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Ignorance Management – an alternative perspective on Knowledge Management

by

John Israilidis Antoniou

2013

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Ignorance Management – an alternative perspective on Knowledge Management

by

John Israilidis Antoniou

Submitted in partial fulfilment of the requirements for the award of

Doctor of Philosophy

of Loughborough University

2013

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Στους σεβαστούς μου γονείς Κλεάνθη και Ειρήνη
και στην αγαπημένη μου αδελφή Μάρσια

Preface

This thesis is submitted to the School of Business and Economics at Loughborough University, Leicestershire, United Kingdom in partial fulfilment of the requirements for the degree of Doctor of Philosophy (PhD) in Business and Management (Knowledge Management).

This PhD thesis is based on research undertaken from 2010 to 2013 under the supervision of Dr. Louise Cooke and Dr. Russell Lock. The work was conducted within an industrial context, but was performed primarily at the Centre for Information Management (formerly known as the Department of Information Science) and the Department of Computer Science at Loughborough University.

A number of peer reviewed journal articles and conference papers were published to disseminate the findings from the study. The full papers are included in the Appendix section, each of which form an integral part of the work and thereby should be read in conjunction with this thesis.

Acknowledgements

I would like to express sincere gratitude and appreciation to my supervisors, Dr. Louise Cooke and Dr. Russell Lock for their unswerving support, kind advice and constant guidance in the supervision of this research project. They both always encouraged me to think critically and creatively throughout my studies at Loughborough University.

In addition, I would like to acknowledge the support of Paul Cheetham and Julian Johnson, without which this work would not have been possible.

I would also like to thank Professor Thomas Jackson and Dr. Jenny Fry for giving me the benefit of their advice on earlier drafts of this thesis.

The research would not have been possible without the co-operation of those who willingly contributed their time, ideas, experience and insights when being interviewed or surveyed. Without their input there would have been no data and, subsequently, no research. Hence, I am very grateful for all of these contributions.

And finally, I wish to thank all the devoted and inspired individuals who assisted me in preparing this thesis, including my family and all friends. In particular, I would like to thank Cleanthes, Irene, Marcia, Christos, Vicky, Antonios and Maria for their constant support and encouragement. And, of course, my beloved partner Eleni, who is always there for me whenever I need her.

Abstract

Managing organisational knowledge is crucial to increase business performance and competitiveness. However, given the complexity and dynamic nature of knowledge management practices, multinational organisations experience difficulties in identifying business opportunities and often fail to make necessary investments. This thesis develops an alternative perspective on knowledge management through the creation of a model based on socio-technical characteristics and organisational ignorance, and argues that managing nescience, i.e. knowing what needs to be known and also acknowledging the power of understanding the unknown, could facilitate employees' knowledge sharing behaviour and could improve both short-term opportunistic value capture and longer term business sustainability. It also creates a novel technique for managing dysfunctional knowledge management scenarios and improving knowledge management practices in the workplace by definition of the concept of KM anti-patterns, while discussing practices that reduce the risk of making the wrong decision when using uncertain information. The philosophy of this study is based on an interpretative approach with inductive reasoning. Both qualitative and quantitative methods, based mainly on workshop style discussions, questionnaires and semi-structured interview data, were implemented using various departments of one multinational organisation within the Aerospace and Defence industry as units of the analysis. Managing organisational ignorance is seldom and insufficiently discussed by the current KM literature and no previous attempt has been made to detect, analyse and categorise KM dysfunctional situations using a systematic KM anti-pattern template. It is argued that the issues addressed in this study could lead to inefficient or otherwise inappropriate KM practices; therefore it is important, particularly for managers and senior executives, to acknowledge, verify and act upon such matters in order to increase performance within their business, and optimise the level of knowledge for an individual employee or group in knowledge intensive settings.

Keywords: knowledge management; ignorance management; anti-patterns; organisational practices; performance improvement; multinational organisations

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Chapter 1

Introduction

This chapter provides an introduction to the research topic. The rationale, the need for the research and the industrial context of the study are presented in the first section of this chapter (Section 1.1). The current knowledge management issues are discussed in the second section (Section 1.2), followed by the aims and objectives of the study (Section 1.3). The fourth section (Section 1.4) examines the research procedures employed in this study; the fifth section (Section 1.5) includes a list of publications produced to disseminate the insights gained through the study, and the sixth section (Section 1.6) reviews the overall structure of the thesis. Finally, a conclusion of this chapter is presented in Section 1.7.

1.1 Research need and industrial context

> *For the most mature knowledge managing organizations*[1] *today, the challenge that lies ahead is forging this link between knowledge management and fundamental business strategy (Davenport and Prusak 2000, p.9).*

Research previously carried out in a large computer software corporation led the author of the current thesis to a better understanding of the information and knowledge challenges within a multinational organisation, and identified the need for better KM practices in order to meet demands posed by the changing global economic landscape (Israilidis 2010). Supporting this observation, the extant literature suggests that multinational organisations often lack effective knowledge transmission mechanisms resulting in fewer innovative ideas, cognitive stress (Malhotra 1982; Schick *et al.* 1990), lack of perspective (Shenk 1997; Schick *et al.* 1990; Schultze and Vandenbosch 1998) and de-motivation (Baldacchino *et al.* 2002). Szulanski (2003, p.13) defines the popular concept of "sticky knowledge", i.e. the difficulty of transferring and sharing knowledge, revealing that the transfer of best practices within

[1] Titles and quotes are reproduced with their original spelling; otherwise English (UK) spelling is used.

multinational corporations is a complex phenomenon and can seem stubbornly motionless. Furthermore, Gupta and Govindarajan (2000) observe that, notwithstanding the increasing sophistication of external markets, multinational organisations remain localised without effective knowledge transfer mechanisms. Additionally, particularly within knowledge intensive organisations[2], it is evident that the enhancements of the systems and applications used, as well as the dedication to critical knowledge decision processes which aim to foster innovation and enable novelty, have become a secondary consideration (Nonaka 1991). The continuous interactions of employees with different sources of information can often lead to information overload and the incorrect use of systems with effects both on individuals and decision processes (Collins 2001; Israilidis and Jackson 2012). In this regard, Nonaka (1991) argued that "employees deluged with highly specific information often find it extremely difficult to turn that information into useful knowledge" (Nonaka 1991, p.102) preventing both the creation of new knowledge and the promotion of innovation within an organisation. In general, despite many attempts to increase the efficiency and productivity of operations and cut operational costs, organisational knowledge is often not successfully captured, stored and accessed, possibly due to the lack of effective KM strategies, the lack of understanding of how an organisation learns and adapts to new environments and the current Information Technology-centric approach (i.e., fight for the best tool attitude) adopted by a number of managers. In several cases, knowledge management is classified as a bolt-on activity and especially within critical projects there are evident signs of knowledge confusion and system failures (Braganza and Möllenkramer 2002; Sommerville 2006; Vartabedian 2009). It may be arguable that this phenomenon has become even more acute due to the 2008 (onwards) financial and economic downturn. The impact of global recession has impinged upon many organisations worldwide resulting in decreased productivity, costly mistakes, poor business performance (Bhaumik 2011) and widespread unemployment (2.51 million in October 2012[3] in the United Kingdom, ONS 2012).

Building on these observations, the necessity to re-examine managerial strategies and improve the efficiency and effectiveness of existing business processes has never been greater. Organisations have emphasised the need to create a vibrant knowledge sharing culture that will ensure growth and innovation and will help overcome problems that might arise within their industry (Von Krogh *et al.* 2001). Additionally, the adoption of such culture could also support more effective colocated and long distance communications and help guide teams to outstanding results, on time and within budget. Thus, in an economy where the only certainty is uncertainty, one sure source of sustainable competitive advantage is the formulation of a strategic knowledge management policy (Nonaka 1991) which will

[2]As Alvesson (1995) suggests, knowledge intensive organisations are characterised by factors such as significant instances of problem solving, creativity as well as high educational levels and a high degree of professionalisation on the part of most employees.

[3]The unemployment total was at its highest level since December 1994, according to the UK Office for National Statistics (ONS).

undoubtedly play a vital role when referring to a company's efficiency, productivity and overall performance.

To address the aforementioned research need, this study has been applied to technology intensive environments and was undertaken at DefenceCo[4], one of the largest military contractors in the world employing over 100,000 people across the globe. The company is ranked within the top ten of the global aerospace and defence indexes including the Defence News, Forbes2000 and Stockholm International Peace Research Institute (SIPRI) top 100, based on a mixture of four metrics: sales, profit, assets and market value. The company's employees are highly skilled within their respective fields and the organisation has attempted to create an environment specifically suited to knowledge exchange, transfer and sharing. DefenceCo delivers a full range of products and services for air, land and naval forces, as well as advanced electronics, security, information technology solutions and support services; hence there is a high demand for knowledge intensive activity, principally within the context of Lifecycle Management (LCM), which is one of the mandated core business processes that has been developed by the organisation over a number of years. In detail, the LCM Framework provides a structured approach to managing the company's commitments for all types of projects throughout their lifecycles, from bidding and contracting for high quality new business through to effective delivery of contracts. LCM promotes the application of best practice management and is intended to facilitate continuous improvement across the organisation. The application of LCM with appropriate tailoring, i.e. the employee need to interpret and apply the LCM for a given project, is critical to the capability of the organisation to deliver projects on time, within projected cost and according to contract whilst meeting external and internal customer commitments and ensuring responsible behaviours at all times.

Given the complexity and dynamic nature of frameworks such as the LCM, multinational organisations experience difficulties in identifying business opportunities and often fail to make necessary investments in KM initiatives. This thesis identifies areas of ineffective knowledge management and suggests new ways of dealing with knowledge intensive activities not only to generate new knowledge internally, but also to be able to acquire knowledge from the external environment in order to increase the level of total organisational knowledge. This will increase the chances of success in generating a competitive advantage, which in turn will improve the interaction between KM and the business strategy, maximising both short-term opportunistic value capture and longer term business sustainability. Coming from a more people-oriented perspective, this thesis also discusses improved knowledge management techniques to alleviate problems and manage knowledge effectively. It also seeks to address what makes up the knowledge culture of a knowledge intensive organisation and focuses on identifying new ways of handling information more efficiently. By looking

[4]DefenceCo is a pseudonym that has been adopted to protect company anonymity.

into social aspects, this research examines the influence of human activity when interacting with system applications and tools while identifying a model which is capable of making a significant contribution to the performance of a multinational company.

1.2 Theoretical debates in Knowledge Management

As noted in the previous section, organisational knowledge is often not successfully managed despite attempts to increase business performance and competitiveness. Previous KM literature suggests numerous models and strategies towards managing knowledge effectively. Hansen *et al.* (1999) for example, provide an interesting perspective on a form of knowledge community in their description of "personalization strategy". This strategy emphasises interpersonal communication of knowledge, rather than relying on a knowledge repository for facilitating knowledge sharing. Nonaka *et al.* (1996) propose a model of organisational knowledge creation in the form of a spiralling knowledge process interaction between tacit and explicit knowledge, also known as the "Socialization, Externalization, Combination, Internalization" (SECI) model. In general, it is widely acknowledged that the sharing of ideas among employees is a key process underlying collective knowledge within an organisation without which a company may not be able to leverage its most valuable asset – its people (Jarvenpaa and Staples 2000; Nahapiet and Ghoshal 1998).

But how can we effectively retain access to such knowledge over time? What approaches and strategies can help prevent organisational amnesia? How can we reduce the risks of making the wrong decision when using 'imperfect information'[5]?

These questions lead to consideration of the potential impact of ineffective knowledge transfer mechanisms in technology intensive organisations, and form the central research theme of this thesis.

Furthermore, there are a number of issues addressed in this thesis which are either insufficiently reported in the literature or not widely investigated within the business world. Such issues include, but are not limited to:

- The lack of knowing what needs to be known and acknowledging the power of understanding the unknowns.
- The lack of describing KM dysfunctions against a formalised template of anti-patterns, as well as identifying necessary actions to resolve such dysfunctions.
- The lack of literature reporting studies carried out in the Aerospace and Defence industry.

[5]In this thesis, the term 'imperfect information' is used to denote information that is neither precise nor certain. As Smets (1997) suggests, imperfection can be due to imprecision, inconsistency and uncertainty.

Hence, in an attempt to address the existing gap, this thesis identifies techniques that enable managers to develop an effective KM strategy which will have a potential significant positive impact on the way knowledge is accessed and processed within the organisation. It also identifies specific factors that cause knowledge confusion and management failure while contributing to the theory of Knowledge Management by developing alternative concepts based on socio-technical characteristics and organisational ignorance.

1.3 Aims and objectives

The aims and specific objectives of the study are:

1. To investigate and identify techniques for knowledge management practices in the context of intensive knowledge exchange activities that enable managers to improve the overall efficiency and functionality of current operations within technology intensive organisations.

    A) Drawing on analysis from a specific case context within the Aerospace and Defence sector, to identify the specific factors that cause knowledge confusion and knowledge management failure.

    B) To explore the organisational design elements that help to optimise the level of knowledge for an individual employee or group in knowledge intensive settings.

    C) To investigate the heterogeneous structures of collaborative business networks, and analyse their strengths and weaknesses within knowledge intensive organisations.

    D) To provide recommendations for practice on how to improve the implementation of knowledge management strategies in the case study organisation and the wider Aerospace and Defence sector.

2. From a methodological and theoretical perspective, to contribute to the theory of Knowledge Management by developing alternative concepts based on nescience and anti-patterns.

    A) To critically review the literature relating to information and knowledge management processes in organisations with particular focus on knowledge sharing and information value.

    B) To develop a theory on the nature of knowledge and ignorance and address the existing gap in the literature around managing adaptivity and the unknown in multinational organisations.

C) To detect, analyse and categorise dysfunctional Knowledge Management situations.

D) To create a pragmatic model for managing KM dysfunctions and improving knowledge management practices in multinational organisations.

