAT results with a better understanding, i.e. in order to manage knowledge they need to define the goal of the initiative and decide within which business process a knowledge management system is to be implemented. The Friends Provident case has illuminated and emphasised even more that KIAT needs to be operated with the "Process Consultant" approach defined by Schein (1969). Schlumberger LMS took the KIAT results to show why and in what way they are ready to implement a knowledge management system in the competency development process. Readiness assessment may be for the purpose of discovery as much as for the purpose of confirmation.

From the three organisation cases, KIAT appears to be comprehensive in order to assess the organisational readiness to implement a knowledge management system. All initial factors perceived by the interviewees from the organisation cases can be matched to the KIAT factors.

As KIAT is positioned at the diagnosis phase within the Organisational Development process, a consultative approach is required to operate KIAT. One important note that has been demonstrated in the three organisation cases is that the facilitator has to be skilful to diagnose and to establish effective helping relationships with customers.

Project Three has contributed to my entire executive doctorate research with the operationalisation of KIAT to different business and/or process settings from the one from which KIAT is constructed. Therefore, Project Three complements the contributions from Projects One and Two by this application of KIAT. In addition, it further elaborates how to operationalise KIAT appropriately in different settings by positioning KIAT within the OD process and confirming the unit of analysis. The limitation of Project Three is that it covers only three organisational cases. The more cases in which we have the opportunity to operationalise KIAT, the more can we learn. However, these three cases demonstrate to operationalise KIAT in those different business settings and processes within the organisations.

In the early days of knowledge management, trials of knowledge management technology were considered to be most important. According to Grover and Davenport (2001), organisations may not even know how willing people are to share

knowledge through systems until after the system is built. However, by then it may be too late because of barriers in the Knowledge Culture, Knoweldge Structure and Infrastructure. There is still no 'one right' technology for knowledge management. Managers in the organisation have to find out which one best suits the organisation. However, trying to implement a knowledge management system without being ready risks a major waste of human energy and financial capital. KIAT has the potential to prevent such waste of valuable resrouces. By applying KIAT, the stronger areas in the organisation that increase its readiness are high-lighted and the weaker areas identified. Armenakis et al. (1993) suggest that in creating readiness, one must not only communicate salient weaknesses, but must also bolster the organisation's strengths to increase the readiness of the weaker areas. KIAT is an assessment instrument that serves this purpose in the knowledge management domain.

6.7 Linking Document and Thesis

As Projects One, Two and Three are now completed, the next step of the Executive Doctorate programme is to complete the linking document and, hence, the thesis. Chapter One is the linking document that summarises Projects One, Two, and Three. It synthesises the domain of contributions of the Doctorate to the existing body of knowledge and to the practitioners. The linking document, together with the project reports, forms the thesis as a part of the requirement for the Doctorate study completion

CHAPTER SEVEN: PERSONAL DEVELOPMENT

I started my doctorate study with a conviction that I could solve a big issue, only to realise humbly that problems can mainly be solved through little contributions by many different contributors. Happily too, I found that the research has been a fascinating journey; extremely demanding yet also satisfying that I have contributed a drop of water to the sea of knowledge body and that I have learned much more – not only about the study – but perhaps more importantly about me.

I have undoubtedly changed during the course of this research. First of all, it came to my realisation that resilience is an important factor in achieving the end results of a project. Secondly, that alternatives or plurality are necessary in organisations.

Undertaking a doctoral research is a major commitment. When the doctoral study is concurrent with a full-time job, the undertaking is significant. At times, during the undertaking of this work a balance between work, Executive Doctorate research and family must be found. At different times each took priority, and at times the others suffered because of it. Challenges throughout this period continuously renewed themselves in one form or another. With them, frustration and suffering came back into the scene. The word resilience seems to be the most appropriate one to describe what one must have to reach the end of the race. I learned the meaning of resilience.

The ability to think critically, evaluate and express ideas clearly is one developmental aspect for a student undertaking doctoral research. I may have developed a little skill in this aspect by writing conference and journal papers. More importantly I have become more aware of being more critical of myself, my assumptions and my conclusions. I have acquired a habit of reflecting more about things surrounding me, and have learned that each perspective can have validity and yet can also be related to other perspectives. The co-existence of multiple viewpoints, diversities in many ways are all natural and necessary parts of organisational life and survival.

I recently changed job from a Managing Director of a business segment to a Vice President of Human Resources Management and Development across the business units of the company I work for. I initiated this change with the conviction that in knowledge economy, competency-based strategies are dependent on people. In other words, people are the key strategic resource, and strategy must be built on a human-resource foundation. In this respect, I certainly hope that my company will also benefit not only from the research results but more importantly from my personal learning and realisation that towards the end of my study I also decided to contribute focally more on building human capital as a core source of competitive advantage.

REFERENCES

Adair, K. (2004), 'Knowledge Management: A Misjudged Instrument of Strategic Change?', *Organization*, Vol. 11, No. 4, pp. 565-574.

Adler, P. (1995), 'Interdepartmental Interdependence and Coordination: the Case of the Design/Manufacturing Interface', *Organization Science*, Vol. 6, No. 2, pp. 147-167.

Adler, P.S. (2001), 'Market, Hierarchy, and Trust: the Knowledge Economy and the Future of Capitalism', *Organization Science*, Vol. 12, No. 2, pp. 215-234.

Alavi, M. and Leidner, D. (2001), 'Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues', *MIS Quarterly*, Vol. 25, No. 1, Mar, pp. 107-136.

Alavi, M. and Leidner, D.E. (2001), 'Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues', *MIS Quarterly*, Vol. 25, No. 1, pp. 107-136.

Allen, T.J. (1977), *Managing the Flow of Technology*, MIT Press, Cambridge, MA.

Amit, R. and Schoemaker, P.J.H. (1993), 'Strategic Assets and Organization Rent', *Strategic Management Journal*, Vol. 14, pp. 33-46.

Appelbaum, S.H. (1997), 'Socio-Technical Systems Theory: an Intervention Strategy for Organizational Development', *Management Decision*, Vol. 35, No. 6, pp. 452-463.

Armenakis, A.A., Harris, S.G. and Mossholder, K.W. (1993), 'Creating Readiness for Organizational Change', *Human Relations*, Vol. 46, No. 6, pp. 681-703.

Bagozzi, R.P. and Dabholkar, P.A. (2000), 'Discursive Psychology: An Alternative Conceptual Foundation to Means-End Chain Theory ', *Psychology & Marketing*, Vol. 17, No. 7, Jul, pp. 535-551.

Baker, S. (2002), 'Laddering: Making Sense of Meaning', in Partington, D. (ed), *Essential Skills for Management Research*, Sage Publication, London, pp. 226-253.

Barley, S.R. (1986), 'Technology As an Occasion for Structuring: Evidence From Observations of CT Scanners and the Social Order of Radiology Departments', *Administrative Science Quarterly*, Vol. 31, pp. 78-108.

Barney, J.B. (1991), 'Firm Resources and Sustained Competitive Advantage', *Journal of Management*, Vol. 17 , No. 1, pp. 99-120.

Bartlett, C.A. and Ghoshal, S. (2002), 'Building Competitive Advantage Through People', *MIT Sloan Management Review*, Winter, pp. 34-41.

Beazley, H., Boenisch, J. and Harden, D. (2003), 'Knowledge Continuity: The New Management Function', *Journal of Organizational Excellence*, summer, pp. 65-81.

Beccerra-Fernandez, I., Gonzalez, A. and Sabherwal, R. (2004), *Knowledge Management: Challenges, Solutions and Technologies*, Prentice Hall, NJ, USA.

Bennis, W. (1969), *Organization Development: Its Nature, Origins, and Prospects*, Addison-Wesley, Reading, MA.

Bessant, J. (2003), *High Involvement Innovation*, John Wiley, Chichester.

Bessant, J., Knowles, D., Briffa, G. and Francis, D. (2002), 'Developing the Agile Enterprise', *International Journal of Technology Management*, Vol. 24, No. 5/6, pp. 484-497.

Bhaskar, R. (1989), *Reclaiming Reality: a Critical Introduction to Contemporary Philosophy*, Verso, London.

Bijker, W. (1995), *Of Bicycles, Bakelites and Bulbs, Towards a Theory of Socio-Technical Change*, MIT Press, Cambridge, MA.

Birkinshaw, J. (2001), 'Why Is Knowledge Management So Difficult?', *Business Strategy Review*, Vol. 12, No. 1, Spring, pp. 11-18.

Birkinshaw, J. and Gibson, C. (2004), 'Building Ambidexterity into an Organization', *MIT Sloan Management Review*, Summer, pp. 47-55.

Birkinshaw, J. and Sheehan, T. (2002), 'Managing the Knowledge Life Cycle', *MIT Sloan Management Review*, Fall, pp. 75-83.

Blaikie, N. (2000), *Designing Social Research*, Blackwell Publishers, Oxford.

Blair, D.C. (2002), 'Knowledge Management: Hype, Hope, or Help?', *Journal of the American Society for Information Science and Technology*, Vol. 53(12), October, pp. 1019-1028.

Bloodgood, J.M. and Morrow Jr., J.L. (2003), 'Strategic Organizational Change: Exploring the Roles of Environmental Structure, Internal Conscious Awareness and Knowledge', *Journal of Management Studies*, Vol. 40, No. 7, pp. 1761-1782.

Blosch, M.P.D. (2000), 'Framing Work Through a Socio-Technical Ensemble: The Case of Butler Co.', *Technology & Strategic Management*, Vol. 12, No. 1, pp. 91-102.

Bock, G.W. and Kim, Y.G. (2002), 'Breaking the Myths of Rewards: An Exploratory Study of Attitudes About Knowledge Sharing', *Information Resources Management Journal*, Vol. 15, No. 2, pp. 14-21.

Boisot, M. and Griffiths, D. (2001), 'To Own or to Possess? Competence and the Challenge of Appropriability', in Sanchez, R. (ed), *Knowledge Management and Organizational Competence*, Oxford Press, Oxford, pp. 210-226.