1.4 Overview of research procedures

The fieldwork research was carried out in numerous visits as discussed below (explored in further detail in Section 3.2 – Research Methodology).

Phase 0: The aim of the primary visits was to facilitate an informal observation of the organisation (context setting). They also gave the researcher the opportunity to meet up with the industrial supervisor and discuss the research scope while developing the aims and objectives of the study.

Phase 1: The second phase of visits was designed to collect primary data through workshop-style discussions, document reviews and observation. This phase was intended to collect qualitative data, allowing the researcher to understand the knowledge management culture of the industry, make links with key personnel and identify key areas for further investigation.

Phase 2: The third phase of visits was conducted in order to pilot the survey and collect predominantly quantitative data. Once the survey was fully tested, this phase was administered over the Internet for a four-month period in order to gather sufficient data for analysis.

Phase 3: Based on the results derived from the analysis of the quantitative survey data, a final phase of qualitative interview data collection was undertaken. The aims of this final phase were to investigate interesting patterns emerging from the interpretation of the results generated, as well as identify any significant correlations or disprove hypotheses regarding an expected correlation. However, due to logistical difficulties and in order to meet certain cost limitations, this phase was conducted over the telephone. The findings of this phase together with the other two data-collection phases presented above, were integrated and compared, in order to produce a complete set of conclusions and recommendations. The complete set of findings is presented in Chapter Four.

1.5 List of publications

A number of peer reviewed papers were published to disseminate the findings from the study. The full papers are included in the Appendix section; however a summary listing

of the publications, along with full bibliographical references is included in this section[6]. These papers are an integral part of the study and thereby should be read in conjunction with this thesis.

1.5.1 Journal articles

1. "Examining the effect of organizational ignorance on knowledge sharing: A conceptual study and an empirical investigation", under review at *Group & Organization Management* (with Evangelia Siachou, Louise Cooke and Russell Lock).
2. "Anti-patterns in Knowledge Management", under review at the *International Journal of Applied Systemic Studies* (with Russell Lock and Louise Cooke).
3. "Analysing the productivity, performance and viability of business networks in multinational organisations: a case study of the Aerospace and Defence industry", under review at the *Journal of Information and Knowledge Management* (with Louise Cooke and Russell Lock).
4. "Ignorance Management" (2013), *Journal of Management Dynamics in the Knowledge Economy*, 1(1), 71-85 (with Russell Lock and Louise Cooke).

1.5.2 Conference papers

1. "Facilitating Knowledge Sharing through Ignorance Management: The moderating role of Knowledge Processors" (2013), 13^{th} *European Academy of Management Conference (EURAM)*, Istanbul, Turkey, 26-29 June (with Evangelia Siachou, Russell Lock and Louise Cooke).
2. "Ignorance Management: An Alternative Perspective on Knowledge Management in Multinational Organisations" (2012), 13^{th} *European Conference on Knowledge Management (ECKM)*, Cartagena, Spain, 6-7 September, 493-501 (with Russell Lock and Louise Cooke).

1.6 Structure of the thesis

The thesis is organised into eight chapters as follows:

Chapter 1 introduces the rationale of the study and notes the research aims and objectives.

Chapter 2 provides a detailed review of the existing literature on KM. It also presents a detailed review of knowledge failures, communities of practice and organisational networks.

[6]The information provided in this section is correct at the time of print, but may be subject to change.

Chapter 3 explains the methodology adopted in carrying out the research. The various perspectives and approaches for meeting the overall research objectives are presented. The data collection methods adopted in this study as well as their suitability are also explained in this chapter.

Chapter 4 is the main corpus of the thesis. It outlines the key findings from the research that resulted from the data captured through quantitative and qualitative sources.

Chapter 5 discusses the results and correlates the findings with the relevant literature. Furthermore, it discusses the implications of the research on the aerospace and defence organisation and its implications for the wider industry.

Chapter 6 presents the theoretical framework of the research and outlines the model derived from the study.

Chapter 7 discusses implications for practitioners involved in managing knowledge practices. It detects dysfunctional KM scenarios by definition of the concept of KM anti-patterns, and gives the applicability and evaluation of the techniques presented.

Chapter 8 discusses the conclusions and scope of the research. It also explores areas for future work.

Appendix A includes the scientific papers that were published in support of this study.

Appendix B includes the survey questionnaires used in this study.

Appendix C includes the interview questions provided to the participants.

1.7 Conclusion

This chapter presented the overall aim of this study and listed the research objectives. It also discussed the rationale for the study and introduced the context, need and procedures of this research project. Additionally, it included a list of publications emanating from this work. Finally, this chapter provided the structure of this thesis, including an overview of each chapter. The extended critical literature review conducted into the subject area is now presented in Chapter Two.

Chapter 2

Literature Review

This review presents some theoretical concepts of knowledge management while identifying key themes about how an organisation learns and adapts to new environments. Literature based on recent academic articles as well as books and journals will be synthesised in order to clarify the importance of managing knowledge processes within technology intensive environments.

This chapter defines the concept of intellectual capital and identifies the importance of knowledge networks in creating a knowledge sharing culture (i.e. an environment in which knowledge and expertise is exchanged by individuals). Current examples of organisational knowledge practices in Aerospace and Defence organisations are identified as well as the role of certain knowledge communities within technology intensive organisations is also identified and presented. In addition, the tangible outcomes of implementing a strategic knowledge management policy are analysed and a philosophical approach of acquiring knowledge based on pragmatism, critical theory and other sociological paradigms is discussed. Finally, the chapter concludes by outlining the research gaps and key issues identified in the literature which this thesis addresses.

2.1 Defining Information and Knowledge

In order to appraise the criticism that knowledge management strategies should be tailored to fit specific business needs, it is important to analyse the definitions of Knowledge and Information. According to the Cambridge Advanced Learner's Online Dictionary (2011), information derives from the verb inform, namely to tell someone about particular facts. More precisely, information is "facts and figures based on reformatted or processed data" (Awad and Ghaziri 2004, pp.36-37). In addition to the above definition, Awad and Ghaziri (2004, p.60) have also specified the semantics of data in the discipline of Information Science.

It is described as a set of discrete facts that do not offer judgment or a basis for action having also mentioned that data is a prerequisite to information. Furthermore, an older definition of information given by Drucker (1998, p.101) is "data endowed with relevance and purpose". All these definitions though are similar to each other and are quite simple compared to the definitions of knowledge, which are more complex. Moreover, knowledge has etymologically derived from the Greek word episteme which comes from the verb "to know". Philosophical debates in general start with Plato's[7] formulation of knowledge as "justified true belief" (Hoitenga 1991, p.27). Many Greek philosophers however have referred to knowledge as a source of power and these quotations remain alive even today, after more than two thousand years. An exemplar is Aristotle, a student of Plato and teacher of Alexander the Great who has stated in the *Posterior Analytics* (Book 1 Part 2):

> *"We suppose ourselves to possess unqualified scientific knowledge of a thing, as opposed to knowing it in the accidental way in which the sophist knows, when we think that we know the cause on which the fact depends, as the cause of that fact and of no other, and, further, that the fact could not be other than it is. Now that scientific knowing is something of this sort is evident — witness both those who falsely claim it and those who actually possess it, since the former merely imagine themselves to be, while the latter are also actually, in the condition described. Consequently the proper object of unqualified scientific knowledge is something which cannot be other than it is" (Aristotle, Posterior Analytics).*

It can therefore be deduced that the passage from information to knowledge requires responsibility, must be a non-biased process and is a very challenging task to achieve. Nevertheless, more definitions of knowledge have been given during the last two decades by researchers who have worked in the areas of knowledge management and integration. Specifically, as noted by Tiwana (2000, p.57), knowledge is "actionable information" whereas Awad and Ghaziri (2004) believe that it is a matter of understanding the information you get through experience or study. As we can see, several different definitions can be given to the term knowledge. Nevertheless, it is quite difficult to clarify and understand the value of being knowledgeable. This can also be justified by exploring the layers in the 'Data-Information-Knowledge Hierarchy' as presented by Chaffey and Wood (2005). We can see in Figure 2.1 that the base of the pyramid is data. This is the necessary building block to start and build the rest of our pyramid. Without having data there are no "symbols" (Ackoff 1989, pp.3-9) to be described in terms of information or knowledge. As we move on in the hierarchy, we can see that there is a connection between each layer and that "higher elements can be explained in terms of the lower elements by identifying an appropriate transformation process" (Rowley 2007, p.168). Moreover, a more focused approach on that transformation process between signals, data, information and knowledge

[7]Plato (born in c. 428 B.C. in Athens, Greece) was a philosopher and mathematician who helped to lay the foundations of Western philosophy and science.

is given by Choo (2006) as shown in Figure 2.2. The figures presented, make it clear that achieving knowledge requires a deeper understanding of the subject we tackle and should be developed in an environment of analysis and critique.

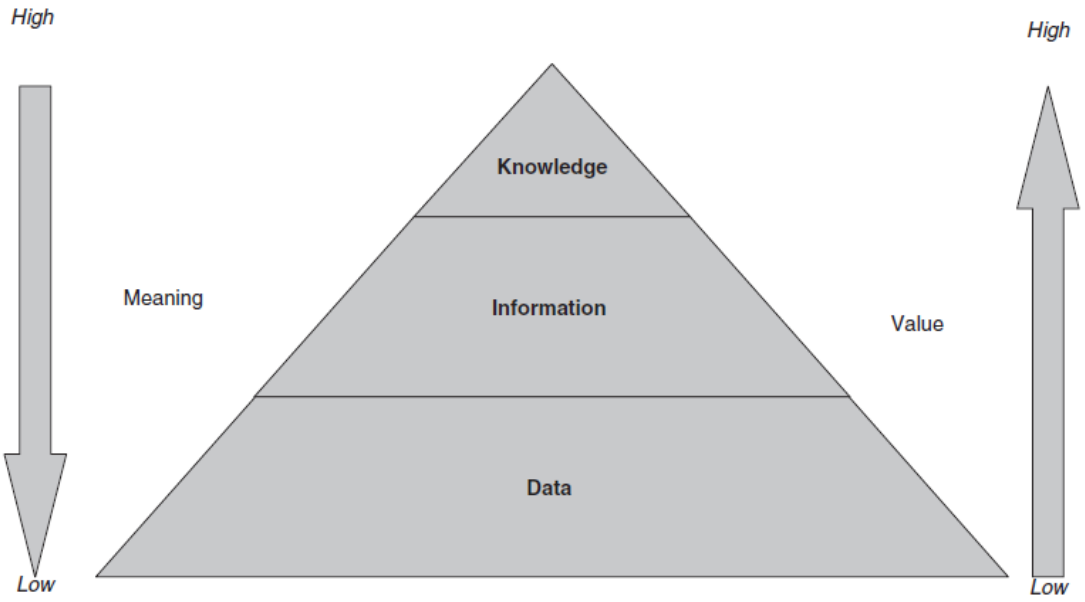

Figure 2.1: 'Data, Information and Knowledge', according to Chaffey and Wood (2005)

2.2 KM in the Aerospace and Defence industry

Organisations that operate in the defence and aerospace industry are mainly involved in the various aspects of designing, building, testing, selling and maintaining aircraft, spacecraft, ships, submarines and other military technology and equipment, such as missiles, weapons and ammunition. In addition, many organisations operating in this industry are also involved in the areas of information security and digital forensics including the protection of private information, secure networks and critical infrastructures.

Despite the fact that the aerospace and defence industry reported its best year ever in 2011 in terms of revenue and profit, the outlook for defence is clouded by multiple issues (PwC 2012). Some examples include the possibility of sequestration in the United States (US), the cuts to the defence budget in the United Kingdom (UK), the US military's role in world affairs, the growing threat of Iran's nuclear weapons programme and other critical factors aiming to influence the long-term picture. However, industry executives believe that defence spending will be driven by threats to security, which have not diminished with the current crisis (PwC 2012). In the UK for example, the whole of the defence support services

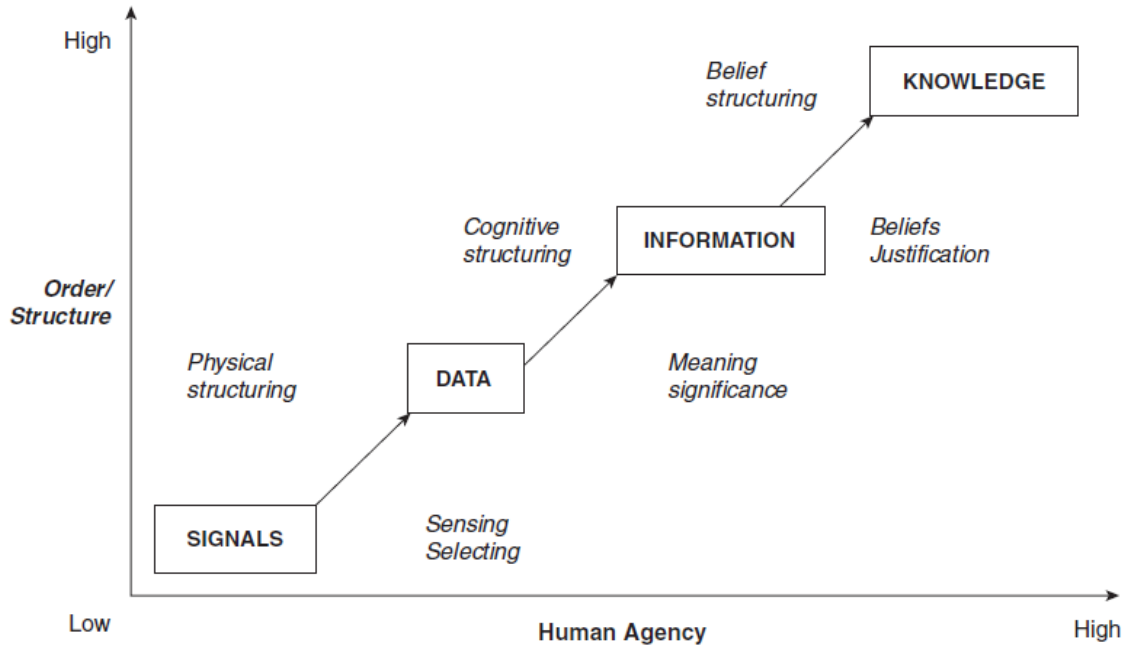

Figure 2.2: Signals, Data, Information and Knowledge, according to Choo (2006)

market is projected to be worth an estimated £16 billion per year by 2020, or approximately 75% of total Ministry of Defence spend within industry, and these trends are also likely to accelerate in Europe according to the PwC Aerospace and Defence 2012 forecast. Hence, the defence industry agrees that it must respond to the affordability challenge and improve productivity.

As Jafari *et al.* (2007) note, one of the most important industries which should be managed completely from the knowledge point of view is the aerospace industry as the design and construction of aerospace systems has raised specific KM concerns, such as dealing with complexity, traceability, maturity of knowledge, interaction between experts, awareness of the status of information, and trust in knowledge. Therefore, it is essential to develop a strategic knowledge management model in order to produce, share and explore organisational knowledge effectively.

Furthermore, managing knowledge has also become increasingly critical due to the increased pressure to boost efficiency and reduce costs for new aerospace and defence systems.

> *"Most of aerospace organizations have increased their outsourcing to suppliers of subassemblies (such as engines, structures, landing gear, and avionics) and concentrating on their core competencies of design, assembling and marketing aircraft. At the same time, they have made efforts to reduce, reorganize, and rationalize their supply base" (Jafari et al. 2007, p.377).*

In the light of these observations, several KM efforts have been undertaken to foster

innovation and improve best practice in today's aerospace and defence organisations. However, there are evident signs of ineffective knowledge transfer mechanisms in multinational organisations (Gupta and Govindarajan 2000), information overload (Nielsen 2003) and cognitive stress (Baldacchino *et al.* 2002; Knott 2003; Sun and Scott 2005) with effects on both individuals and decision processes. The literature does not give a clear picture on how the recent economic crisis has further affected knowledge transfer mechanisms within these organisations; however this phenomenon is spreading rapidly throughout the corporate world leading to lower economic activity and knowledge process failures (Bhaumik 2011). The small number of studies and surveys conducted after the 2008 recession (Greaner and Hale 2009; Israilidis and Jackson 2012; Yates 2010) reveal the need to develop an employee-centred approach that is aligned to existing, integrated workforce planning strategies and which will undoubtedly play a vital role when referring to a company's efficiency and productivity.

Greaner and Hale (2009) note that high-performing organisations need to review and streamline their business processes to increase efficiencies and enable quick action amid rapidly changing business conditions. Furthermore, "leaders and employees will need to challenge their current way of thinking and work in ways they haven't worked before" (Greaner and Hale 2009, p.1).

Additionally, the result of an aging workforce is also one of the main reasons of knowledge and expertise loss in aerospace and defence organisations. "The loss of corporate knowledge caused by retirements and layoffs is known as considerable impact on the industries such as aerospace in the world" (Jafari *et al.* 2007, p.376). Deloitte (2012) has also highlighted that talent is one of the biggest challenges companies face in the coming years, particularly the Aerospace and Defence (A&D) industry given its demographic composition.

> *"Today's entry-level workers value open environments, rapid advancement, flexible work arrangements, diverse assignments, and non-hierarchical organizations. A&D companies have traditionally been characterized by the opposite: Facilities are at times old, utilitarian, and closed; access to information is tightly controlled, advancement can be slow and measured, hierarchies are clear and firm, and many people work a single program for 10 to more years" (Deloitte 2012, p.17).*

It is assumed therefore that managers should address the changing trends in the industry "making themselves more attractive to the next generation, while retaining the core elements that have made them successful" (Deloitte 2012, p.17).

2.3 Intellectual Capital

> *"An important issue of knowledge creation is to enhance the pace of innovation and to reduce the time span to commercial success in market" (Von Krogh et al. 2001, p.425).*

Intellectual Capital (IC) is widely used to represent the value of a company's intangible assets. It can also be defined according to Nahapiet and Ghoshal (1998, p.245) as "the knowledge and knowing capability of a social collectivity, such as an organisation, intellectual community, or professional practice". Examining the formation of IC as stated by Newell *et al.* (2002), we can see that four parts are included under that term. These are the Customer, Structural, Human and Social Capitals. At first sight, it might seem awkward that humans have been represented separately as it is not possible to price tag people and measure their effectiveness and skills. But when talking in terms of business, humans are assets and must be controlled by strategies in order to keep them on board a company (Coff 1997). Characteristics of these assets could be people's skills, knowledge, abilities and personal relationships (Coff 1997). It could also include behavioural actions as well as the effort, mental or physical, they consume towards a solution to a task (Kidwell and Bennett 1993). Social Capital mainly refers to trust and mutual respect that employees have among each other and with their external environment (Leana and van Buren III 1999). As examined by Cox and Thompson (1997) through the application of the Relational Competence Analysis framework trust cannot be enforced and must be gained over time. So when referring to strategies needed in order to protect the intellectual capital of an organisation, we can clearly identify the importance of informal networks which enhance information and knowledge flows within organisations. It is pertinent to quote from a paper written by Cross *et al.* (2001) the following:

> *"By analyzing the dimensions of relationships that precede or lead to effective knowledge sharing, we can offer more precise ways to improve a network's ability to create and share knowledge".*
>
> *"On a more conceptual level, the combined network view offers unique purchase on the elusive concept of organizational learning. Some have claimed that an organization has learned when, through its processing of information, its range of potential behaviours has changed. Thus, if we are interested in promoting an organization's ability to react to new opportunities, we need to account for the ways in which people in networks become able to leverage each others' knowledge".*
>
> *"Understanding how knowledge flows (or more frequently does not flow) across these various boundaries within an organization can yield critical insight into where management should target efforts to promote collaboration that has a strategic payoff for the organization" (Cross et al. 2001, p.118-119).*

Using this citation makes it clear and easier to understand the dynamics of social networks which can increase effectiveness of business processes. It is stated, that in order to develop a knowledge sharing culture, you must rely on people's minds and willingness to learn and succeed. This focus on human performance illustrates the importance of the human value for a company and recognises the fact that despite the number of sophisticated tools a business may have, it is necessary to share and discuss issues and ideas with others (Nonaka 1994; Nonaka and Takeuchi 1995).

2.4 Business networks and KM failures

The creation and support of business networks can have a significant positive impact on the way information and knowledge is transferred within a company. It has been highlighted by many academics and practitioners that such networks can help support businesses' operations, lead to new business opportunities as well as prevent the organisation from potential external threats and determine actions to mitigate risk.

For example as Aldrich *et al.* (1987) state, by analysing the business networks of a firm together with their relationships with other organisations we can logically deduce characteristics regarding its behaviour and decision making. Organisations are influenced by the environment they operate and live in and therefore are more likely to create structures of linked networks to exchange knowledge and services (Hodgson 1988).

One of the main concepts in Marshall's (1965) research is the role of business networks in assisting knowledge transfer and sharing processes not only between different organisations but also within them, between departments. Since 1965, many researchers and academics have adopted similar approaches, however Marshall's study still remains one of the main contributions in Knowledge Management and neoclassical economic theory. Moreover, Granovetter (1985) noted the importance of business networks in the economic stability and development of a company. His study based on the premise that each activity is undertaken by a network of actors working in collaboration with each other, identified that the interactions and communications of employees working in a team can affect the knowledge activities made within the organisation. In addition, a previous study focusing on the dynamics of business networks (Granovetter 1973) makes a differentiation on strong and weak ties that such networks may have. In an organisational context, it is common to establish some strong business links with many weak ties. The weak connections can help to create new business links and bring new knowledge into the organisation. As Burt (1992) notes, establishing weak ties is essential to create further stronger links and develop a collaborative knowledge network.

Birley *et al.* (1991) highlight that small organisations coming from different cultural

backgrounds can shape different styles of networks (both external and internal) based on their regional and national characteristics. For example, organisations based in the USA have created a wider range of knowledge networks (9.5 members on average) compared to companies based in other countries despite the low frequency rate of their meetings (10 meetings per month). In contrast, the Japanese companies which have devoted the smallest amount of time in developing knowledge networks compared to all other states (7.9 hours per week), have managed to build the most well connected knowledge networks with only a limited number of relationships (ties) among the members of the network (Aldrich and Sakano 1995). However, despite the fact that these figures represent small organisations, networking range and intensity are deemed particularly important in the growth process of technology intensive organisations (Zhao and Aram 1995). Also, although networking activities may have different cultural roots, organisational success is influenced by the same principles of networking (Zhao and Aram 1995). Therefore, many multinational technology intensive organisations are trying to develop a holistic knowledge framework in order to enhance networking opportunities and improve the overall knowledge culture of their company. Nevertheless, there are a plethora of cases in which they fail to deliver cost effective solutions and support knowledge transfer, mainly due to the lack of incentives for sharing and creating networks. The Fogbank case as well as the London Ambulance Service failure are examples of this phenomenon and thus will be discussed in brief below.

In the 2007 Fogbank case, employees had difficulties in re-establishing the manufacture of a material used in nuclear weapons known as Fogbank in order to refurbish the W76 warhead. The Fogbank material was previously produced by experienced professionals in the 1980s. However, production was ceased in the mid-1990s and as time passed, the precise techniques used to manufacture Fogbank were completely forgotten. Despite the lack of necessary knowledge and experience to carry out the production, scientists started the re-manufacturing process of the Fogbank material and soon discovered that the final product failed to meet quality requirements. A review of the development records for the original production process revealed that the material characteristics of the final product were not understood; hence many additional resources had to be engaged adding costs (further expenditure of US$69 million) and delaying the completion of the project (Vartabedian 2009). This case study reveals the extent to which the knowledge sharing and transfer mechanisms within the production line of the Fogbank material had been affected. Also, the personnel experienced the problem of knowledge identification and location. Fogbank's case is similar to many other knowledge failure cases reported in the literature. The common problems of wading through an abundance of information to find what you really need, and spending a long time investigating undefined methods and processes should be managed under a new holistic approach based on social interaction and knowledge circulation.

The London Ambulance Service (LAS) Computer Aided Dispatch (CAD) system failed

dramatically on October 26, 1992 shortly after it was introduced due to a series of errors made in the procurement, design, implementation and introduction of the system (Sommerville 2006). Specifically, concerns discussed at project meetings were not followed-up, software changes were put through 'on the fly' and only one out of seventeen proposals met all of the project team's requirements. In addition, the knowledge gap between the staff members, the poor industrial relations as well as the 'outdated' working practices set by the management, all contributed to the "London Ambulance fiasco", as stated by Sommerville (2006).

The above knowledge management failure factors are common in several other cases, including PharmaCorp's inflexible KM strategy (Braganza and Möllenkramer 2002), SoftwareCo's ineffective knowledge transfer mechanisms (Israilidis and Jackson 2012) and the Challenger space shuttle disaster (Boisjoly *et al.* 1989). Malhotra (2004) noted that knowledge management systems fail because of two broad reasons.

> *"First, knowledge management systems are often defined in terms of inputs (such as data, information technology [IT], best practices and so on) that alone may be inadequate for effective business performance. For these inputs to result in business performance, the influence of intervening and moderating variables (such as attention, motivation, commitment, creativity, and innovation) must be better understood and accounted for in business model design. Second, the efficacy of inputs and how they are strategically deployed are important issues often left unquestioned as 'expected' performance outcomes are achieved; however, the value of such performance outcomes may be eroded by the dynamic shifts in the business and competitive environments" (Malhotra 2004, p.99).*

Fontain and Lesser (2002, pp.1-3) identified a number of roadblocks that organisations typically face when implementing knowledge management programmes.

Specifically, the roadblocks noted are:

- Failure to align knowledge management efforts with the organisation's strategic objectives.
- Creation of repositories without addressing the need to manage content.
- Failure to understand and connect knowledge management into individuals' daily work activities.
- An overemphasis on formal learning efforts as a mechanism for sharing knowledge.
- Focusing knowledge management efforts only within organisational boundaries.

Although these are not meant to form an exhaustive list, they represent issues that can hinder the effectiveness of a knowledge management effort, costing organisations time,

money, resources and - perhaps, most importantly - their ability to effect meaningful business results (Akhavan *et al.* 2005). Thus, particularly within technology intensive and geographically dispersed industries such as Aerospace and Defence, organisations should develop holistic knowledge networks in order to benefit from knowledge residing in different parts of the organisation, as well as to improve communication in solving business challenges.

2.5 Communities of Practice

As we move on, we need to focus on improved methods of retaining and storing valuable knowledge so that it can be easily retrieved and used in the future.

> *"In practical terms, there are only two types of strategies to protect this type of knowledge: retention policies and the circulation of knowledge. Retention policies are more clearly understood. Circulation of knowledge strategy relates to actively developing mentoring (helping juniors learn from more senior people that hold strategic knowledge) and fostering teamwork and communities of practice (making sure a number of people develop knowledge collectively, therefore, reducing the potential of losing knowledge suddenly by the departure of a particular individual)" (Terra and Angeloni 2005, p.7).*

Hence, an ideal place for acquiring knowledge and sharing information and advice is by participating in a Community of Practice (CoP). A definition by Wenger *et al.* (2002, p.4) can shed light and clarify this key term. Communities of Practice are "groups of people who share a concern, a set of problems or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis". Given this definition it can be seen that a community of practice is a process of participation and evolution where people share information, insight and advice, help each other solve problems and ponder common issues, explore ideas and act as sounding boards (Wenger *et al.* 2002).