Bossidy, L. and Charan, R. (2002), *Execution: The Discipline of Getting Things Done*, Crown Business, New York.

Botschen, G. and Hemetsberger, A. (1998), 'Diagnosing Means-End Structures to Determine the Degree of Potential Marketing Program Standardization', *Journal of Business Research*, Vol. 42, No. 2, Jun, pp. 151-159.

Braganza, A. (2004), 'Rethinking the Data-Information-Knowledge hierarchy: toward a case-based model', *International Journal of Information Management*, Vol. 24, No. 4, August, pp. 347-356.

Braganza, A. and Lambert, R. (2000), 'Strategic Integration: Developing a Process-Governance Framework', *Knowledge and Process Management*, Vol. 7, No. 3, pp. 177-186.

Braganza, A. and Morgan, C. (2000), 'Mature Organizations and the Internet: Lessons for Net-Competition', *International Journal of Services Technology and Management*, Vol. 1, No. 4, pp. 447-458.

Braganza, A. and Möllenkramer, G.J. (2002), 'Anatomy of a Failed Knowledge Management Initiative: Lessons From PharmaCorp's Experiences', *Knowledge and Process Management*, Vol. 9, No. 1, pp. 23-33.

Bressand, A. and Distler, C. (1995), *La Planete Relationnelle*, Flammarion, France.

Brown, J.S. and Duguid, P. (1991), 'Organization Learning and Communities-of-Practice: Toward a

Unified View of Working, Learning, and Innovation', *Organization Science* , Vol. 2, No. 1, February, pp. 40-57.

Brown, J.S. and Duguid, P. (1998), 'Organizing Knowledge', *California Management Review*, Vol. 10, Spring (no.3), pp. 90-111.

Brown, J.S. and Duguid, P. (2000), 'Balancing Act: How to Capture Knowledge Without Killing It', *Harvard Business Review*, May-June, pp. 73-80.

Brown, J.S. and Duguid, P. (2001), 'Knowledge and Organization: A Social-Practice Perspective', *Organization Science*, Vol. 12, No. 2, pp. 198-213.

Buchel, B. and Raub, S. (2002), 'Building Knowledge - Creating Value Network', *European Management Journal*, Vol. 20, No. 6, pp. 586-596.

Buckley, P.J. and Carter, M.J. (2000), 'Knowledge Management in Global Technology Markets', *Long Range Planning*, Vol. 33, No. 1, pp. 55-71.

Burke, W. (1994), *Organization Development: A Process of Learning and Changing*, Addison-Wesley, Reading, MA.

Burns, T. and Stalker (1961), *The Management of Innovation*, Tavistock, London.

Burrell, G. and Morgan, G. (1979), *Sociological Paradigms and Organizational Analysis*, Ashgate Publishing, England.

Carlsson, S.A., El Sawy, O.A., Eriksson, I. and Raven, A. (1996), 'Gaining Competitive Advantage Through Shared Knowledge Creation: In Search of a New Design Theory for Strategic Information Systems', in Coelho, J.D., Jelassi, T., Konig, W., Kromar, H. and O'Callaghan, R.S.M. (eds), *Proceedings of the Fourth European Conference on Information Systems:* Lisbon.

Cherns, A. (1986), 'Principles of Socio-Technical Design Revisited', *Human Relations*, Vol. 40, pp. 153-162.

Chia, R. (2002), 'The Production of Management Knowledge: Philosophical Underpinnings of Research Design', in Partington, D. (ed), *Essential Skills for Management Research*, Sage, London, pp. 1-19.

Child, J. (1972), 'Organization Structure, Environment and Performance: The Role of Strategic Choice', *Sociology*, Vol. 6, pp. 2-21.

Claeys, C., Swinnen, A. and Abeele, P.V. (1995), 'Consumers' Means-End Chains for "Think" and "Feel" Products', *International Journal of Research in Marketing*, Vol. 12, No. 3, Oct, pp. 193-208.

Coghlan, D. (2001), 'Insider Action Research Projects: Implications for Practising Managers', *Management Learning*, Vol. 32, No. 1, pp. 49-60.

Cohen, W. and Levinthal, D. (1990), 'Absorptive Capacity: a New Perspective on Learning and Innovation', *Administrative Science Quarterly*, Vol. 35, No. 1, pp. 128-152.

Connor, K.R. and Prahalad, C.K. (1996), 'A Resource-Based Theory of the Firm: Knowledge Versus Opportunism', *Organization Science*, Vol. 7, pp. 477-501.

Cranfield University (1998), *The Cranfield/Information Strategy Knowledge Survey: Europe's State of the Art in Knowledge Management*, The Economist Group, London,

Cummings, J.N. (2004), 'Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization', *Management Science*, Vol. 50, No. 3, March, pp. 352-364.

Davenport, T. (1994), 'Saving IT's Soul: Human-Centered Information', in Harvard Business Review (ed), *Harvard Business Review on the Business Value of IT*, Harvard Business Review, Boston, pp. 1-33.

Davenport, T. and Glaser, J. (2002), 'Just-in-Time Delivery Comes to Knowledge Management', *Harvard Business Review*, Vol. 80, No. 7, July, pp. 107-111.

Davenport, T.H. and Prusak, L. (1998), *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, Boston.

Davenport, T.H., de Long, D.W. and Beers, M.C. (1998), 'Successful Knowledge Management Projects', *Sloan Management Review*, Vol. 39, No. 2, pp. 43-57.

Davenport, T.H., Prusak, L. and Wilson, H.J. (2003), *What's the Big Idea?*, Harvard Business School Press, Boston, USA.

Davis, L.E. and Taylor, J.C. (1972), *Design of Jobs*, Penguin Books, Harmondsworth.

De Long, D.W. and Fahey, L. (2000), 'Diagnosing Cultural Barriers to Knowledge Management', *Academy of Management Executive*, Vol. 14, No. 4, pp. 113-127.

Deeter-Schmelz, D.R., Kennedy, K.N. and Goebel, D.J. (2002), 'Understanding Sales Manager Effectiveness: Linking Attributes to Sales Force Values', *Industrial Marketing Management*, Vol. 31, No. 7, Oct, pp. 617-626.

Denison, D.R., Hart, S.L. and Kahn, J.A. (1996), 'From Chimneys to Cross-Functional Teams: Developing and Validating a Diagnostic Model', *Academy of Management Journal*, Vol. 39, No. 4, pp. 1005-1023.

Drucker, P.F. (1986), *The Practice of Management*, Harper Collins, New York.

Drucker, P.F. (1988), 'The Coming of the New Organization', *Harvard Business Review*, January - February, pp. 98-111.

Drucker, P.F. (1993), *Post-Capitalist Society*, Butterworth Heinemann, Oxford.

Drucker, P.F. (1995), *Managing in a Time of Great Change*, Truman Talley Books/Dutton, New York.

Easterby-Smith, M. and Malina, D. (1999), 'Cross-Cultural Collaborative Research: Towards Reflectivity', *Academy of Management Journal*, Vol. 42, No. 1, pp. 76-86.

Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002), *Management Research: An Introduction* (2nd edition), Sage, London.

Eisenhardt, K.M. (1989), 'Building Theories From Case Study Research', *Academy of Management Review*, Vol. 14, No. 4, pp. 532-550.

El Sawy, O., Eriksson, I., Raven, A. and Carlson, S. (2001), 'Understanding Shared Knowledge Creation Spaces Around Business Processes: Precursors to Process Innovation Implementation', *International Journal of Technology Management*, Vol. 22, No. 1/2/3, pp. 149-173.

Emery, F. (1980), 'Designing Socio-Technical Systems for 'Greenfield' Sites', *Journal of Occupational Behaviour*, Vol. 1, pp. 19-27.

Emery, F.E. (Ed.) (1969), *Systems Thinking*, Penguin, London.

Emery, M. (ed.) (1993), *Participative Design for Participative Democracy*, Australian National University, Canberra, Australia.

Emery, R.E. and Trist, E.L. (1965), 'The Causal Texture of Organizational Environments', *Human Relations*, Vol. 18, pp. 21-32.

Fahey, L. and Prusak, L. (1998), 'The Eleven Deadliest Sins of Knowledge Management', *California Management Review*, Vol. 4, No. 3, Spring, pp. 265-276.

Field, A. (2000), *Discovering Statistics: Using SPSS for Windows*, Sage, London, UK.

Francis, D. and Bessant, J. (2005), 'Targeting Innovation and Implications for Capability Development', *Technovation*, Vol. 25, pp. 171-183.

French, W. (1969), 'Organization Development Objectives, Assumptions, and Strategies', *California Management Review*, Vol. 12, No. 2, pp. 23-34.

French, W.L. and Bell, J.C.H. (1999), *Organization Development: Behavioral Science Interventions for Organization Improvement* (6th edition), Prentice Hall, New Jersey.

Friedman, V.J. (2002), 'The Individual As Agent of Organizational Learning', *California Management Review*, Vol. 44, No. 2, Winter, pp. 70-89.

Gengler, C.E., Mulvey, M.S. and Oglethorpe, J.E. (1999), 'A Means-End Analysis of Mothers' Infant Feeding Choices', *Journal of Public Policy & Marketing*, Vol. 18, No. 2, Fall , pp. 172-188.

Gerwin, D. and Kolodny, H. (1992), *Management of Advanced Manufacturing Technology*, Wiley, New York.

Ghoshal, S. and Gratton, L. (2002), 'Integrating The Enterprise', *MIT Sloan Management Review*, Vol. 44, No. 1, Fall, pp. 31-38.

Gilmour, D. (2003), 'How to Fix Knowledge Management', *Harvard Business Review*, Vol. 81, October, pp. 16-17.

Giroux, H. and Taylor, J.R. (2002), 'The Justification of Knowledge: Tracking the Translations of Quality', *Management Learning*, Vol. 33, No. 4, Dec, pp. 497-517.

Goffin, K. (2002), 'Repertory Grid Technique', in Partington, D. (ed), *Essential Skills for Management Research*, Sage Publication, Ltd., California, pp. 199-225.

Gold, A.H., Malhotra, A. and Segars, A.H. (2001), 'Knowledge Management: An Organization Capabilities Perspective', *Journal of Management Information Systems*, Vol. 18, No. 1, pp. 185-214.

Grant, R.M. (1996), 'Toward a Knowledge-Based Theory of the Firm', *Strategic Management Journal*, Vol. 17, Winter special issue, pp. 109-122.

Grant, R.M. and Baden-Fuller, C. (2004), 'A Knowledge Accessing Theory of Strategic Alliances', *Journal of Management Studies*, Vol. 41, No. 1, January, pp. 61-84.

Griffith, T.L. and Dougherty, D.J. (2001), 'Beyond Socio-Technical Systems: Introduction to the Special Issue', *Journal of Engineering and Technology Management*, Vol. 18, pp. 207-218.

Grover, V. and Davenport, T. (2001), 'General Perspectives on Knowledge Management: Fostering a Research Agenda', *Journal of Management Information Systems*, Vol. 18, No. 1, Summer, pp. 3-21.

Gupta, A.K. and Govindarajan, G.V. (2000), 'Knowledge Flows Within Multinational Corporations', *Strategic Management Journal*, Vol. 21, No. 4, pp. 473-496.

Gutman, J. (1982), 'A Means-End Chain Model Based on Consumer Categorization Processes', *Journal of Marketing*, Vol. 46, Spring, pp. 60-72.

Gutman, J. (1997), 'Means-End Chains As Goal Hierarchies', *Psychology & Marketing*, Vol. 14, No. 6, September, pp. 545-560.

Hackman, R.J. and Oldham, G.R. (1980), *Work Redesign*, Addison-Wesley, Reading, MA.

Hammer, M. (2002), 'Process Management and the Future of Six Sigma', *MIT Sloan Management Review*, Winter, pp. 26-32.

Hammer, M. and Champy, J. (1994), *Reengineering the Corporation*, HarperCollins Publishers, New York.

Hannan, M. and Freeman, J. (1977), 'The Population Ecology Model of Organizations', *American Journal of Sociology*, Vol. 82, pp. 929-964.

Hansen, M.T., Nohria, N. and Tierney, T. (1999), 'What's Your Strategy for Managing Knowledge?', *Harvard Business Review*, March-April, pp. 106-116.

Hansen, M.T. and von Oetinger, B. (2001), 'Introducing T-Shaped Managers: Knowledge Management's Next Generation', *Harvard Business Review*, March, pp. 106-116.

Hargadon, A. and Sutton, R.I. (2000), 'Building Innovation Factory', *Harvard Business Review*, May-June, pp. 157-166.

Harrison, A. (2002), 'Case Study Research', in Partington, D. (ed), *Essential Skills for Management Research*, Sage, London, pp. 158-180.

Hauschild, S., Licht, T. and Stein, W. (2001), 'Creating a Knowledge Culture', *The McKinsey Quarterly*, Vol. 1, pp. 74-81.

Heaton, L. and Taylor, J.R. (2002), 'Knowledge Management and Professional Work', *Management Communication Quarterly*, Vol. 16, No. 2, Nov, pp. 210-236.

Heller, F. (2001), 'Towards a Socio-Oecotechnology', *Journal of Engineering and Technology Management*, Vol. 18, pp. 295-312.

Hofstede, F.T., Audenaert, A., Steenkamp, J.B. and Wedel, M. (1998), ' An Investigation into the Association Pattern Technique As a Quantitative Approach to Measuring Means-End Chains', *International Journal of Research in Marketing*, Vol. 15, No. 1, pp. 37-50.

Holsapple, C.W. (2001), 'Knowledge Management Support of Decision Making', *Decision Support Systems*, Vol. 31, No. 1, pp. 1-3.

Huber, G.P. (2001), 'Transfer of Knowledge in Knowledge Management Systems: Unexplored Issues and Suggested Studies', *European Journal of Information Systems*, Vol. 10, No. 2, pp. 72-29.

Iverson, J.O. and McPhee, R.D. (2002), 'Knowledge Management in Communities of Practice', *Management Communication Quarterly*, Vol. 16, No. 2, November, pp. 259-266.

Janz, B.D. and Prasarnphanich, P. (2003), 'Understanding the Antecedents of Effective Knowledge Management: The Importance of a Knowledge-Centered Culture', *Decision Sciences*, Vol. 34, No. 2, Spring, pp. 351-384.

Jenkins, M. (2002), 'Cognitive Mapping', in Partington, D. (ed), *Essential Skills for Management Research*, Sage, London, pp. 181-198.

Kaplan, R.S. and Norton, D.P. (2001), *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*, Harvard Business School Publishing, USA.

Katsioloudes, M.I. (1996), 'Socio-Technical Analysis: a Normative Model for Participatory Planning',

Human Systems Management, Vol. 15, No. 4, pp. 235-243.

Kavan, C.B., O'Hara, M.T., Patterson, E.C. and Bostrom, R.P. (1999), 'Excellence in Client/Server Information System Implementations: Understanding the STS Connection', *Management Decision*, Vol. 37, No. 3, pp. 295-301.

Kilmann, R. (1984), *Beyond The Quick Fix: Managing Five Tracks to Organizational Success*, Jossey-Bass, San Francisco.

Kogut, B. and Zander, U. (1992), 'Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology', *Organization Science*, Vol. 3, No. 3, August, pp. 383-397.

Kouzmin, A. (1980), 'Control and Organization: Towards a Reflexive Analysis', in Boreham, P. and Dow, G. (eds), *Work and Quality: Ideology and Control in the Capitalist Labour Process*, The Macmillan Company Australia PTY, Ltd., Australia, pp. 130-162.

Langerak, F., Peelen, E. and Nijssen, E. (1999), 'A Laddering Approach to the Use of Methods and Techniques to Reduce the Cycle Time of New-to-the-Firm Products', *The Journal of Product Innovation Management*, Vol. 16, No. 2, Mar, pp. 173-182.

Leonard-Barton, D. (1998), *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation* (paperback edition), Harvard Business School Press, Boston, USA.

Lesser, E.L. and Storck, J. (2001), 'Communities of Practice and Organizational Performance', *IBM Systems Journal*, Vol. 40, No. 4, pp. 831-841.

Levitin, A.V. and Redman, T.C. (1998), 'Data As a Resource: Properties, Implications, and Prescriptions', *MIT Sloan Management Review*, Vol. 40, No. 1, Fall, pp. 89-101.

Levitt, B. and March, J.G. (1988), 'Organizational Learning', *Annual Review of Sociology* , Vol. 14, pp. 319-340.

Luhmann, N. (2000), *The Reality of the Mass Media*, Policy Press, Cambridge.

Majchrzak, A. and Borys, B. (2001), 'Generating Testable Socio-Technical Systems Theory', *Journal of Engineering and Technology Management*, Vol. 18, pp. 219-240.

Majchrzak, A., Cooper, L.P. and Neece, O.E. (2004), 'Knowledge Reuse for Innovation', *Management Science*, Vol. 2, No. 2, February, pp. 174-188.

March, J.G. (1991), 'Exploration and Exploitation in Organizational Learning', *Organization Science*, Vol. 2, No. 1, February, pp. 71-87.

Marglin, S. (1978), 'What Do Bosses Do?: The Origin and Functions of Hierarchy in Production', in Gorz, A. (ed), *Divison of Labour*, Harvester Press, London, pp. 13-54.

Markus, M.L., Majchrzak, A. and Gasser, L. (2002), 'A Design Theory for Systems That Support Emergent Knowledge Processes', *MIS Quarterly*, Vol. 26, No. 3, pp. 179-212.

Marshall, N. and Brady, T. (2001), 'Knowledge Management and the Politics of Knowledge: Illustrations From Complex Products and Systems', *European Journal of Information Systems*, Vol. 10, pp. 99-112.

Matusik, S.F. and Hill, C.W. (1998), 'The Utilization of Contingent Work, Knowledge Creation, and Competitive Advantage', *Academy of Management Review*, Vol. 23, No. 4, pp. 680-697.

May, M., Rajguru, A., Burns, L., Howes, M. and Matthews, G. (1997), 'Preparing Organizations to Manage the Future', *Management Accounting - London*, Vol. 75, No. 2, pp. 28-32.

Maznevski, M. and Chudoba, C. (2000), 'Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness', *Organizational Science*, Vol. 11, No. 5, pp. 473-492.

McAfee, A. (2003), 'When Too Much IT Knowledge Is a Dangerous Thing', *MIT Sloan Management Review*, Vol. 44, No. 2, Winter, pp. 83-89.

McDermott, R. (1999), 'Why Information Technology Inspired but Cannot Deliver Knowledge Management', *California Management Review*, Vol. 41, No. 4, pp. 103-117.

McFayden, M.A. and Cannella, A.A.Jr. (2004), 'Social Capital and Knowledge Creation: Diminishing Returns of The Number and Strength of Exchange Relationships', *Academy of Management Journal*, Vol. 47, No. 5, pp. 735-746.

McInerney, C. (2002), 'Knowledge Management and the Dynamic Nature of Knowledge', *Journal of the American Society for Information Science and Technology*, Vol. 53 (12), October, pp. 1009-1018.

Merton, R.K. and Lerner, D. (1961), 'Social Scientist and Research Policy', in Bennis, W.G., Benne, K.D. and Chin, R. (eds), *The Planning of Change*, Holt, Rinehart and Winston, New York, pp. 53-69.

Molleman, E. and Broekhuis, M. (2001), 'Sociotechnical Systems; Towards an Organizational Learning Approach', *Journal of Technology and Engineering Management*, Vol. 18, No. 3/4, Sep-Dec, pp. 271-295.

Morgan, G. (1998), *Images of Organization: The Executive Edition*, Sage, California.