> *"Communities of practice are not a new idea. They were our first knowledge-based social structures, back when we lived in caves [...] and have continued to proliferate to this day in every aspect of human life" (Wenger et al. 2002, p.5).*

Nevertheless, the accumulation of knowledge can be achieved either through the creation of tools, standards, manuals and other documents (Wenger *et al.* 2002) or simply by developing a tacit understanding (Nonaka 1991). Participants are "informally bound by the value they find in learning together" (Wenger *et al.* 2002, p.5), confirming Orlikowski's (2002, p.249) claim that "knowing is not a static embedded capability or stable disposition of actors, but rather an on-going social accomplishment, constituted and reconstituted as

actors engage the world in practice". Wenger *et al.* (2002) have also emphasised the long term developments of a community of practice. Specifically they claim that over time, people "develop a unique perspective on their topic as well as a body of common knowledge, practices and approaches. They also develop personal relationships and established ways of interacting. They may even develop a common sense of identity" (Wenger *et al.* 2002, p.5). Moreover, the learning that takes place in communities of practice is not just situated learning but "generative social practice" (Lave and Wenger 1991, p.35). Therefore, the development of a community is especially important in multinational organisations boosting internal communications and individual capabilities and can be viewed as an on-going performance evaluation for employees. Regarding the form of a community of practice, there is no set way of doing it (Wenger *et al.* 2002, p.24). They can be small or big, long lived or short lived, co-located or distributed, homogeneous or heterogeneous, spontaneous or intentional as well as unrecognised to institutional (Wenger *et al.* 2002, p.24).

The structural model of a community of practice is a combination of three fundamental elements: a domain of knowledge, a community of people, and the shared practice that they are developing to be effective in the domain (Wenger *et al.* 2002, p.27). Specifically, the domain legitimises the community by affirming its purpose, inspires members to contribute and participate and guides members' learning by creating a sense of common identity. The community creates the social fabric of learning; it fosters interactions and relationships based on mutual respect and trust and encourages a willingness to share ideas, expose one's ignorance, ask difficult questions and listen carefully (Wenger *et al.* 2002, p.28). Last but not least, the practice is a set of frameworks, ideas, tools, information, styles, language, stories and documents that community members share (Wenger *et al.* 2002, p.29).

According to Wenger *et al.* (2002, p.51), there are seven principles for cultivating communities of practice.

- Design for evolution.
- Open a dialogue between inside and outside perspectives.
- Invite different levels of participation.
- Develop both public and private community spaces.
- Focus on value.
- Combine familiarity and excitement.
- Create a rhythm for the community.

Furthermore, these age-old structures have a central role in business and are a key to success in a global knowledge economy (Wenger *et al.* 2002, p.6) that can create value and improve performance (Lesser and Storck 2001).

> *"Cultivating communities of practice in strategic areas is a practical way to manage knowledge as an asset, just as systematically as companies manage other critical assets. [They] connect people from different organizations as well as across independent business units. [...] They knit the whole system together around core knowledge requirements" (Wenger et al. 2002, p.6).*

Zboralski (2009) noted that communities of practice can provide a suitable environment to share or exchange knowledge between different groups in an organization. Also, by sharing aspirations and ideas, they improve business outcomes and foster participation in organisational tasks such as recruitment and selection processes of employees adding short and long term value to organisations and community members (Wenger *et al.* 2002, p.7).

At this point, it must be noted that there can be downsides to all three fundamental elements of a community of practice. First of all, the temptation of ownership can be detrimental to the domain and arrogance can bring imperialistic, narcissistic, marginal and factional beliefs (Wenger *et al.* 2002, p.140). Secondly, the bond between community members may become too tight, leading to problematic and toxic relationships. Cliques may arise, and the presence of co-dependent, disconnected and localised communities has the potential to result in less diversity of perspectives within the group (Wenger *et al.* 2002, p.144). Finally, the cost of an efficient practice can blind practitioners to seeing what fits in their paradigm and what does not (Wenger *et al.* 2002, p.147). A single-minded focus on documentation and failure to develop and deepen practice can lead to amnesia, dogmatism and mediocrity (Wenger *et al.* 2002, p.148). Some examples of remedies to address these challenges, highlighted by Wenger *et al.* (2002), are to establish legitimacy and strategic value of the domain; involve new generations – new blood, connect with other communities, encourage multi-membership; make enough time to participate actively, benchmark practice of other communities and initiate exciting knowledge development projects.

2.6 Managing the unknown

> *"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know" (US Department of Defense, Secretary Rumsfeld 2002).*

One of the proponents of the KM concept, Nonaka (1991) is concerned with the transfer process between tacit and explicit knowledge. In particular, knowledge creation can be seen as a process of articulating (converting tacit knowledge into explicit) and internalising (using that explicit knowledge to extend one's own tacit knowledge base) knowledge processes. Arguments for the distinction between tacit and explicit knowledge and the difficulty in communicating tacit knowledge to others come from the philosopher Michael Polanyi

(1958). He argues that human beings have a kind of tacit knowledge that language cannot capture; or in other words "we can know more than we can tell" (Polanyi 1966, p.4). Hence, knowledge management is a matter of sharing knowledge with others and not just keeping it for own use and power (Brown and Duguid 2000; Wenger and Snyder 2000). It is the answer to 'know how' as opposed to 'know why' and 'know what', which are common practices of Information Management (Polanyi 1958, 1966). Moreover, knowledge is the generation of somebody's own way of thinking. As Cottrel (2005, p.9) noted, "providing evidence to illustrate your arguments" while having non-biased views could lead to gaining new knowledge and expertise, and are some prerequisites for effective knowledge management and critical thinking.

But how do we know what we need to know? And more importantly, how can we reduce the risks of making the wrong decision when using 'imperfect information'?

Modica and Rustichini (1994, p.108) provide an introduction to the concept of awareness and unawareness in models of information:

> *"A subject is certain of something when he knows whether that thing is true or false; he is uncertain about it when he does not know its truth value, but he knows he does not – 'conscious' uncertainty [...] On the other hand, a subject is unaware of something when he does not know its truth value, and he does not know that he does not know – and actually so on ad infinitum: he does not perceive, does not have in mind, the possible object of knowledge".*

According to Plato's *Apology* (21d), the Classical Greek philosopher and leading figure in the areas of epistemology and ethics, Socrates once said:

> *"This man, on one hand, believes that he knows something, while not knowing [anything]. On the other hand, I - equally ignorant - do not believe [that I know anything]" (Plato Apology, 21d).*

The above quotes support the researcher's personal point of view that Knowledge Management could better be seen in line with 'Ignorance Management' due to the fact that it is impossible for someone to comprehend and understand everything in a complete way. The only real wisdom is in recognising the limits and extent of your knowledge and therefore, KM is essentially a matter of sharing the extent of our ignorance with other people and thus learning together. This process of accumulating awareness will develop a tacit understanding and will increase "the short and long term value to organisations and community members" (Wenger *et al.* 2002, p.16).

The concept of exploring the power of understanding the unknown in multinational organisations is acknowledged by critical thinkers who discussed knowledge and organisational learning, from Socrates, Plato and Aristotle in Ancient Greece to Polanyi,

Takeuchi, Nonaka, Senge, and others in the modern age. However, in order to apply this concept to large and multinational environments, it is important to understand how individuals acquire new knowledge in organisations. As Bhatt (2001, p.75) noted "knowledge management is a comprehensive process of knowledge creation, knowledge validation, knowledge presentation, knowledge distribution, and knowledge application". Therefore, it can be deduced that managing knowledge within an organisation is a reflective and complex practice and is characterised by collective thinking and the creation of a shared frame of reference (Sarker *et al.* 2011).

Multinational organisations, even in today's uncertain economic climate, have made notable changes to their KM strategies shifting to a human-centred and more social-like perspective. It is plausible that this movement has probably occurred because companies are starting to admit the importance of human factors within their organisations. They can see that by taking into account the knowledge of their employees, the overall value of their businesses rises, becoming at the same time more profitable and successful. Hence, knowledge management strategies are tailored to meet specific business needs while aiming to produce more effective knowledge exchange mechanisms and foster innovation. Notably, Porac *et al.* (1989) saw an increase in interest in the interpretive side of organisations in the early 1980s (Barley 1983, 1986; Bartunek 1984; Kiesler and Sproull 1982), which was later incorporated into questions of strategic management (Dutton and Jackson 1987).

However, despite the observation of Porac *et al.* (1989), it is evident that "in most companies the ultimate test for measuring the value of new knowledge is economic" (Nonaka 1991, p.103). People often follow rules, prefer stability and maintain the status quo. Also, it is a psychological concept that individuals are often afraid to make extreme and radical changes, and embrace new ideas and thoughts (Aldag and Stearns 1991; Griffin 1993). It is apparent, therefore, that knowledge creation within an organisation should centre on the crucial presumption that human knowledge is created and enlarged by means of understanding the unknowns. This statement is also supported by Pynchon (1984, p.15-16) who sees ignorance as a potential component for future success and achievement.

> *"Ignorance is not just a blank space on a person's mental map. It has contours and coherence, and for all I know rules of operation as well. So as a corollary to [the advice of] writing about what we know, maybe we should add getting familiar with our ignorance, and the possibilities therein for writing a good story".*

Based on the above analysis, one can explain why managing ignorance is important and essential for maintaining a strategic knowledge sharing culture within multinational organisations. However, the concept of managing ignorance remains still widely unexplored in today's organisational milieu. Thus, this study explores the power of understanding the unknown while arguing that there is no perfect knowledge to enhance and facilitate knowledge management processes. It also defines the concept of Ignorance Management

highlighting the necessity to re-examine managerial strategies and improve innovative capacity in multinational organisations (Chapter Six).

2.7 Learning and Knowledge

In 1997 a definition given from Pröbst and Büchel introduced the concept of Organisational Learning (OL). Specifically, "organizational learning is the process by which the organization's knowledge and value base changes, leading to improved problem-solving ability and capacity for action" (Pröbst and Büchel 1997, p.15). As Kim (1993) states, organisational learning differs from learning by individuals because the emphasis is not on individual motives, values and needs but on processes for making collective decisions. However, learning by individuals is a prerequisite for organisational learning (Pröbst and Büchel 1997).

Moreover, in today's turbulent climate it is important to understand how individuals acquire new knowledge in organisations. According to the pioneering work of Argyris and Schön (1978, p.9) "there is something paradoxical here".

> *"Organizations are not merely collections of individuals, yet there are no organizations without such collections. Similarly, organizational learning is not merely individual learning, yet organizations learn through the experience and actions of individuals" (Argyris and Schön 1978, p.9).*

Additionally, they conclude by questioning "what then, are we to make of organizational learning? What is an organization that it may learn?" (Argyris and Schön 1978, p.9). Therefore, it can be deduced that learning within an organisation is a reflective practice and is characterised by collective thinking and the creation of a shared frame of reference (Sarker *et al.* 2011). Jashapara (2007) formulates and defends a realist conception of OL. He argues for instance that "gunpowder has the 'necessary power' to explode but does not explode. It needs the 'contingent condition' of a spark to explode" (Jashapara 2007, p.761). In this context, Jashapara is using the term 'necessary power' to describe experiential, vicarious and congenital learning as well as the organisational memory and learning curves (Jashapara 2007). Alternatively, the term 'contingent condition' is used to portray unlearning[8] practices, information interpretation and distribution strategies as well as experimenting organisations (Jashapara 2007).

According to Pröbst and Büchel (1997, p.21), there are three conditions to successfully move from individual to organisational learning: Communication, Transparency and Integration. Moreover, Flood and Romm (1996, pp.225-229) have introduced three models of OL also

[8]Hedberg (1981) noted that unlearning is the functional and perhaps intentional discarding of obsolete or misleading knowledge.

known as the loops of learning (Figure 2.3). Distinctively, the single loop is focusing on adaptive learning, namely the process of adjusting effectively to given goals and norms by mastering the environment (Flood and Romm 1996, p.225). The double loop is focusing on reconstructive learning which is the process of questioning organisational norms and values and building a new frame of reference (Flood and Romm 1996, p.227). Finally the triple loop is a method of process learning which consists of gaining insights into the learning process i.e. learning to learn (Flood and Romm 1996, p.229). To sum up, the single, double and triple loop are about how work will be accomplished, what goals are pursued and why work is accomplished respectively.

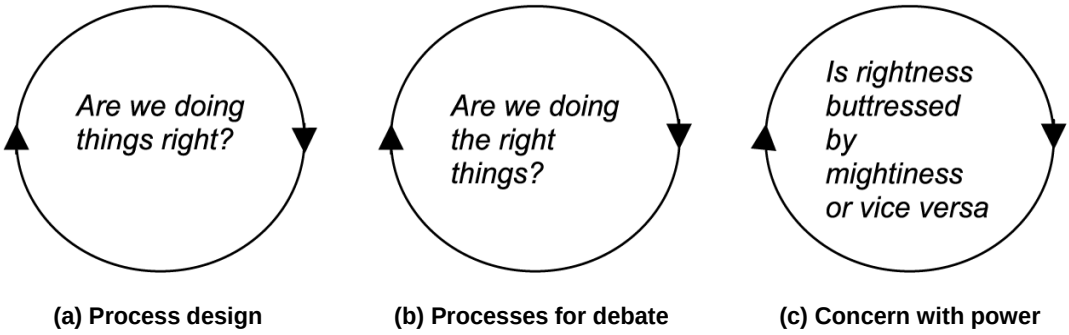

Figure 2.3: The three single loops of learning as adopted by Flood and Romm (1996)

However regardless of the usefulness of the processes of OL in the furthering of effective KM, we must consider examples of barriers to organisational learning and suggest ways of overcoming them. Hedberg (1981) introduced the concept of unlearning and defined it "as a process through which learners discard knowledge" (Hedberg 1981, p.18). He argues that unlearning makes way for new responses and mental maps and sees it as a challenge to unlearn world views and negate connections between stimuli and responses (Hedberg 1981, p.18). Nevertheless, obstacles to unlearning can be organisational defensive patterns for example to avoid personal contact and public discussion of sensitive issues, norms, privileges and taboos, or information disorders such as structural, doctrinal and psychological (Pröbst and Büchel 1997).