Mukherji, A. and Mukherji, J. (1998), 'Structuring Organizations for the Future: Analyzing and Managing Change', *Management Decisions*, Vol. 36, No. 4, pp. 265-273.

Mumford, E. (1965), 'Clerks and Computers', *The Journal of Management Studies*, May, pp. 138-152.

Mumford, E. (1995), 'Contracts, Complexity and Contradictions: The Changing Employment Relationship', *Personnel Review*, Vol. 24, No. 8, pp. 54-70.

Mumford, E. and Ward, T. (1966), 'Computer Technologists', *The Journal of Management Studies*, October, pp. 244-255.

Nahapiet, J. and Ghoshal, S. (1998), 'Social Capital, Intellectual Capital, and the Organizational Advantage', *Academy of Management Review*, Vol. 23, No. 2, pp. 242-258.

Nelson, R. and Winter, S. (1982), *An Evolutionary Theory of Economic Change*, Harvard University Press, Cambridge, MA.

Nissen, M., Kamel, M. and Sengupta, K. (2000), 'Integrated Analysis and Design of Knowledge Systems and Process', *Information Resources Management Journal*, Vol. 13, No. 1, pp. 24-43.

Nonaka, I. (1991), 'The Knowledge-Creating Company', *Harvard Business Review*, November-December, pp. 96-104.

Nonaka, I. (1994), 'A Dynamic Theory of Organizational Knowledge Creation', *Organization Science*, Vol. 5, No. 1, Feb, pp. 14-37.

Nonaka, I. and Konno, N. (1998), 'The Concept of "Ba": Building a Foundation for Knowledge Creation', *California Management Review*, Vol. 40, No. 3, spring, pp. 40-54.

Nonaka, I. and Takeuchi, H. (1995), *The Knowledge Creating Company*, Oxford University Press, Oxford.

Obstfeld, D. (2002), 'Knowledge Creation, Social Networks and Innovation: an Integrative Study', in *Academy of Management Proceedings* pp. H1-H6.

Orlikowski (1992), 'The Duality of Technology: Rethinking the Concept of Technology in Organizations', *Organization Science*, Vol. 3, pp. 398-427.

Pan, S.L. and Leidner, D.E. (2003), 'Bridging Communities of Practice With Information Technology in Pursuit of Global Knowledge Sharing', *Journal of Strategic Information Systems*, Vol. 12, pp. 71-88.

Pan, S.L. and Scarbrough, H. (1998), 'A Socio-Technical View of Knowledge-Sharing at Buckman Laboratories', *Journal of Knowledge Management*, Vol. 2, No. 1, September, pp. 55-66.

Parent, M., Gallupe, R.B., Salisbury, W.D. and Handelman, J.M. (2000), 'Knowledge Creation in Focus Group: Can Group Technologies Help?', *Information and Management* , Vol. 38, No. 1, pp. 47-58.

Partington, D. (2000), 'Building Grounded Theories of Management', *British Journal of Management*, Vol. 11, pp. 91-102.

Pasmore, W., Francis, C. and Haldeman, J. (1982), 'Sociotechnical Systems: A North American Reflection on Empirical Studies of the Seventies', *Human Relations*, Vol. 35, No. 12, pp. 1179-1204.

Pasmore, W.A. (1995), 'Social Science Transformed: The Socio-Technical Perspective', *Human Relations*, Vol. 48, No. 1, pp. 1-33.

Pelz, D.A.F. (1966), *Scientists in Organizations*, Wiley, New York.

Polanyi, M. (1966), *The Tacit Dimension*, Routledge & Kegan Paul, London.

Porras, J. and Bradford, D.L. (2004), 'A Historical View of the Future of OD', *The Journal of Applied Behavior Science*, Vol. 40, No. 4, December, pp. 392-402.

Prusak, L. (1996), 'The Knowledge Advantage', *Strategy and Leadership*, Vol. 22, No. 2, March/April, pp. 6-8.

Prusak, L. (2001), 'Where Did Knowledge Management Come From?', *IBM Systems Journal*, Vol. 40, No. 4, pp. 1002-1007.

Ramesh, B. and Tiwana, A. (1999), 'Supporting Collaborative Process Knowledge Management in New Product Development Teams', *Decision Support Systems*, Vol. 27, No. 1-2, pp. 213-235.

Rao, M. (2005), 'Overview: The Social Life of Knowledge Management Tool', in Rao, M. (ed), *Knowledge Management Tools and Techniques: Practitioners and Experts Evaluate Knowledge Management Solutions*, Elsevier Butterworth-Heinemann, Oxford, UK.

Rastogi, P.N. (2000), 'Knowledge Management and Intellectual Capital - the New Virtuous Reality of Competitiveness', *Human Systems Management*, Vol. 19, No. 1, pp. 39-48.

Ray, G., Barney, J.B., & Muhanna, W.A. (2004), 'Capabilities, business processes, and competitive advantage: Choosing the dependent variable in empirical tests of the resource-based view', *Strategic Management Journal*, Vol. 25, pp. 23-37.

Reynolds, T.J. and Gutman, J. (1988), 'Laddering Theory, Method, Analysis, and Interpretation', *Journal of Advertising Research*, Vol. 18, No. 1, Feb/Mar, pp. 11-31.

Roberts, J. (2004), *The Modern Firm: Organizational Design for Peformance and Growth*, Oxford University Press, UK.

Rogers, E.M. (1995), *Diffusion of Innovations* (4th edition), Free Press, New York, NY.

Ross, J.W. and Weill, P. (2002), 'Six IT Decisions Your IT People Shouldn't Make', *Harvard Business Review*, November, pp. 84-91.

Sage, A.P. and Rouse, W.B. (1999), 'Information Systems Frontiers in Knowledge Management', *Information Systems Frontier*, Vol. 1, No. 3, pp. 205-219.

Sanchez, R. (2001a), 'Managing Knowledge into Competence: The Five Learning Cycles of the Competent Organization', in Sanchez, R. (ed), *Knowledge Management and Organizational Competence*, Oxford Unversity Press, Oxford, pp. 3-37.

Sanchez, R. (2001b), 'Product, Process, and Knowledge Architectures in Organizational Competence', in Sanchez, R. (ed), *Knowledge Management and Organizational Competence*, Oxford University Press, Oxford, pp. 227-250.

Sanzgiri, J. and Gottlieb, J.Z. (1992), 'Philosophic and Pragmatic Influences on the Practice of Organization Development, 1950-2000', *Organization Dynamics*, Vol. 21, No. 2, pp. 57-69.

Sawhney, M. and Prandelli, E. (2000), 'Communities of Creation: Managing Distributed Innovation in Turbulent Markets', *California Management Review*, Vol. 42, No. 4, Summer, pp. 24-54.

Sayer, A. (2000), *Realism and Social Science*, Sage, London.

Schein, E. (1969), *Organization Development - Process Consultation*, Addison-Wesley, Reading, MA.

Schifo, R. (2004), 'OD in Ten Words or Less: Adding Lightness to the Definitions of Organizational Development ', *Organizational Development Journal*, Vol. 22, No. 3, Fall, pp. 74-85.

Schon, D. (1963), 'Champions for Radical New Inventions', *Harvard Business Review*, Mar/April, pp. 77-86.

Schubert, P., Lincke, D. and Schmid, B. (1998), 'A Global Knowledge Medium As a Virtual Community: The Net Academy Concept', in Hoadley, E. and Benbasat, I. (eds), *Proceedings of the Fourth American Conference on Information Systems:* Baltimore, MD., pp. 618-620.

Siemieniuch, C. and Sinclair, M. (2004), 'A Framework for Organisational Readiness for Knowledge Management', *International Journal of Operations & Production Management*, Vol. 24, No. 1, pp. 79-98.

Singh, V. and Dickson, J. (2002), 'Ethnographic Approaches of Organizations', in Partington, D. (ed), *Essential Skills for Management Research*, Sage Publishing, London, pp. 117-135.

Southon, F.C.G., Todd, R.J. and Seneque, M. (2002), 'Knowledge Management in Three Organizations: An Exploratory Study', *Journal of the American Society for Information Science and Technology*, Vol. 12, No. 53, October, pp. 1047-1059.

Spender, J.C. (1996), 'Making Knowledge the Basis of a Dynamic Theory of the Firm', *Strategic Management Journal*, Vol. 17, Winter, pp. 45-62.

Sproull, L.S. and Hofmeister, K.R. (1986), 'Thinking About Implementation', *Journal of Management*, Vol. 12, pp. 43-60.

Stankowsky, M.A. (2005), 'Advances in Knowledge Management: University Research Toward an Academic Discipline', in Stankowsky, M.A. (ed), *In Creating the Discipline of Knowledge Management: The Latest in University Research*, Elsevier Butterworth-Heinemann, Burlington, MA,

Storck, J. and Hill, P.A. (2000), 'Knowledge Diffusion Through "Strategic Communities"', *MIT Sloan Management Review*, Winter, pp. 63-74.

Styhre, A. (2002), 'The Knowledge-Intensive Company and the Economy of Sharing: Rethinking Utility and Knowledge Management', *Knowledge and Process Management*, Vol. 9, No. 4, Oct-Dec, pp. 228-236.

Szulanski, G. (1996), 'Exploring Internal Stickiness: Impediments to the Transfer of Best Practices Within the Firm', *Strategic Management Journal*, Vol. 17, Winter Special Issue, pp. 27-43.

Szulanski, G. (2003), *Sticky Knowledge: Barriers to Knowing in the Firm,* Sage, Thousand Oaks, CA.

Taylor, J.C. and Felten, D.F. (1993), *Performance by Design*, Prentice-Hall, Englewood Cliffs, NJ.

Taylor, W.A. and Wright, G.H. (2004), 'Organizational Readiness for Successful Knowledge Sharing: Challenges for Public Sector Managers', *Information Resources Management Journal*, Vol. 17, No. 2, April - June, pp. 22-37.

Tranfield, D., Denyer, D. and Smart, P. (2003), 'Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review', *British Journal of Management*, Vol. 14, No. 3, pp. 207-222.