It is worth discussing at this point, how concepts such as ignorance and incompetence are used in other disciplines, such as psychology, education and philosophy, to gain a better understanding of the cognitive capabilities and learning ability of human beings. In this context, it is instructive to discuss the difference between incompetence and ignorance which is often misunderstood. Incompetence is the lack of physical or intellectual ability for effective action, whereas ignorance is the lack of knowledge, information or education. It is clear that the term ignorance implies lack of awareness about something and not the inability to understand; thus it is mainly caused by the circumstances of one's life and can be removed by the acquisition of knowledge. It must be noted that a number of researchers,

e.g. Howell and Dunning, equate the term incompetence to the definition of ignorance given above.

Howell (1982, pp.29-33) develops a conscious-competence model, noting that there are four stages of consciousness and competence that an individual may experience during the learning process as shown in Figure 2.4. Specifically, unconscious incompetent individuals lack knowledge and skills and are unaware of this lack. Conscious incompetent individuals realise they are not as knowledgeable as they had initially thought to be. Conscious competent individuals learn about the new area but are very conscious about everything they do, and finally unconscious competent individuals are experts who do not longer have to think about what they are doing (or have to do).

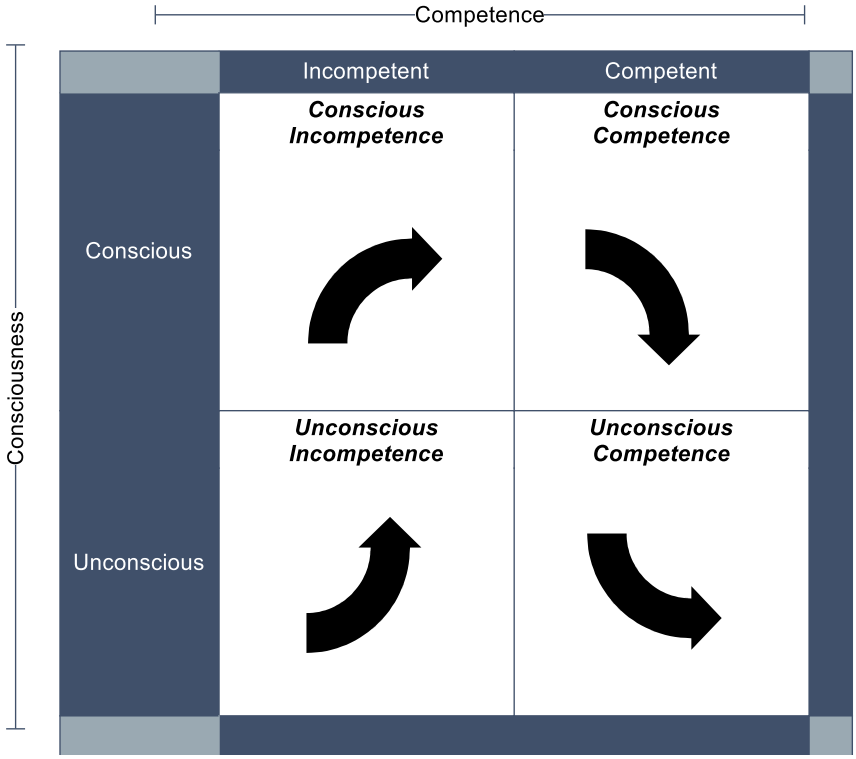

Figure 2.4: The conscious-competence model as developed by Howell (1982)

Similar to the learning cycle discussed above, Luft and Ingham (Luft 1969) developed a model, namely the Johari window, to help people better understand their relationship with self and others. A Johari window consists of 56 adjectives used as possible descriptions of the participant, e.g. cheerful, confident, idealistic, introverted, observant, reflective, shy, and trustworthy, amongst others. Five or six adjectives that match someone's personality are selected by both the participants and their peers, and are mapped onto a grid as illustrated in Figure 2.5. The individuals can therefore develop an interpersonal awareness of their behaviour, feelings and motivation.

Figure 2.5: The Johari window

It is evident that the aforementioned learning models are related to psychological factors involved in the process of progressing from incompetence to competence, limiting the effectiveness of the knowledge management process. In addition, the transition from the 'knowledge-poor' to the 'ignorance-poor' state is designed to increase an individual's overall level of awareness and self-awareness, but it is mainly unidirectional (or circular) in nature restricting the possible ways of transition from one state to the other. In general, learning cycles are fundamentally unidirectional in flow. Arguably however, individuals, and consequently organisations, can fall from a higher state of knowledge to a lower one. Hence, this thesis argues that a model predicated on the flow being multi-directional could bring new insights in organisational KM while helping to deliver 'knowledge evangelism' to the employees.

Based on the concept of 'known unknowns', which is widely acknowledged since ancient times as discussed in Sections 2.1 and 2.6, it is important to further explore the role of ignorance within an organisational KM context to improve knowledge management processes and develop complete knowledge in the workplace. It is also vital to investigate organisational factors leading to unhealthy levels of ignorance along with their associated trajectories, namely the failure-prone path to knowledge for both the organisation and the individual, in order to manage dysfunctional KM situations as well as prevent and control KM inefficiencies.

As noted in Section 1.2, Nonaka *et al.* (1996) proposed a model (namely SECI for Socialization, Externalization, Combination, Internalization) of organisational knowledge creation in the form of a spiralling knowledge process interaction between tacit and explicit knowledge. In this model, tacit knowledge is 'externalised' to become explicit knowledge, and explicit knowledge is 'internalised' into implicit knowledge.

Specifically, there are four modes of knowledge conversion, as shown in Figure 2.6.

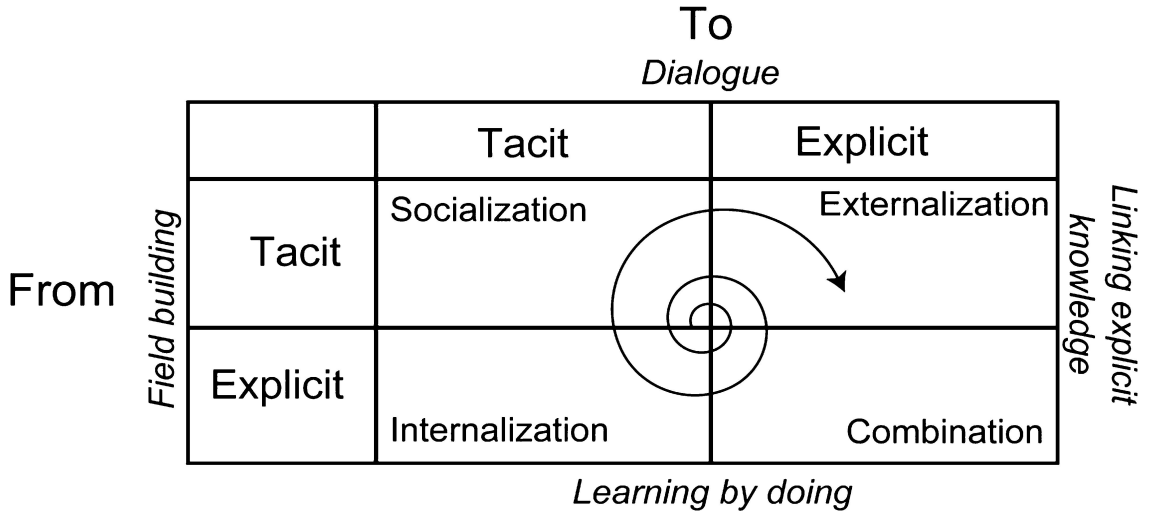

Figure 2.6: The SECI model of knowledge creation as proposed by Nonaka et al. (1996, p.842)

- Tacit to Tacit (Socialization): This dimension refers to the sharing of tacit knowledge between individuals through face-to-face meetings, shared organisational cultures or by sharing experiences in a traditional apprenticeship.
- Tacit to Explicit (Externalization): This dimension discusses the conversion of tacit into explicit knowledge through a process of codification; knowledge is therefore crystallised, enabling articulation and widespread dissemination.
- Explicit to Explicit (Combination): This dimension outlines the organisation and integration of different types of explicit knowledge (from outside or inside the organisation) to form new knowledge. This mode of knowledge conversion is supported through the use of information systems, large-scale databases, and computerised communication networks.
- Explicit to Tacit (Internalization): This dimension refers to the conversion of explicit into tacit knowledge, i.e. learning by doing. Hence, explicit knowledge becomes part of an individual's knowledge, building on the assets of the organisation.

Furthermore, many scientists have identified that learning can be successful when accomplished through a strategy. According to Pröbst and Büchel (1997) strategic planning is a process of learning about where the future prospects of a company might lie undertaken by a group of people. However, the instruments for effective strategic planning may vary from scenario techniques to knowledge indicators and intellectual assets as described for the first time by Edvinsson in a supplement to Skandia's annual report (Brennan and Connell 2000). Finally, as illustrated in the Gore and Associates case study in Pröbst and Büchel (1997, p.137), learning is the preparation of a new cultural framework. The development of a culture conducive to learning should be established through the company's KM strategy taking into account the company's image and assumptions in order to promote transparency

and accountability (Pröbst and Büchel 1997, p.138).

As seen from above, OL is a descriptive stream which deals with learning processes in organisations while having a significant academic focus. In contrast, a Learning Organisation (LO) is a practical, more prescriptive, and focussed stream that reflects the subject area (Braham 1995). Moreover, a LO is an organisation that prioritises learning; learning is integrated into everything people do, it is seen as a process and not as an event and cooperation is the foundation of all relationships (Braham 1995). Individuals evolve and grow and in turn transform the organisation (Braham 1995). In general, learning organisations are creative; individuals recreate the organisation and the organisation learns from itself (Braham 1995).

Senge (1990) describes the relationship between learning and organisations as follows:

> *"Real learning gets to the heart of what it means to be human. Through learning we re-create ourselves. Through learning we become able to do something we never were able to do. Through learning we reperceive the world and our relationship to it. Through learning we extend our capacity to create, to be part of the generative process of life. There is within each of us a deep hunger for this type of learning [...] This, then, is the meaning of a 'learning organisation' – an organisation that is continually expanding its capacity to create its future" (Senge 1990, p.14).*

Easterby-Smith and Lyles (2003) portray the four main topics in the field of learning and knowledge, as presented in Figure 2.7. They argue that based on the differences noted above between OL and LO, organisational knowledge and knowledge management can be distinguished in the same way. Specifically, the field of KM is concerned with creating ways to disseminate and leverage knowledge in order to improve organisational performance, whereas organisational knowledge tries to understand and conceptualise the nature of knowledge in organisations (Easterby-Smith and Lyles 2003).

This thesis examines and focusses on movements along the 'content' axis, hence identifying improved knowledge-channelling practices in multinational organisations. Based on the work of Easterby-Smith and Lyles (2003) however, the distinction between learning and knowledge is noted as knowledge being the content the organisation possesses, and learning being the process whereby it acquires this content. It is widely known that KM initiatives have received extensive critique on the grounds that they ignore social architecture of knowledge exchange within organisations (Hansen *et al.* 1999). Therefore, it is argued that the social perspective should be incorporated into the organisational context, enabling flexible communication and sharing of tacit knowledge between members (McAfee 2006).

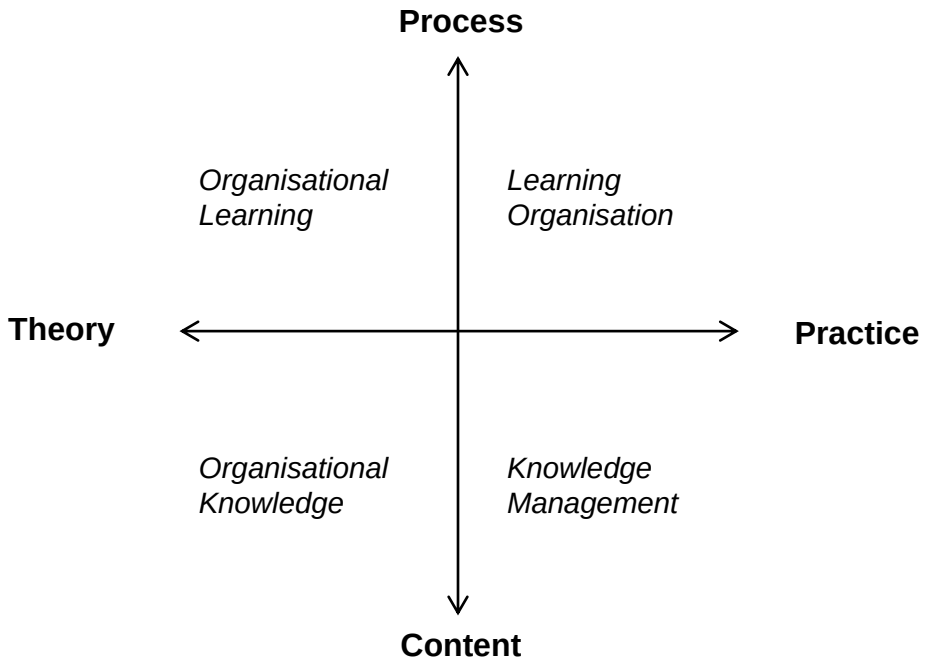

Figure 2.7: Learning and knowledge as portrayed by Easterby-Smith and Lyles (2003, p.3)

2.8 Common approaches towards KM

In today's unstable economic environment, "KM practitioners need to be able to show the business value that knowledge sharing and reuse bring to their organizations" (Vestal 2002, p.1). This can be mainly achieved by measuring various metrics such as the customer satisfaction level, the productivity of the knowledge workers, the cost of savings and the Return on Investment (ROI) for the organisation. However, according to Vestal (2002), organisations should not expect to see significant ROI from KM too quickly.

> *"ROI takes time to gather due to the complexity of understanding the impact that people, process, content, and technology have on knowledge sharing, and subsequently, the business. Many senior executives embark on the KM journey by taking a leap of faith because they understand that sharing and reusing knowledge just makes good business sense. However, the price tag of aligning people with tools, content, and processes that facilitate knowledge flow is not small" (Vestal 2002, p.1-2).*

Nevertheless, extensive research has been carried out to identify a pragmatic and fair way of calculating the value of knowledge. Specifically, Martin (2000) insists that the measurement of knowledge is important and acknowledges that any attempt to do so is fraught with dangers, yet understands that there are risks in doing nothing. Vestal (2002, p.2) also noted that "many organizations have turned to storytelling and anecdotal success stories

to show the value of the investments made in KM [...] However, while stories help to personalize the effects of knowledge sharing, many managers want proof [and] that's where effective measures and metrics come in". Towards that direction, Turner and Jackson-Cox (2002) developed a model to determine the value of organisational knowledge, regardless of the size and nature of the organisation. Their model focuses on measuring the domain knowledge of an organisation comprising three elements: formal education, post-secondary education and formal training. In particular, the model takes into account the opportunity cost of capital invested in each level of education as well as the capitalised value of costs acquired from a particular level of education, as shown in Equation 2.1.

$$K = c\ [\ (1+r)^n - \frac{1}{r}\ ] \tag{2.1}$$

Where: K is the value of knowledge, c is the standard cost of acquiring knowledge in each period of time, r is long-run rate of return on investment and n is the number of years of education.

In addition, Turner and Jackson-Cox (2002, p.9) also note that "since organisational tacit knowledge is acquired through social interaction, or the sharing of employee experience, the only cost relevant to the organisation is the cost of labour for the time spent by its employees on this activity".

> *"For example, if the average annual cost to the organisation for each employee is £39,824.77*[9] *and [assuming] that 12.5 per cent of each employee's time is spent growing the tacit knowledge of an organisation, the cost to the organisation each year of acquiring tacit knowledge is £4,978.09 per employee. [...] Therefore, [assuming that the available period of employment would not exceed 47 years] for each employee, the maximum value to an organisation of tacit knowledge is equivalent to the present value of £4,978.09 for each of those 47 years. Using the [...] estimate for a real long-run rate of return of 5.34 per cent, the present value of a working lifetime's tacit knowledge may be estimated to be £85,138.72" (Turner and Jackson-Cox 2002, p.10).*

The above example suggests that the stock of knowledge may be increased by providing more training or taking on more employees (Turner and Jackson-Cox 2002). Although individuals are significant sources, conduits and generators of knowledge, the body of organisational knowledge is not just simply the aggregate of each individual employee's domain knowledge (Howells 1996). Hence, the value of knowledge should not be merely based on tangible economic criteria, and a 'softer' and more social-like perspective (such as trust in people,

[9]The data has been determined from estimates in an Australian context and all values are expressed in Australian currency and converted into pound sterling at the exchange rate set by the central bank of the United Kingdom on January 6, 2012.

ethical professional conduct and communication skills) should be imported. Knowledge creation within an organisation centres on the crucial presumption that human knowledge is created and enlarged by means of social interaction. This interaction converts the domain knowledge of individuals into collective structural and procedural, or tacit, knowledge within the organisation (Nonaka and Takeuchi 1995). From an organisational perspective, this form of knowledge has a more permanent dimension and the organisation may build on it a sustainable competitive advantage. Given the above discussion, it is argued that that in order to calculate the total value of knowledge, additional costs must be factored into the aforementioned formula. For example, knowledge costs occurring due to staff reduction or malfunctioning and inappropriate KM practices could be subtracted from the total, whilst on the other hand, savings made due to successful KM projects could be added, as shown in Equation 2.2.

$$K^* = K - t - d + p \tag{2.2}$$

Where: K^* is the revised value of knowledge, K is the initial value of knowledge, t is the ratio of total separations to the average number of employees (employee turnover rate), d is the number of dysfunctional scenarios due to ignorant and ill-informed behaviours, and p is the number of successful projects delivered as a result of effective and efficient collaboration KM processes. The aim of this thesis however, is not to explore and expand this formula further by adding weighted values as well as other complex components. Additionally, the entire concept of simplifying to the point of placing quantifiable values on anything so ethereal as knowledge may prove more dangerous than useful to managers. Even as an average, there is no evidence we learn at a steady rate in the workplace, and one piece of knowledge is not equivalent to another. For example, being ignorant of how to shut down a nuclear reactor and how to remove staples does not have the same cost to an organisation, and most importantly does not require the same amount of time to learn. It is therefore evident that the total value of an employee's knowledge to an organisation should not be merely based on quantifiable economic criteria, and a one-size-fits-all formula may be incapable of calculating its total 'selling' price.

The following table (see Table 2.1) adopted by Vestal (2002, p.2-4) shows several organisations, their KM Target Value Proposition (TVP), KM approach, and results. It is important to highlight that "all [companies] noted that they are receiving more from sharing knowledge than they paid for the capacity to do so" (Vestal 2002, p.2-4).

Table 2.1: Several organisations, their KM value proposition, KM approach and results as adapted by Vestal (2002, p.2-4)

Organisation	TVP	Approach	Results
Chevron Texaco	Reduce operating costs, improve operational excellence, improve safety	CoPs, facilitate transfer of best practices, People finder	Two billion dollar reduction in annual operating costs, [US]$670 million came from refining best practices. Total investment of more than [US]$2 million
Dow Chemical	Provide faster access to information, improve information management, improve sales leads	Content management, CoPs	Increased number of sales leads. Increase in new product sales. Improved customer satisfaction scores. CM investment of over [US]$3 million for start-up, [US]$8 million annually
GE Plastics	Decrease customer service costs	Customer portal, customer knowledge repository	Number of test chips created decreased from 4.2 to 2.7. Average reduction of 4.5 hours per colour match. Savings of [US]$2.25 m/year
Shell	Create a single, global company. Reduce cycle time. "Too Fast to Follow"	Global Networks (CoPs), New ways of working, Letting the new guys into "Old Boy" networks, Transfer of best practices	[US]$200 million/yr cost savings, Reduced number of wells, Increased facility uptime, Reduced design and planning errors. Total investment of approximately [US]$4 million

Continued on next page

Table 2.1 – *Continued from previous page*

Organisation	TVP	Approach	Results
BP[10]	Know-how: A brand attribute; ability to innovate and execute faster and smarter than competitors	Networks, Peer Assist, Retrospects, Technology VP support, Operations Value Process	[US]$260 million cost savings/yr cost savings [Shorter drilling times], Increased facility uptime, Reduced design and planning errors
Schlumberger	Knowledge in the hands of employees and customers	CoPs, InTouch KM system, intranet, extranet, content management	[US]$200 million cost savings, 95% reduction in time to resolve technical queries, 75% reduction in updating modifications, Total investment of approximately [US]$20 million
Cap Gemini Ernst & Young	Faster revenue growth, lower costs	CoPs, central KM managers, content management	Ten-fold increase in revenue with only five-fold increase in employees [Type of projects unknown]
IBM Global Services	Revenue growth, industry leadership	CoPs, knowledge managers, Intellectual Capital Management System	400 percent increase in service revenue, Time savings of [US]$24 million in 1997. Approximately [US]$750K to start up, [US]$750K annually to maintain
Best Buy	Bring creative new solutions to market faster, shorten the learning curve, lower costs	Portal (RetailZone), Employee Toolkit, CoPs (retail and services)	1.5 percent increase in gross margin, Sold 4.2 units/store/day more in pilot stores, 3 percent drop in damage claims, Paper reduction savings of [US]$250K/yr. Total investment of approximately [US]$3.5 million

[10]On April 20, 2010, BP experienced the largest accidental marine oil spill in the history of the petroleum industry leading to protests, allegations and widespread criticism.

From the figures presented, it can be deduced that the most commonly used KM approach is based on creating communities of practice. This is plausibly because organisations recognise that achieving knowledge requires a deeper understanding of the subject we tackle and should be developed in an environment of analysis and critique. Furthermore, another important aspect deduced was to enhance the IT infrastructure either by creating collaborative decision-support tools (i.e. portals) or by developing knowledge-exchange applications that will enable knowledge sharing and provide access to explicit organisational knowledge. In general, the adoption of such approaches is beneficial for the operational performance of a company. However, we must not neglect various obstacles that may arise when implementing such changes.

2.9 Gaps in the literature

This literature review presented both theoretical and practical concepts of managing knowledge practices and system applications in multinational organisations. As noted in this chapter, the idea of Knowledge Management started with the neo-economic view of the strategic value of organisational knowledge and gained academic legitimacy on the back of Nonaka's work (Easterby-Smith and Lyles 2003). However, the main techniques – possibly the only techniques adopted by a number of managers – used to facilitate the exchange, transmission, sharing and utilisation of knowledge are merely based on the use of IT software, such as network platforms or online databases. As such, this IT-centric (i.e. fight for the best tool) approach offers a more structured and technical way of managing knowledge while limiting the scope of inter-personal communications, innovation and new knowledge within the business. Many scholars (Fontain and Lesser 2002, Malhotra 2004, and Sommerville 2006, among others) have discussed the role of technology in knowledge management; however, various capabilities which may exist in collaborative knowledge creation environments are not thoroughly explored in the literature.

The literature review has also identified the need for better knowledge management practices (Davenport and Prusak 2000) in the context of both critical projects and day-to-day operations, something which has recently been neglected, possibly due to the 2008 economic crisis and the lack of funding to support KM activities.

Furthermore, very little discussion is captured by the current KM literature on managing the unknown as well as exploring ignorance as a mechanism to enhance knowledge storage and transmission processes. Hence, in an attempt to address the existing gap, this thesis develops a novel theory on the nature of knowledge and ignorance and argues that managing ignorance and adaptivity is not just a theoretical foundation but also a pragmatic exercise which has become increasingly important in multinational environments.

Moreover, in the broader KM literature, discussion and understanding of how an organisation learns and adapts to new environments was found to be limited. Several studies have associated business networks with various aspects of performance (Granovetter 1985; Wenger *et al.* 2002; Zhao and Aram 1995). Others have noted the importance of developing communities of practice in reducing operating costs and improving operational excellence (Vestal 2002). In combination, organisational networks are seen as a key driver of business success. However, some scholars argue that failure to understand and connect KM practices into individuals' daily work activities can hinder the effectiveness of a knowledge management effort, costing organisations time, money and resources (Akhavan *et al.* 2005; Braganza and Möllenkramer 2002). It is therefore suggested that further research is required in exploring the characteristics and incentives for increasing the level of knowledge within the business as well as the relationship between rewards and productivity.

Finally, the lack of literature reporting studies carried out in the Aerospace and Defence industry should also be noted. This study attempts to narrow this gap by developing an in-depth case study while analysing the working practices of individual business units in the Aerospace and Defence sector.

The purpose of the current study is to address these gaps and enable managers to develop an effective KM strategy which will have a potential significant positive impact on the way knowledge is accessed and processed within the business.

2.10 Summary

This chapter has discussed some theories and practices of information and knowledge management in today's organisational milieu. As noted by several authors, the movement from a 'hard' and natural approach to a 'softer' and more social-like perspective can foster innovation and increase operational efficiency, particularly within knowledge intensive organisations. This change has happened mainly because companies are starting to admit the importance of human factors and social influences in promoting best practice across a range of operational areas from quality management and information security to business continuity and health and safety. They can see that by taking into account the knowledge of their employees, the overall value of their businesses rise, becoming at the same time more profitable and successful.

It is true that there is no recipe to follow in order to end up with the same result. Humans have become the centre of a company's structure and issues referring to trust, culture and reward have been identified. The characteristics of empowering learning communities that foster productivity and increase the effectiveness and efficiency of operations in organisations have also been highlighted in this chapter.

However, as outlined in the literature review, there are still a number of companies which utilise ineffective knowledge transfer mechanisms. Employees seem to miss basic knowledge regarding organisational processes and find it very difficult to quickly adapt to new environments and work effectively in collaboration with existing teams. Particularly in the Aerospace and Defence industry, there is an increased pressure to boost efficiency and reduce costs for new aerospace and defence systems. KM processes need to be reviewed and streamlined to increase efficiencies, and managers should address the changing trends in the industry by reaching out to the next generation of workers while responding to the affordability challenge. It is therefore evident that the issues addressed in this chapter could unavoidably lead to dysfunctional KM scenarios in the workplace. The need therefore to clearly identify, define and explore techniques for managing such KM dysfunctions is greater than ever. It is also affirmed that these issues have become even more acute due to the 2008 financial and economic crisis and thus further research is essential and necessary. Furthermore, the concept of exploring the power of understanding the unknown has also been emphasised. Arguably, there is no perfect knowledge to enhance and facilitate knowledge management processes; hence sharing the extent of our ignorance with other people and thus learning together is the only real wisdom in optimising the level of organisational knowledge, as well as increasing performance by reducing the risks of making the wrong decision.

To sum up, there are no specific steps to achieve effective knowledge management and there are different reasons for sharing knowledge at each case. However, the transposition from a scientific and harder side to a softer and more qualitative point of view is essential to produce completeness and perfection in something as well as to create true objective knowledge of any kind.

The next Chapter discusses the research philosophy and methodology adopted for this study. It also outlines the data collection methods adopted in carrying out the research and discusses the rationale behind the adoption of such methods, with particular reference to the relevant literature on methodology.

Chapter 3

Methodology

The methodology and methods of this study are presented in five sections. The first section in this chapter (Section 3.1) discusses the theoretical perspectives (also known as knowledge claims) available and the philosophical approach adopted in this thesis. The next two sections (Section 3.2 and Section 3.3) review the research strategy and methods for collecting the data required for the research. The fourth section (Section 3.4) reviews the qualitative and quantitative methods for analysing the data collected. The fifth section (Section 3.5) reviews the legal and ethical considerations identified for this research study. Finally, a synopsis of the methodology and methods is presented in the concluding section (Section 3.6) of this chapter.