Trist, E. and Murray, H. (1993), *The Social Engagement of Social Sciences, Vol II*, University of Pennsylvania, PA.

Trist, E.L. and Bamforth, K.W. (1951), 'Some Social and Psychological Consequences of the Long-Wall Method of Coal-Getting', *Human Relations*, Vol. 4, pp. 3-38.

Trist, E.L., Higgin, G.W., Murray, H. and Pollock, A.B. (1967), *Organizational Choice*, Tavistock, London.

Tsoukas, H. (1994), 'Refining Common Sense: Types of Knowledge in Management Studies', *Journal of Management Studies*, Vol. 31:6, November, pp. 761-780.

Tuomi, I. (1999), 'Data Is More Than Knowledge: Implications of the Reversed Knowledge Hierarchy for Knowledge Management and Organizational Memory', *Journal of Management Information Systems*, Vol. 16, No. 3, pp. 103-117.

Ulbo de Sitter, L. and Friso den Hertog, J.D.D. (1997), 'From Complex Organizations With Simple Jobs to Simple Organizations With Complex Jobs', *Human Relations*, Vol. 50, No. 5, pp. 497-534.

Un, C.A. and Cuervo-Cazurra, A. (2004), 'Strategies for Knowledge Creation in Firms', *British Journal of Management*, Vol. 15, pp. S27-S41.

van Eijnatten, F.M. (1993), *The Paradigm That Changed the Work Place*, Van Gorcum, Assen, The Netherlands.

Vince, R., Sutcliffe, K. and Olivera, F. (2002), 'Organizational Learning: New Directions', *British Journal of Management*, Vol. 13, pp. S1-S6.

von Hipple, E. (1994), 'Sticky Information and the Locus of Problem Solving: Implication for Innovation', *Organization Science*, Vol. 40, No. 4, pp. 429-439.

von Krogh, G. (1998), 'Care in Knowledge Creation', *California Management Review*, Vol. 40, No. 3, Spring, pp. 133-153.

von Krogh, G., Nonaka, I. and Aben, M. (2001), 'Making the Most of Your Company's Knowledge: a Strategic Framework', *Long Range Planning*, Vol. 34, pp. 421-439.

Walker, B.A. and Olson, J.C. (1991), 'Means-End Chains: Connecting Products With Self', *Journal of Business Research*, Vol. 22, pp. 111-118.

Walker, R. (1985), *Applied Qualitative Research*, Gower, Aldershot.

Walter, G.A. and Marks, S.E. (1985), 'The Third Wave of Experiential Learning', in Warrick, D.D. (ed), *Contemporary Organizational Development: Current Thinking and Applications*, Scott, Foresman and

Co., Glenview, IL.

Wang, S. and Ariguzo, G. (2004), 'Knowledge Management Through the Development of Information Schema', *Information and Management*, Vol. 41, pp. 445-456.

Wansink, B. (2003), 'Using Laddering to Understand and Leverage a Brand's Equity', *Qualitative Market Research: An International Journal*, Vol. 6, No. 2, pp. 111-118.

Weick, K.E. (1979), *The Social Psychology of Organizing*, Addison-Wesley, Reading, MA.

Weick, K.E. (1993), 'The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster', *Administrative Science Quarterly*, Vol. 38, pp. 628-652.

Weick, K.E. (2002), 'Puzzles in Organizational Learning: An Exercise in Disciplined Imagination', *British Journal of Management*, Vol. 13, pp. S7-S15.

Weick, K. (2001), 'Gapping the Relevance Bridge: Fashions Meet Fundamentals in Management Research', *British Journal of Management*, Vol. 12, Special Issue, pp. S71-S75.

Weill, P., Subramani, M. and Broadbent, M. (2002), 'Building IT Infrastructure for Strategic Agility', *MIT Sloan Management Review*, Vol. 44, No. 1, Fall, pp. 57-65.

Wenger, E. (2000), 'Communities of Practice and Social Learning Systems', *Organization*, Vol. 7, No. 2, pp. 225-246.

Wenger, E.C. and Snyder, W.M. (2000), 'Communities of Practice: The Organizational Frontier', *Harvard Business Review*, January-February, pp. 139-145.

Whitworth, B. and De Moor, A. (2003), 'Legitimate by Design: Towards Trusted Socio-Technical Systems', *Behavior & Information Technology*, Vol. 22, No. 1, pp. 31-51.

Yin, R. (1994), *Case Study Research: Design and Methods* (2nd edition), Sage, London.

Zack, M.H. (1999), 'Managing Codified Knowledge', *Sloan Management Review*, Summer, pp. 45-58.

APPENDICES

Appendix 1: Summary of the literature review

	Knowledge Life Cycle														
	Creation					Mobilization					Diffusion				
	Criteria	ProQuest		EBSCO		Criteria	ProQuest		EBSCO		Criteria	ProQuest		EBSCO	
		Options	# articles	Options	# articles		Options	# articles	Options	# articles		Options	# articles	Options	# articles
Communities of Practice Theory	Knowledge Creation	Citation and Text	187	All Text	588	Knowledge Mobilization***	Citation and Text	585	All Text	169	Knowledge Diffusion****	Citation and Text	664	All Text	211
	Communities*	Citation and Text		All Text		Communities	Citation and Text		All Text		Communities	Citation and Text		All Text	
	Knowledge Creation	Citation and Abstract	187	Default fields	53	Knowledge Mobilization	Citation and Abstract	586	Default fields	33	Knowledge Diffusion	Citation and Abstract	664	Default fields	59
	Communities	Citation and Text		All Text		Communities	Citation and Text		All Text		Communities	Citation and Text		All Text	
	Knowledge Creation	Citation and Abstract	24	Default fields	16	Knowledge Mobilization	Citation and Abstract	45	Default fields	11	Knowledge Diffusion	Citation and Abstract	43	Default fields	21
	Communities	Citation and Abstract		Default fields		Communities	Citation and Abstract		Default fields		Communities	Citation and Abstract		Default fields	
Knowledge based theory or Resource based theory	Knowledge Creation	Citation and Text	499	All Text	119	Knowledge Mobilization	Citation and Text	213	All Text	32	Knowledge Diffusion	Citation and Text	246	All Text	36
	KBT or RBT**	Citation and Text		All Text		KBT or RBT	Citation and Text		All Text		KBT or RBT	Citation and Text		All Text	
	Knowledge Creation	Citation and Abstract	499	Default fields	9	Knowledge Mobilization	Citation and Abstract	213	Default fields	7	Knowledge Diffusion	Citation and Abstract	246	Default fields	13
	KBT or RBT	Citation and Text		All Text		KBT or RBT	Citation and Text		All Text		KBT or RBT	Citation and Text		All Text	
	Knowledge Creation	Citation and Abstract	16	Default fields	1	Knowledge Mobilization	Citation and Abstract	9	Default fields	0	Knowledge Diffusion	Citation and Abstract	25	Default fields	0
	KBT or RBT	Citation and Abstract		Default fields		KBT or RBT	Citation and Abstract		Default fields		KBT or RBT	Citation and Abstract		Default fields	

* The actual string used to search is communit?

** The actual string used to search is: Knowledge based theory or Resource based theory

*** The actual string used to search is: Knowledge mobili? or transfer or diffusion or dissemination, and the subject: knowledge management

**** The actual string used to search is: Knowledge diffusion or exchange or interchange or transfer or sharing, and the subject: knowledge management

Appendix 2: Guideline for Interview Questions – Data Collection Instrument

Start with: • Could you please talk me through your experience with InTouch so far? • Could you tell me what you believe makes InTouch give you that experience?
Principal questions: • What are the critical aspects that make InTouch what it is today? • What are the attributes within the organization or its actions that encourage knowledge sharing within InTouch? • What are the attributes within the organization or its actions that foster continuous learning for InTouch users? • What does the organization do within its human resources policies that reinforces employee participation in InTouch? • How does Schlumberger decide on the technologies used for InTouch? • How does Schlumberger ensure that knowledge within InTouch is reliable?
Follow up questions: • Could you give some examples or elaborate more on what you just said? • What do you mean by that? • Could you explore that further? • How do the organization or the individuals deal with that? • What can you say about the possible consequences if the opposite actions were taken?
Alternative questions: • What do you like about InTouch? And what did Schlumberger do to create that? Can you please give examples? • Can you please take me through the derivation of each Factor that causes InTouch to give beneficial results to the organization? Can you please give some examples?

Appendix 3: Socio-Technical System (STS) History and Developent

STS was originally developed at the Tavistock Institute of Human Relations in London, based on the classic studies of the British coal mining industry, reported by Trist and Bamforth (1951). Since then, in its relatively brief history, the STS approach to organisational analysis and design has established for itself a grand tradition (Katsioloudes, 1996). Appelbaum (1997) suggests that STS is probably the most extensive body of conceptual and empirical work underlying employee involvement and work design applications today. Appelbaum (1997) further states that in Europe and particularly Scandinavia, STS is almost synonymous with work design and employee involvement. In Canada and the USA, STS has become the major underpinning of efforts involving work design. With the inevitable infiltration of technology into organisations in all industries, STS has become more frequently referred to.

The original STS thinkers made a critical contribution by breaking decisively with the notion of technological determinism. According to von Bertalanffy (1950, cited in Majchrzak and Borys, 2001), STS theory was originally developed from the open systems theory. Across its development, however, STS has also been recognised in different ways. Taylor and Felten (1993) refer to STS as a philosophy and methodology. Gerwin and Kolodny (1992) refer to STS as a "paradigm" consisting of a conceptual scheme, a methodology, a design process, a set of values about work, contextual conditions such as interdependence with the environment, and an historical tradition built on psychology, sociology and workplace research. Emery (1980) refers to STS as a generalised model of the dimensions of social and technical systems.

Research building on STS continues today; much STS work focuses on designing work for both organisational and human good; and there is a normative slant, in that the work suggests people should be involved in designing the relationships between technology and work (Griffith and Dougherty, 2001). Quality of work life is a key consideration; examples are the work of Emery (1969) and Molleman and Broekhuis (2001). The other perspective of STS is more theoretical. STS provides critical insights to understand the relationships between people, technology and organisational outcomes. In this perspective some scholars such as, for example, Spender (1996) have indicated a limited, but interesting, approach to understanding organisational outcomes. Spender uses the ideas of social construction and STS to discuss a knowledge theory of the firm. He concludes that STS "is unsuitable as the basis for a theory of the firm because it adapts too naïve a view of social systems and ignores economic interactions." (1996:55).

STS thinking complements the attention to the practical dynamics of technology developments, from the early days of Research and Development (R&D), research use of product champions to overcome "dynamically conservative" tendencies of organisations (for example Schon, 1963); analysis of creative tensions in managing R&D (Pelz, 1966); studies of patterns of communication within and among project teams (Allen, 1977); to concerns in concurrent engineering, design and manufacturing (Adler, 1995). These general concerns with socio-technical interactions are also found in studies of manufacturing innovations and their interactions with organisational structure (Bessant et al., 2002; Leonard-Barton, 1998).

One argument against the traditional STS perspective is that it does not delve into the technology system as fully as it does into the social system, so the particular

dynamics within technology as a system and how this system is itself developed remain under-examined (Heller, 2001). Technology researchers, however, explore the perception of technology more deliberately, so that researchers can elaborate better upon technology's various aspects, dynamics and development paths (Griffith and Dougherty, 2001). Social construction speaks of the duality of technological design. Orlikowski (1992) outlines distinct perceptions of technology, that each has different dynamics: technology as a product of ongoing human action, which downplays its material nature; technology as a material object whose meaning is defined by the context of use, which downplays its adaptive nature. According to Weick (1979) there is a technology in the head and a technology on the floor. The technology on the floor is designed and redesigned by a process of social construction. Likewise, the organisational structure relating to the technological system is socially constructed (Barley, 1986).

In the Management Information Systems (MIS) field, STS thinking complements in the unravelling of interactions of individual cognition and technology use, such as with e-mail systems and the relationships between social roles, networks and technology adoption (Sproull and Hofmeister, 1986). This is also the case in other fields, such as, for example, where Weick (1993) considers the co-evolution of social values and technological systems.

While STS has infiltrated many areas, the techniques used in socio-technical analysis and design can be numerous and demanding and have led to some attempts to compress or abridge the phases of processes required for work redesign (Hackman and Oldham, 1980). Van Eijnatten (1993) describes four alternative views of STS: the classical approach of the Tavistock Institute explained by Trist and Murray (1993), the participative design approach of Emery (1993) in Australia, the democratic dialogue approach in Sweden, and the Dutch integral organisational renewal (IOR) approach (Ulbo de Sitter and Friso den Hertog, 1997). In addition to the four described by van Eijnatten, there are other perspectives, including the job design perspective of Davis and Taylor (1972). Common across all these perspectives is a focus on very specific design practices. Classical STS relies heavily on a detailed variance analysis method for determining which variances need to be controlled and how the organisation should be designed to facilitate the control (Griffith and Dougherty, 2001). Wide application of the socio-technical approach is due to its generality and so has the capacity to be "adopted with ease to almost any organisational situation… and remains open to continual improvement and revision" (Cherns, 1986).

Appendix 4: Implication Matrix from Project One

	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	KC	KM	KD	
1									0.01		4.00										0.01		0.01							1.00			5.03
2	1.00		1.00		1.00	3.03			5.04				9.00	0.03									0.01		1.00					0.01			21.12
3									3.03	1.00																	2.00					1.01	7.04
4				0.01					0.01		5.00		0.01										0.01				0.01					0.01	5.06
5									0.01		5.00																						5.01
6		2.04			0.04				1.00		3.00												0.03										6.11
7				0.01					1.00			1.00	6.00	0.04		0.01							0.04		1.00		0.03					1.02	10.15
8											5.00												0.01										5.01
9	4.00	0.02							4.01																0.01		1.00					0.02	9.06
10									4.00				2.03																				6.03
11	7.00							1.01	1.07	1.00	3.00	1.00											0.01		0.01								14.10
12									3.01	5.00	1.00	2.03				1.00							1.01			1.00	1.01				0.01		15.07
13	1.00	1.00				3.03			7.04		5.01	1.01		1.00		0.01					1.02											0.01	20.13
14	1.00	0.01			0.02				1.03				4.00	0.01					0.01				0.01									0.02	6.11
15									1.01														5.01		0.02						0.01	2.01	8.06
16	5.01		4.00	0.01					9.06		1.00					0.01						0.01	0.04							0.01	0.01	1.02	20.18
17	1.00		4.01						1.01														0.03							0.01		2.02	8.08
18			1.00	1.01		6.00	0.04	0.04	11.02	2.00	3.00	10.01	2.00	2.01	2.00	0.02		0.01	1.01	0.01	0.01		1.07	0.02	0.02	2.04	0.01	0.01		0.03	0.02	1.05	45.46
19				1.00					6.00			4.01			1.00	0.02							0.02		0.01						0.03	0.04	12.13
20									4.00		1.00			0.01									0.01	0.01	1.00								6.03
21				1.00					3.00			5.01			1.00	0.01							0.02		0.01					0.06		0.01	10.12
22				1.00					4.01			7.03		1.00	3.00	0.02	0.04		0.01				3.05		0.04		0.01			1.01	1.05	1.03	22.30
23	1.00	1.00		0.01					1.02			16.01			2.00	0.06	0.01	0.01	1.00			0.01	0.06	0.01	1.04		0.01			0.02	1.01	1.13	25.41
24	1.00			4.00	1.01	0.01	0.01	0.01	8.04	3.02	9.00	0.02	1.00			0.04			0.01		0.03		1.02	1.01	0.02	0.01	0.04	3.01	0.02		0.01	0.04	32.38
25	4.00	0.02							5.02																						0.01	0.01	9.06
26	4.00		0.02						3.01														0.01										7.04
27	4.00								6.05		2.00															1.00							13.05
28	5.00	0.02							2.02			1.00														1.00			0.01		0.01		9.06
29									1.02		10.00						0.01						0.01		0.01								11.05
30									2.04		5.00																						7.04
31	3.01	0.01							5.03		3.01				1.03						0.03					1.04				1.01	0.02	2.01	16.20
32	2.00	1.01			0.02				2.00	4.02		2.02													0.01	1.04		0.04		0.02		1.01	13.19
33	3.02								5.03			1.04			2.01								0.04		1.02		0.02				0.03	0.01	12.22
34	0.01	2.03			2.02				1.01																							0.02	5.09
35	3.02								3.03		2.03																				0.01	0.03	8.12
36		2.00							3.02													0.01										1.00	6.03
37					4.02							1.01				2.03														0.01	0.02	1.04	8.13
38									3.00							0.02														0.01			3.03
39									1.00			4.01							0.01	1.00			1.00	1.00			1.03			0.01			9.06
40											1.01					3.02																0.02	4.05
41							8.00	9.00				1.01	1.01			0.02		0.05	1.02	1.01	1.01	0.06	2.01	0.02				1.00	3.02	0.02		0.03	28.29
42	1.00																		4.01												0.01	0.02	5.04
43																		4.00		3.02				0.05						0.05	0.01	0.01	7.14
44																1.00	1.00	2.00	3.00	1.00		1.00	1.00		1.00	1.00	1.00			1.03	1.01	1.01	16.05
45									0.02																0.01	5.00						0.03	5.06
46									3.02			1.00									6.00	1.00			1.00	1.03	0.01			0.01	0.01		13.08
47				1.04					1.00					1.00		4.00	0.05	1.00	1.00	1.00		1.00	2.01		2.02		1.00			1.04	1.04	1.02	19.22
48									1.00			1.00		3.00		0.01			1.00	1.00	1.00	0.01	1.01			1.00				2.00	2.00	14.03
49																1.00	1.00						4.00		1.00								7.00
50		1.00										6.03																		3.00	0.03		10.06
51								0.01															3.02		1.00	2.00	0.01					0.03	6.07
52																																	0.00
53																			2.00	0.01										3.01			5.02
54																																	0.00
55																																	0.00
56																																	0.00
57																																	0.00
58																																	0.00
59																		1.00												0.01			1.01
60																																	0.00
61																																	0.00
62																																	0.00
63																																	0.00
64																															1.00		1.00
KC																																	0.00
KM																																	0.00
KD																																	0.00
	51.07	10.16	10.03	9.09	8.13	12.07	8.05	10.07	125.75	16.04	68.06	65.25	25.05	8.10	12.04	12.30	2.11	8.07	14.08	8.05	9.11	3.10	25.58	2.12	11.25	17.16	7.19	4.06	3.05	11.38	7.36	19.74	
	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	42	53	54	55	56	57	58	59	60	61	62	63	64	KC	KM	KD	