3.1 Theoretical perspectives

Researchers have different philosophical and ideological perspectives. These theoretical approaches may vary around issues such as the nature of reality and the ability to measure outcomes in an objective and unbiased way. In general, theory represents a scheme or system of ideas or statements held as an explanation or account of a group of facts or phenomena. It is a hypothesis that has been confirmed or established by observation or experiment and is propounded or accepted as accounting for the known facts. Moreover, theory is a statement of what are held to be the general laws, principles, or causes of something known or observed. In this usage, a theory is not necessarily based on facts; in other words, it is not required to be consistent with true descriptions of reality. Furthermore, theory involves explanation and insight for facts or phenomena. In science, a theory is a proposed description, explanation, or model of the manner or interaction of a set of natural phenomena, capable of predicting future occurrences or observations of the same kind and capable of being tested through experiment or otherwise falsified through empirical observation. It follows from the statement that for scientists “theory” and “fact” do not

necessarily stand in opposition. At this point Occam's razor principle should be mentioned. According to Gibbs (1996), the principle states that "Pluralitas non est ponenda sine necessitate" or in other words "entities should not be multiplied unnecessarily". Thus, the explanation requiring the fewest assumptions is more likely to be correct and accurate (Gibbs 1996). However, this principle goes back at least as far as Aristotle who wrote "Nature operates in the shortest way possible" which can well work in philosophy or particle physics, but less often so in cosmology or psychology (Gibbs 1996).

Theory building consists of two main methodologies: induction and deduction. More specifically, in the induction phase, theory is constructed after collecting data and examining specific examples. Thus, there is a movement from the specific to the general (generalising). In contrast, in the deduction phase conclusions about specific instances are reached from general principles and the data is collected to test various theory practices. Hence, a progression from the general to the specific is noted.

> *"Deduction works especially well in math, where the objects of study are clearly defined and where little or no gray area exists. For example, each of the counting numbers is either even or odd. So, if you want to prove that a number is odd, you can do so by ruling out that the number is divisible by 2. [...] On the other hand, as apparently useful as induction is, it's logically flawed. Meeting five friendly people – or 10 or 10,000 - is no guarantee that the next one you meet won't be nasty. Meeting 10,000 people doesn't even guarantee that most people in the town are friendly as you may have just met all the nice ones" (Zegarelli 2007, pp.43-44).*

However, despite the fact that these two methods seem so fundamentally different, induction can be used for theory building, while deduction can be used for theory testing and refining.

This section identifies different research perspectives by analysing social research paradigms, widely known as positivism, post-positivism and interpretivism, and selects the philosophical approach that best fits the aims and objectives of this thesis.

3.1.1 Positivism and post-positivism

Auguste Comte (1798-1857), widely regarded as the first true sociologist, is the founder of positivism, a philosophical and political movement which enjoyed wide diffusion in the second half of the nineteenth century (Bordeau 2010). More specifically, positivists adopted a systematic and sceptical research approach considering that the only authentic knowledge is scientific knowledge, from positive affirmation of theories through strict scientific methods. This theory brought into question anything that relied on induction, hinted of subjectivity or was not scientifically provable. Positivism led to a closed system analysis which was

appropriate for the laboratory, but could not be coherently adopted in the social sciences where human interaction and behaviour is critical. Specifically, this movement is based on experimental testing and therefore results are validated through experiments and tests.

At the end of World War II, a "neo-positivism" approach, namely post-positivism, was introduced as a result of critiques of logical positivism by Popper and Kuhn, demonstrating the complete disappearance of what was known as "paleo-positivism". This conjectural concept is fuelled by the use of qualitative methods and partial objectivity, not based on unchallengeable foundations (Blaxter *et al.* 2006, p.60). In particular, context is required in this movement but is not sufficient without conducting experimental testing analysis. Hart (2005, p.200) depicts the main assumptions and arguments in the development of positivism in the nineteenth and twentieth centuries, as presented in Figure 3.1.

3.1.2 Interpretivism

Interpretivism (also known as anti-positivism) is "a way to gain insights through discovering meanings by improving our comprehension of the whole" (Romejko 2008, p.71). In general, this qualitative research approach explores the richness, depth, and complexity of phenomena. Creswell (1998, p.15) defines interpretivism as "an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting". Broadly defined, Interpretivism means any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification (Strauss and Corbin 1990). For example, in the context of a particular experiment, each individual constructs his or her own reality and hence multiple interpretations can be formulated and explained.

The different logic however that exists within this approach has led to controversy over how one can draw the line between subjective and objective research, and researchers may easily misunderstand the meaning of the social situation from the point of view of those who live it. For this reason, it is important to interpret the event, understand the process of meaning construction and reveal what meanings are embodied in people's actions (Schwandt 1998). With regard to the historical development of interpretivism, Hart (2005, pp.220-221) cites the line of interpretivist philosophers running from Vico in the late sixteenth century through Rousseau, Hegel, Marx, Scheiermarcher, Dilthey and Richert, to Weber in the early nineteenth century.

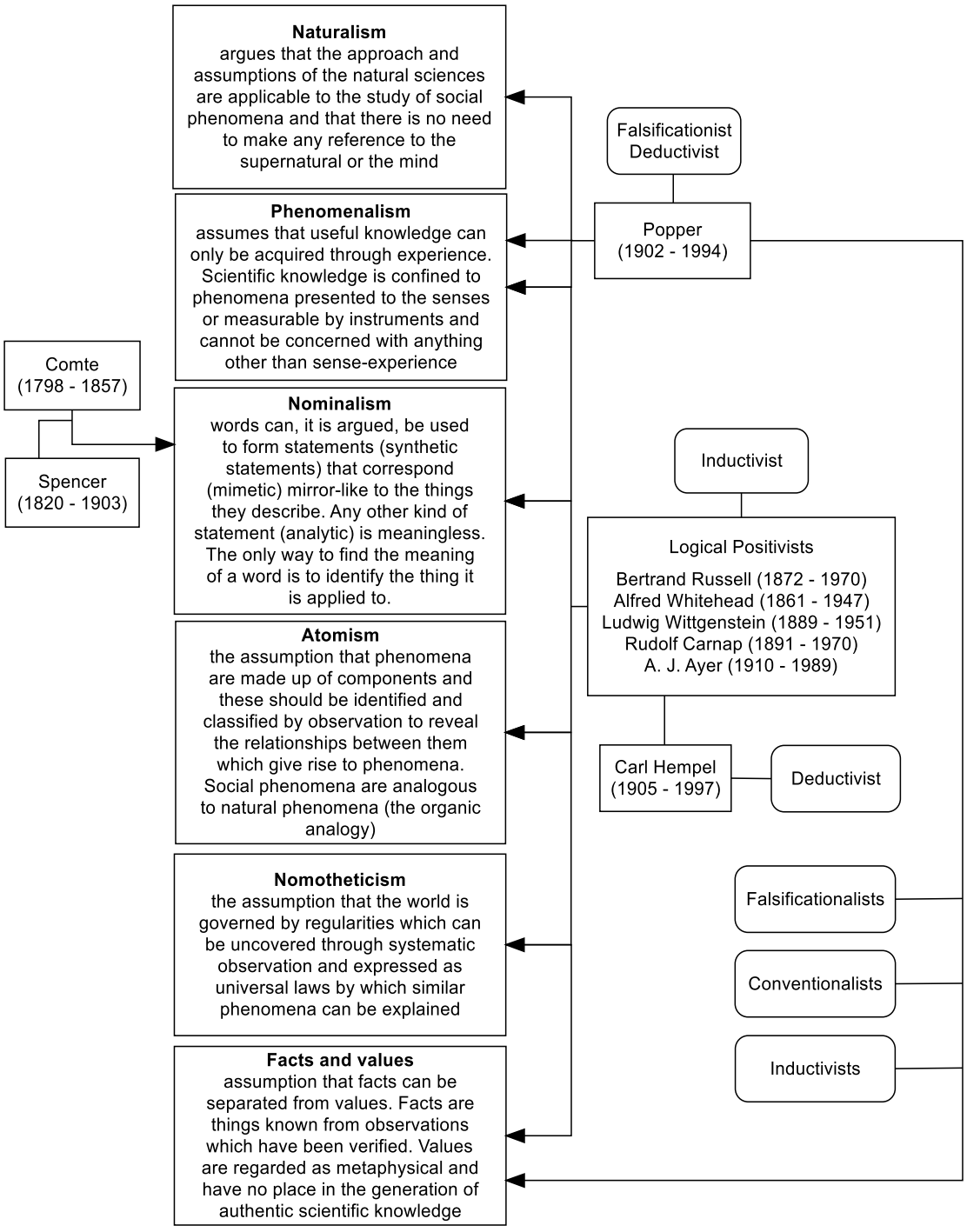

Figure 3.1: Positivists and their assumptions in the nineteenth and twentieth centuries as adapted by Hart (2005, p.200)

3.1.3 Research philosophy

The choice of the research philosophy was influenced by the study's aims and objectives and by the limitations imposed on the research; hence, this thesis adopts an underlying interpretivist philosophy with inductive reasoning. This is supplemented with consideration of theories on case study research and mixed methods analysis given by Yin (1994), Creswell (2003), and Tashakkori and Teddlie (2003). There are critics of this interpretive approach, objecting to the researcher's subjectivity in the observations and their analysis of the observed processes. However, as with any empirical study, caution was exercised so that field observations did not mislead the development of theory, and care was taken to ensure that observations were common enough to be generalised. Specifically, data were collected using a mixed methods approach in order to check reliability, ensure validity and explore issues in more depth. This investigation technique, also known as triangulation, focuses on different perspectives and aims to better understand the knowledge processes involved in organisations while developing best practice.

The use of a case study also allowed deeper investigation of the phenomena and resulted in richer understanding of certain human behaviours. Moreover, a considerable amount of research was conducted to generate an understanding of the organisational rules and processes that impact on knowledge creation, transfer and sharing. Case studies however are vulnerable to claims that they are unscientific. This is also emphasised by the practice of using case study findings to form generalisations. Generalisations are based on the local construction of meaning and local rules for behaviour (emic viewpoint) and the analysis of data with a strong link to the reality of peoples experiences, therefore caution has to be exercised to avoid over generalisation. Bryman (1988, p.88) highlighted the way the technique is used and expressed concerns over the representational scope within the case study that can affect the external evaluation of the validity of the study and its findings. As a consequence of this and in order to develop arguments for rigour and validity, studying and analysing the organisational knowledge management practices mainly relied on exploratory and constructive research. Exploratory research structured and identified new problems, and constructive research developed solutions to a problem. In many social science circles, exploratory research "seeks to find out how people get along in the setting under question, what meanings they give to their actions, and what issues concern them. The goal is to learn 'what is going on here?' and to investigate social phenomena without explicit exceptions" (Schutt 2006, p.14). This is also referred to as "qualitative research" or "interpretive research", and is an attempt to provide a rigorous approach to cultivating data with meaning.

3.2 Research methodology

Three research styles were considered for this study: quantitative, qualitative and mixed methods. The collection of facts and the study of relationships between sets of facts which come to quantified and generalisable conclusions was part of the quantitative research. In contrast, qualitative research tries to understand people's perceptions of the world and develops some insights collecting words, observing behaviours and interpreting. However, "when quantitative and qualitative research is jointly pursued much more complete accounts of social reality can ensue" (Bryman 1988, p.126). Moreover, Baillie and Bernhard (2009, p.291) argue that it is "necessary in educational research and in engineering to use quantitative as well as qualitative approaches". Creswell and Garrett (2008, p.322) state that "when researchers bring together both quantitative and qualitative research, the strengths of both approaches are combined, leading, it can be assumed, to a better understanding of research problems than either approach alone". Weber (1990) also points out that the best content-analytic studies use both qualitative and quantitative operations. In general, quantitative research is more likely to explore the topic in breadth whereas qualitative research is more likely to explore in depth. Tashakkori and Teddlie (2003, p.190) define mixed methods as "the incorporation of various qualitative or quantitative strategies within a single project that may have either a qualitative or a quantitative theoretical drive". However it is important to note that the use of mixed methods is not "about mix-and-match research (with strategies liberally selected and combined) but about using supplemental research strategies to collect data that would not otherwise be obtainable by using the main method" (Tashakkori and Teddlie 2003, p.190).

> *"The major strength of mixed methods designs is that they allow for research to develop as comprehensively and completely as possible. When compared with a single method, the domain of inquiry is less likely to be constrained by the method itself. Because the supplementary data are often not completely saturated re as in-depth as they would be if they were a study in their own right, certainty is attained by verifying supplemental data with data strategies used within the core study" (Tashakkori and Teddlie 2003, p.195).*

As noted in Section 1.4, the research involved a primary 'context-setting' phase (Phase 0) followed by three main phases (Phases 1 to 3) of data collection, using a sequential triangulation (mixed methods) design with data analysis between qualitative and quantitative stages. Specifically, the data collection and analysis process was characterised by an initial phase of field observations and workshop-style discussions (Phase 1), followed by a phase of survey data collection (Phase 2), and concluded by a final phase of interview data collection and analysis (Phase 3). This research design first allowed qualitative data to be gathered and analysed from a selected sample on the current KM practices and

experiences, and then quantitative data to be gathered from a larger sample to validate the first set of results (exploratory design). In addition, based on the results derived from the analysis of the quantitative survey data, this design also allowed a final qualitative interview data collection from a smaller sample to further investigate interesting patterns that emerged from the interpretation of the results as well as identify any incorrect or significant correlations (explanatory design). The findings of these three phases were integrated and compared, in order to produce a complete set of conclusions and recommendations. A visual representation of the sequential triangulation design used in this study, along with the data collection methods employed, is shown in Figure 3.2.