Appendix 5: The changes of the description from KIAT version 1.0 to version 1.1

FACTORS	DESCRIPTION (KIAT VERSION 1.0)	DESCRIPTION (KIAT VERSION 1.1)
Workers who understand what they need to know to perform	Workers apply their knowledge to perform their work. In doing so, they need to understand what it is that they need to know in order to do their work. Workers who are aware of what they need to know make better decisions and help organisations understand the target domain of knowledge to be managed. Qualified workers who are targeted to be users of a knowledge system play a critical role in knowledge activities in the process within which the system is going to be implemented. How would you rate your organisation in terms of qualified workers' ability to spell out what knowledge they need to know to do their work?	Workers apply their knowledge to perform their work. It is, therefore, a requirement that workers understand what knowledge the need to be able to perform their work. Workers who understand this will make better decision and help organizations understand the relevant knowledge that needs to be managed. The targeted users for a knowledge system that will be implemented are the workers that concern with this factor. How would you rate their ability to spell out what knowledge they need to know to do their work?
Documentation established in a standard language	One piece of evidence when an organisation has commonly understood terms is that it has some sort of a glossary and that documentation used in the business activities contains the standard language. How would you rate your organisation in this respect?	One evidencec that will help us to understsand if an organization has commonly understood terms is the availabiliy of internal document that use the standard language across the board. The documents are the ones that are related to the business process within which the knowledge management system is to be implemented. How would you rate the organizatoin in this respect?
Personalisable IT System	Users interact with a knowledge system for a certain purpose for themselves. A system which provides the capability for users to personalise their interaction with it will encourage users to leverage it for their own purpose. Personalisation can be exemplified as: "personal bookshelf", "a personal or self-tailored organisation of one's interaction with the system". How would you rate your organisation in its infrastructure capacity to provide personalisation for users?	Users interact with a knowledge system in the way that he/she would like it to be. If the system gives the possibility to users to personalize their interaction with it users will be encouraged to keep using the system. Personalization can be such as "personal bookshelf" or a "self-taylored organizatoin of one's interaction with the system". To make this happen there must be a policy within the organization that will allow this personalization and the technology that is capable in doing so. How would you rate your organization in this respect?
Business Processes	Knowledge activities happen while performing work. Knowledge which is not made available within the work flow will most likely be unusable by workers eventhough important. Organisations without clear business processes will have difficulties in managing knowledge into the workflow. Organisations need to have business processes embedded into their infrastructure in running the business. How would you rate your organisation in spelling out the business processes?	Business process is where activities happen and where knowledge is applied. Therefore, knowledge is organized that it is made available within the workflow. Knowledge which is not in the workflow will most likely be unusable by the workers. To be able to manage knowledge in the flow of the business process, the business process itself has to be clearly defined and understood. Without the clear business process managing knowledge will face a lot of challenges. How would you rate your organization in its clarity with the business process(es)?
Adherence to Business Processes	Business processes are meaningful when workers understand and adhere to them. These processes are espoused by them in their day-to-day activities in performing their duties. With adherence to business processes, knowledge can then be structured and embedded into the workflow. How do you rate the workers in your organisation for adherence to the business processes?	A business process is meaningful only when workers understand and adhere to it. This process is espoused by them in their day-to-day activities in performing the duties. With the adherence to the business process the relevant knowledge can be structured and embedded into the workflow. How would you rate the workers in your organization in respect to business process within which the system is implemented?
Problem Solving	Knowledge is often used to address problem solving from which a decision is made. A system that facilitates workers' interaction to create, mobilise and diffuse knowledge should address the problem solving activities. How would you rate the workers in their problem solving activities?	Knowledge is often used to address problem solving from which a decision is made. A knowledge management initiative needs to start with a business issue or a business problem to solve that involves knowledge. However, workers are the ones that will solve the problems. How would you rate the targeted users in their capabiliies and culture within the problem solving activities?
Recognition scheme	A knowledge contributor needs to be recognised by name. By recognising contributors by name, they are encouraged to share knowledge. This recognition can be through an attribution of their contribution and/or through a getting together session where his/her contribution is mentioned and appreciated. How would you rate your organisation in recognising workers' contributions by name?	A knowledge contributor needs to be recognized by name. By recognizing contributors by name, they are encouraged to share knowledge. This recognition can be through an attribution of the name to the contribution and/or through a getting together session where his/her contribution is mentioned and appreciated. Within the process where the system is going to be implemented, how would you rate your organization in recognizing workers' contributions by name for a knowledge contribution?

Appendix 6: THE KIAT INSTRUMENT

Organisational Readiness to operationalise a system that manages the creation, mobilisation and diffusion of knowledge						
Score your organisation for each of the Factors. Please read carefully the explanations for each Factor and understand the description of the ratings. Then mark the score with an X.						
Levels:1 = unacceptable or inexistent 2 = insufficient 3 = correct, can be improved 4 = good 5 = excellent		1	2	3	4	5
Workers who understand what they need to know to perform	Workers apply their knowledge to perform their work. It is, therefore, a requirement that workers understand what knowledge they need to be able to perform their work. Workers who understand this will make a better decision and help organisations understand the relevant knowledge that needs to be managed. The targeted users for a knowledge system that will be implemented are the workers that are concerned with this Factor. How would you rate their ability to spell out what knowledge they need to know to do their work?					
Relationship of Knowledge to Business Activities	It is essential to clearly understand the organisational knowledge domains that support the organisation's activities. Knowledge management is not managing all knowledge but the knowledge that will bring competitive advantage. Understanding the relationship between business activities and the knowledge required to perform the activities is critical to structuring the knowledge to be managed. How would you rate your organisation in this respect?					
Habit of accessing knowledge	While it is important to understand what knowledge is required to perform their duties, it is also important for workers to possess the habit of accessing that knowledge. There are many ways of accessing knowledge, such as for example, technical journals, business magazines, manuals, and on-line information facility. Workers with the habit of accessing knowledge will form the knowledge culture in operationalising a system in which they create, mobilise and diffuse knowledge. How would you rate this for the workers in your organisation?					
Information that is well structured	Structured information facilitates the design of the knowledge structure architecture within a system in which workers interact to create, mobilise and diffuse knowledge. With structured information, access to it can be approached in many different ways. What is the status of your organisation in structuring the knowledge?					

IT technology	IT can provide friendly and quick accessibility to the required knowledge. It brings about greater knowledge exchange and at a higher speed. How would you rate your organisation's IT capacity, such as the bandwidth, the IT system agility, the willingness to equip workers with the necessary hardware and software?					
Organisation's policy for the use of a standard language	A shared language is essential to productive knowledge exchange. Language does not only mean English, French, Chinese, etc. but also what each term means to the community of workers within the business activities. This standard language may be achieved through an organisation policy that emphasises it. How would you rate your organisation in handling this policy and in its implementation?					
Documentation established in a standard language	One piece of evidence that will help us to understand if an organisation has commonly understood terms is the availability of internal documents that use a standard language across the board. The documents are the ones that are related to the business process within which the knowledge management system is to be implemented. How would you rate the organisation in this respect?					
Workers who communicate and build trust with a standard language	In a multi-lingual cultural setting of an organisation the use of a standard language is also reflected in how its workers communicate among themselves. In a meeting, for example, it is important that the standard language is used so that all participants will fully understand the subjects being discussed. How would you rate your organisation in this respect?					
Senior management that shows support through direct reporting and gains respect	In order for a knowledge project to be successfully implemented, visible support by the senior management is a must. Having the knowledge project manager reporting directly to a senior manager sends a strong message to workers. Successful implementation of an initiative is very much linked with how senior management show their support, e.g. the reporting structure. How would you rate your senior management with regard to having a project manager reporting to him/her?					
Organisation reporting structure	A clear organisational structure contributes to the clarity of how an organisation is run. Having a project manager reporting to senior management can only be meaningful when the organisation has a clear reporting structure. How would you rate your organisation in its organisation reporting structure?					

Financial Support	Strong support from senior management cannot be separated from the financial support for the project. Designing and implementing a system where workers interact to create, mobilise and diffuse knowledge can require significant funds. Direct allocation and measurement of funding are needed. How would you assess your organisation in terms of the availability of funds, the funding process for projects and the follow-up of the measurement?					
Feedback-response loop	Management needs to realise that only users can tell what works and what does not, what can work better and what they do not need. An open feedback mechanism for the development or modification of a system needs to be channelled and taken seriously. How would you assess the organisation in terms of ensuring the involvement of users to make a system suitable for them and in being transparent to users and their needs?					
The means to channel feedback	To give their feedback, workers need to have a "tool" that enables them to do so. An organisation infrastructure that channels feedback is required. Without it, a feedback-response loop may remain as an idea rather than being implemented. How would you rate your organisation in having the infrastructure to channel and process feedback?					
Infrastructure for Content Management	Content management is very much dependent on the knowledge structure. At the same time, however, technology that supports the requirement for the knowledge structure needs to be made available. With good content management design, reliability of knowledge sources is perceived by users and they are encouraged to keep learning and sharing knowledge within the system. How would you rate the IT capacity of the organisation or the system in handling the content management?					
Governance Body	A project to design and implement a system where workers interact to create, mobilise and diffuse knowledge can evolve along many different alleys of development To ensure a consistent path and to provide a clear direction and objectives (and maintain them), a knowledge project needs a governance body. The governance body sets “the rules of the game” for processes and critical issues such as content management, training programme, and measurement. This governance approves, asks for rework, or rejects proposals for changes. Senior management becomes a sponsor of the governance body. With its charter, governance ensures a reliable knowledge source that maintains member confidence. How would you rate your organisation in its capacity to create and adhere to a governance body?					

Personalisable IT System	Users interact with a knowledge system in the way that he/she would like it to be. If the system gives the possibility for users to personalise their interaction with it users will be encouraged to keep using the system. Personalisation can be such as "personal bookshelf" or a "self-tailored organisation of one's interaction with the system". To make this happen there must be a policy within the organisation that will allow this personalisation and the technology that is capable of doing so. How would you rate your organisation in this respect?					
A system that is fast, real time, and easy to use	A system that supports workers in knowledge interaction needs to be fast, real time and easy to use. Often a system that makes it harder for users to perform their work will not appeal to them. How would you rate your organisation in providing a system that is fast, real time and easy to use?					
Ease of navigation	The amount of user effort to interact with the system is a significant Factor in its usability. Users look for easy navigation. This depends on the content management of the knowledge structure. Different types of user will interact differently with the system. The design for the navigation needs to follow the knowledge structure design that addresses these many types of user. How would you rate the organisation's understanding on how different types of user may interact with the system and the readiness of the organisation to take that into account in designing and developing the navigation system?					
Workers who are eager and positive towards becoming trained and sharing what they know	Workers who are eager to continually learn and share what they learn form the basis for a training culture within an organisation. This training culture facilitates the design and implementation of a system where workers interact to create, mobilise and diffuse knowledge in two ways: in the eagerness to use it and also in the involvement in the training for the system. How would you rate the training culture among the workers?					
Training programme that links to people development and business needs	A training culture influences and is influenced by the organisation policy toward people development and training for the business needs. A clear policy on workers' training encourages and can form the learning culture that is expected. How would you rate your organisation in its training and people development policy?					
Mobility of workers across geographical areas and/or business units	When people change function, location or activities, they are faced with a new situation where they need to learn. At the same time, they also carry with them their acquired knowledge. They, naturally, will need some knowledge transferred to them and they may contribute their knowledge to the newer environment they are in. This creates a natural need and situation where knowledge exchange takes place. Organisations with a policy of moving people from one function or location or activities to another are more likely to create a knowledge exchange environment. How would you rate your organisation in having a policy and implementing people mobility?					

Single source	Structuring the organisation knowledge into one source makes it much easier for users to refer to, and for administrators and contributors to manage. Having more than one single source for a given domain creates "competition" among the systems/sources and they will become incomplete, unreliable and eventually lose credibility and users. How would you rate your organisation in aggregating and diffusing information or knowledge through a systematic process leading to a "single source" structure?					
Business Processes	Business process is where activities happen and where knowledge is applied. Therefore, knowledge is organised so that it is made available within the workflow. Knowledge which is not in the workflow is likely to be unusable by the workers. To be able to manage knowledge in the flow of the business process, the business process itself has to be clearly defined and understood. Without a clear business, process managing knowledge will face many challenges. How would you rate your organisation in its clarity with the business process(es)?					
Adherence to Business Processes	A business process is meaningful only when workers understand and adhere to it. This process is espoused by them in their day-to-day activities in performing their duties. With adherence to the business process, relevant knowledge can be structured and embedded into the workflow. How would you rate the workers in your organisation in respect to the business process within which the system is implemented?					
Alert Feature	Not only does knowledge need to be in the workflow but busy workers need to be alerted to some critical knowledge which is created in their relevant domain. This "instant" knowledge needs to be diffused through a "push" method because it is critical and may lead to a better performance or avoid major fiascos. How would you rate your organisation in its policy of communicating critical knowledge to the relevant population and also the system capability to send alerts?					
Answer to users' needs	Workers exchange knowledge and use a knowledge system to answer their needs. If the system does not answer the user needs, it will simply remain a beautiful system without the users' souls that make the system alive. The social environment within the organisation leads to how management will take the workers' needs into consideration in designing and implementing a system. How would you rate your organisation on taking workers' needs into account for the various projects?					

Workers that ask questions	Knowledge creation, mobilisation and diffusion can often start with a question. A work environment where "open question - answer" is encouraged may generate workers' enthusiasm to ask questions. This is an important atmosphere for a knowledge system to be effective. How would you rate your organisation in its social setting for workers to ask questions?					
Problem Solving	Knowledge is often used to address problem solving from which a decision is made. A knowledge management initiative needs to start with a business issue or a business problem to solve that involves knowledge. However, workers are the ones who will solve the problems. How would you rate the targeted users in their capabilities and culture within the problem solving activities?					
Knowledge Broker	Knowledge brokers connect between those who need the knowledge and those who have it. Knowledge brokers are the reference, in many instances, for the workers in realising the knowledge activities. They ensure the rules of the game are well followed and they facilitate – in line with the knowledge system – the workers' interaction in which knowledge is being created, mobilised and diffused. How would you rate your organisation's readiness to assign a knowledge broker that is well respected and emphasises the knowledge structure?					
Expert users	Often, problem solving requires expert knowledge – not only by the subject matter experts but also by the recognised users who are considered experts. These experts are recognised within the work environment and their contribution to the knowledge activities is mainly voluntary. It is therefore a culture in itself where expert users are recognised and they volunteer for the knowledge activities. How would you rate your organisation in recognising expert users and in ensuring them to collaborate?					
Knowledge Champion	Knowledge Champions are the "cheer leaders" for the knowledge activities at different sites. They provide cognitive resources to workers on site in their role of helping the knowledge brokers to ensure the rules of the game are being followed. How would you rate the readiness of your organisation to identify and assign knowledge champions?					
Subject Matter Experts	Subject Matter Experts are identified as the people who have the knowledge. Their collaboration in the knowledge activities is normally voluntary and the identification of these experts is compulsory. Without these identified experts, the mobilisation and diffusion of knowledge will remain as a hope rather than a reality. How would you rate your organisation in recognising Subject Matter Experts and in ensuring them to collaborate?					

Structure of Communities	The concept of communities for knowledge activities has been recognised as being critical. Communities need to be structured as to how the members will interact in addressing the structured knowledge. Addressing the structure of communities requires the project team to draw up the rules of the game for the communities to sustain their activities. How would you rate your organisation in its ability to structure the intended communities for workers to interact in the system in which the creation, mobilisation and diffusion of knowledge take place?					
Working in Communities	A structure for communities does not guarantee that workers will work within communities. The structure is the facility for workers to work together in communities. The social setting will need to be such that workers are eager to work in their communities. A habit of working in teams educates workers to work in communities. How would you rate the workers in your organisation in terms of their habit and readiness to work in communities?					
Validation Process	Reliable content in a knowledge system is a pre-requirement to expect workers' interaction with the system. A validation process is therefore required for any knowledge to be placed into the system. This validation process sets the rules as to how knowledge becomes validated among experts to ensure its reliability. How would you rate your organisation in setting and handling a validation process within its activities?					
Objectives-based appraisal	A culture of setting and achieving metrics is facilitated through an organisation policy that evaluates its workers based on how objectives are met. How would you rate your organisation in its policy towards an objective-based appraisal?					
Workers who work through metrics	In general, scholars agree that execution through metrics will ensure the implementation of a strategy or an idea. Setting metrics and driving all efforts towards achieving these metrics is a capability that an organisation needs to have to achieve the objectives of a knowledge project. This capability is a manifest of the way workers behave in their day-to-day activities. How would you rate the workers in your organisation in terms of the manner in which they set metrics and work towards achieving them?					
Organisation communication policy and structure	Addressing What's In It For Me requires an official setting to communicate it. This will be made possible if an organisation has a communication policy and structure that will facilitate the required communication to workers. How would you rate your organisation in its communication policy and structure with regard to how it will address the WIIFM?					

What's In It For Me (WIIFM) Awareness	Workers and managers need to be made aware of what a system can bring to them. It is true that the system should answer the users' needs; but it is through an awareness programme that workers will realise what it is that the system may have for them. How would you rate the workers in your organisation in responding to such a WIIFM awareness programme?					
Recognition scheme	A knowledge contributor needs to be recognised by name. By recognising contributors by name, they are encouraged to share knowledge. This recognition can be through an attribution of the name to the contribution and/or through a getting together session where his/her contribution is mentioned and appreciated. Within the process where the system is going to be implemented, how would you rate your organisation in recognising workers' contributions by name for a knowledge contribution?					
Knowledge Feedback loop	Knowledge exchange is two-way communication. For a knowledge system to attract workers, it needs to provide a mechanism for users to give feedback on the knowledge being shared. With this, the system is kept up-to-date and alive. How would you rate your organisation in providing a knowledge structure that includes the knowledge feedback loop?					
Two-way communication	To keep knowledge alive, a *two-way communication atmosphere* must exist within an organisation. This is a social setting that is normally taken for granted. However, with the absence of this atmosphere, knowledge feedback activities will probably not exist. How would you rate your organisation's culture in terms of two-way communication?					
Leadership who walk the talk	Support from leadership to a knowledge project needs to include the leaders' personal commitment to communicate its importance. Leadership should also carry the "flag". With this kind of action, workers feel the drive from leadership and the importance of the project. How would you rate the leadership of the organisation in their personal commitment to a knowledge project? If there has not been any knowledge project, then how would you rate the leadership in their personal commitment to a critical project?					
Structured team to promote knowledge initiative	Promoting a knowledge initiative to reach all requires a team that is focused and is ready to travel to the necessary geographical areas to promote the subject. It is also possible that the structured team is built around the central core team but at different locations. The coordination is, however, very important. How would you rate your organisation in its capability and intention to create a structured promotion team for a knowledge project?					

Reaching all	Full coverage of targeted users is an issue that needs to be addressed if a knowledge project is to be successful. More often than not, organisations forget to ensure full coverage and consequently knowledge system implementation is only partial. How would you rate your organisation, in its culture of reaching out to all workers concerned, in communicating a subject?					
Identification of important knowledge that comes from workers	The identification of the knowledge to be managed needs to come from the workers of the organisation. A top-down decision will not receive much enthusiasm. Besides, the knowledge workers know better. This should be a requirement in deciding and designing a knowledge structure within an organisation. How would you rate your organisation in structuring the knowledge that comes from the workers rather than making a top-down decision?					
Workers who control their own time	Knowledge workers feel uncomfortable when their activities are put under a "magnifying glass". Scholars say that workers need to have some "space" for them to become involved in knowledge activities. It only then makes sense for knowledge workers to control their own time in their day-to-day activities. How would you rate the way workers in your organisation control their own working time?					
Knowledge Structure that addresses both the organisation's and the workers' benefits	In structuring the knowledge being managed, transparency is required for both organisation and worker benefits. For example, the reporting structure produced from a knowledge system needs to address this issue. A one-way transparent benefit will cause a lack of enthusiasm among workers. How would you rate your organisation in its transparency of the knowledge structure that addresses both the organisation and worker benefits?					
Streamlined activities	Adding activities without removing other activities will load workers even more within their day-to-day tasks. Knowledge activities need to be streamlined – the rules of the game need to be designed so that the use of the knowledge system will not add a burden to workers but rather make their work easier. How would you rate your organisation in streamlining activities – removing some activities when adding others?					
Addressing workers' value	It is hard, if not impossible, to expect workers to interact and contribute within a knowledge system that will result in the diminishing of his/her own value to the organisation. Knowledge structure within the knowledge activities and system needs to enrich the workers' value to the organisation. If a re-organisation is required due to the new knowledge structure, then this should be addressed prior to the knowledge system being introduced. How would you rate your organisation in aligning knowledge structure to enriching workers' value and in its response to change as required?					