Furthermore, the use of a case study was considered the best strategy associated with the design of the research. According to Yin (1994) a case study can be defined as:

> *"an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident and it relies on multiple sources of evidence" (Yin 1994, p.13).*

Hart (2005, p.327) defines the case study as "a focus on a single case (person, group, setting etc.) [that] allows investigation of the details, including contextual matters, of a phenomenon". This aligns very well with the aims and objectives outlined in this study. Cavaye (1996) noted that the general focus of case study research is on the in-depth exploration of a phenomenon and its context. Furthermore, case study research usually observes the characteristics of an individual unit (Blaxter *et al.* 2006, p.71), is "ideally suited to the needs and resources of the small-scale researcher" (Blaxter *et al.* 2006, p.72), and is considered by many to be more or less synonymous with 'qualitative research' (Bryman 1988, p.87). Nevertheless, quantitative approaches can also be adopted in a case study research.

Consequently, several qualitative and quantitative data collection methods were used in this study. A short introduction is given in this section since an extensive analysis of the multiple data collection methods used is presented in Section 3.3. Specifically, semi-structured interviews, questionnaires, structured and unstructured observations, secondary data, workshop-style discussions, field notes and individual files were combined to best fit the aims and objectives of the thesis. Common tools to gather and categorise information included participant interview and observation recordings, questionnaire surveys as well as keeping notes for research purposes. Regarding the analysis of the findings, data gathered from quantitative sources, such as questionnaires, were mainly interpreted using statistical techniques. In contrast, qualitative data, captured mainly through interviews and observations, were analysed using open-coding to identify major themes while describing common KM issues. The data collection and analysis methods of each individual phase are discussed in detail in the following sections of this chapter. However, in an effort to guide

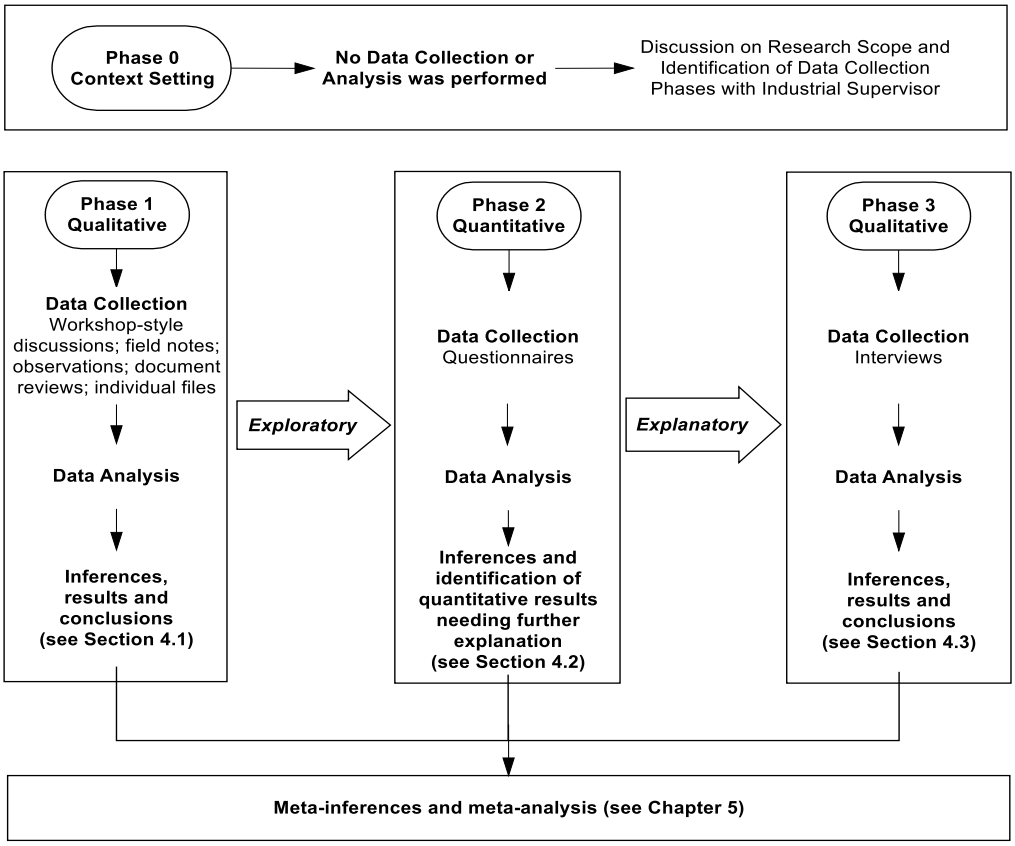

Figure 3.2: Overview of the research methodology

the reader through this chapter, Table 3.1 gives a summarised diagrammatic representation of the data collection and analysis instruments.

The primary focus when gathering and analysing qualitative data was to address some business aspects around knowledge management and investigate the degree to which a company can apply and exploit information effectively. Example questions included:

- How effective is KM?
- How effectively is it being applied?
- How effectively are we managing the knowledge and experience around KM?
- What is the ultimate value to the company of KM (benefits vs costs)?
- How do we measure the value of KM?
- What recommendations would help to improve any of these aspects?
- How does it compare with equivalent industry best practice?

These questions were formulated to explore KM issues around relevant materials and identify issues in relation to knowledge, performance and attitudes.

Furthermore, in addition to the case study design presented above, this research also adopts an embedded case study approach as it examines knowledge management practices of different departments (also referred to as business units) in the case study organisation. Yin (1994) defined this approach as an embedded design which he believes is increasingly popular within single case studies and provides a rigorous and valid output. This can also be justified by the fact that the research questions formulated at the beginning of the study and any other theoretical assumptions derived from the literature review process were only tentative interpretations. It is worth noting at this point that single cases allow deeper investigation of the phenomena and result in richer descriptions and understandings of the studied phenomenon (Walsham 1995). Hence, the choice of an embedded approach not only supports Walsham's (1995) view but also provides greater feelings of confidence in solving problems and making instructional decisions.

Prior to selecting the aforementioned methodology, other possible methods, such as brainstorming and the Delphi technique, were also considered. These however were not pursued mainly due to the fact that they did not entail the collection and use of both qualitative and quantitative data which was necessary for achieving the aims and objectives of this study. In detail, the difficulty of gaining continuous and longitudinal co-operation with the case-study organisation ruled out the use of the Delphi method; nevertheless the development of an online survey engaged the participation of a broad selection of employees from a variety of disciplines and within different business areas. On the other hand, brainstorming sessions were difficult to undertake during this research due to the

Table 3.1: The data collection and analysis instruments

Phase	Description	Participants	Depts.	Nation(s)	Questions	Duration	Analysis
1	Workshop-style discussions	22	14	1	10	1 day	Community Maturity Model
2	Questionnaire	375	15	9	42	88 days	Bristol Online Surveys
3	Interviews	9	4	1	13	1hr per interview	ATLAS.ti

fact that employees of the case-study organisation were too geographically spread and their time too valuable to attend such sessions. Hence, to overcome these issues, workshop-style discussions (which encompass similar characteristics to brainstorming) were used, since they were fortuitous in that they took advantage of an existing event and thus did not take more time from the employees than they had already allocated.

To conclude, this study was conducted in a natural-setting which involved broadly stated questions about human experiences, used multiple interpretive methods and was emergent rather than tightly prefigured. The social phenomena were viewed holistically and three research styles (quantitative, qualitative and mixed methods) were adopted and used. The data were held in various forms, and were analysed using various different techniques. The respondents were asked to describe (either in written form or spoken form) their experiences as they perceived them, encouraging open and frank discussions. Finally, the case study approach created a system-wide mind-set for improving knowledge management processes, promoting reflection and self-assessment.

3.3 Data collection methods

As discussed briefly in Section 3.2, multiple data collection methods were used during this study. Specifically, seven techniques were used for collecting data:

- Workshop-style discussions, field notes, observations, document reviews and individual files (i.e. logs of meetings, checklists and journals) in Phase 1 of the data collection process.
- Online self-administered structured questionnaires in Phase 2 of the data collection process.
- Semi-structured telephone interviews in Phase 3 of the data collection process.

The multiple sources of data enabled a better understanding of the work processes in the organisation; however various legal and ethical considerations had to be considered for each data collection technique (explored in further detail in Section 3.5).

The majority of qualitative data were collected by a series of in-depth interviews. The questions were designed to identify potential communication barriers, find out what 'real' constraints exist with the current technological tools and evaluate the KM processes in the case study organisation. An online survey was developed to better understand the information flows and knowledge processes within technology-intensive environments. It also shed light into hidden aspects regarding organisational knowledge management, knowledge sharing as well as information streams within the workplace. Although it is generally assumed that case study research is mainly based on interview data,

Benoliel (1996) made a plea for observational data to be reincorporated as a standard data collection strategy. Moreover, Jorgensen (1989, p.22) commented that "participant observers commonly gather data through casual conversations, in-depth, informal, and unstructured interviews, as well as formally structured interviews and questionnaires". Hence, workshop-style discussions and field observations were conducted as part of the research and used for the initial qualitative component of the study. These approaches tied into the interview and survey methods applied in this study and helped to address complex business aspects around the use and effectiveness of knowledge management processes. The sampling methods and further details regarding the workshop-style discussions, survey and interviews are presented in Sections 3.3.1, 3.3.2, and 3.3.3 respectively.

Additionally, document reviews and field notes (i.e. a field diary) were used throughout the research lifecycle. The document reviews produced relevant background information for the study whereas the field notes provided a record of the chronological events and development of the research process. Furthermore, observation of the way people actually work gave the author a more complete understanding of the working and knowledge management processes in a multinational organisation.

Finally, this study could not be carried out without the thorough analysis and critique of the data, information and knowledge that already exists in the field (i.e. individual files such as logs of meetings, checklists and journals), in order to validate the research results and concrete the final findings obtained by monitoring, observing and questioning people.

3.3.1 Workshop-style discussions

Following on from the sequential exploratory design (Tashakkori and Teddlie 2003, p.225), an important part in the initial phase of the study was to start collecting data using qualitative sources as it allowed the researcher to develop a comprehensive picture of the overall knowledge exchange mechanisms across different business units in the organisation. Therefore, field observations were conducted as part of the research, and workshop-style discussions were used for the initial qualitative component of the study. These data collection methods were considered appropriate for addressing the research aims of this study as they would identify whether employees were involved in any knowledge sharing activities or were part of a community of practice where they could gather and exchange ideas and information about a common topic.

Krueger (1994, p.11) notes that workshop-style discussions are effective because they tap into the human tendency to develop attitudes and perceptions by interaction with people and that "people may need to listen to opinions of others before they form their own personal viewpoints". Moreover, workshop-style discussions were considered an appropriate choice for this study because of their ability to produce concentrated amounts of data on

a specific topic while allowing the researcher to "obtain deeper levels of meaning, make important connections, and identify subtle nuances in expression and meaning" (Stewart and Shamdasani 1990, p.16). All of the above, however, must be viewed in light of the inherent limitations associated with this method, including the small number of respondents that participated, the limitations on generalisability to a larger population, and the bias of the researchers' influence and interests.

The majority of empirical data reported in this phase were generated by a one-day workshop which was organised by the KM group of the organisation at the company's headquarters, and in which the researcher was actively involved as participant and observer. It is worth mentioning at this point that the organisation was very keen to organise such events, however no corrective or preventive actions appeared to be taken subsequent to the workshops, even if new KM dysfunctions were discovered. Also despite the limited time availability of the participants and the relatively simple organisation of the event, a systematic method was adopted (further discussed in this section), and the participants seemed to be willing to share their thoughts and experiences openly with the researcher. Thus, no further discussions were considered necessary as part of the initial phase of this study.

The workshop involved twenty-two employees from fourteen different organisational departments, including military air and information, avionics, maritime, land, electronic systems, shared services, business winning, security and space, amongst others. The participants were self-selecting based on their desire to exchange knowledge, and were involved in several different communities or networks. Some of their main activities included sharing good practice, connecting people to people, supporting growth, stimulating innovation, auditing current systems and enhancing services, amongst others. This in itself enhanced the validity of the outcome as the results were reflecting not only specific divisions, project groups or self-directed teams but the organisation as a whole.

The session commenced with each member sharing basic details about themselves (i.e. name, department, role, network they were involved in). In addition, information was gathered regarding their role within the community or network in which they were involved in identifying supportive or growth-oriented approaches. This short introduction stimulated the thoughts of the audience and created a friendly atmosphere that encouraged frank and open discussion. Based on the Capability Maturity Model of Carnegie-Mellon University published by Paulk *et al.* (1995), a Community Maturity Model (CMM), presented by an invited guest speaker who had direct links with the organisation's KM group, was used as a performance metric and diagnostic tool to understand the heterogeneous knowledge structures and analyse their strengths and weaknesses. The literature has reported on a number of maturity models for application in the KM field. Examples include, but are not limited to, the work of Wenger *et al.* (2002), McDermott (2002), Gongla and Rizzuto (2001), and Hsieh *et al.* (2009). As with the majority of such models, this model reported

on five different areas of impact:

- *Strategic alignment* explored the clarity of the community's charter and strategy to support organisational goals.
- *Governance* focussed on whether the community's structure is recognised by management, and whether consistent governance mechanisms to ensure sufficient time, funding and resources are available to the community.
- *Collaboration* analysed whether members within a community are working together, sharing success stories and embedding learning into the way the community works.
- *Information technology* examined whether there is a wide range of common collaborative tools and corporate infrastructure available to support and help the community learn.
- *Valuable outputs* identified whether the community acts as an agent of change, benchmarking knowledge process indicators and engaging in work that is changing what the business does.

Additionally, in order to capture the full scope of networking performance, it is common practice to group values into levels for statistical treatment. Thus, all the above areas were sectioned into six different levels which were associated in an ascending order as depicted in Table 3.2 (Level 0 indicated the lowest level and Level 5 the highest). Each maturity level represented an extension of the previous level in terms of the documentation, implementation and impact of each area reported, namely strategic alignment, governance, collaboration, information technology and valuable outputs. Hence communities of practice that score a higher maturity rating are in general considered to be more structured, optimised and well-managed. The participants were given a sufficient amount of time to study the model and were asked to indicate where they think their network or community place is within it (i.e. current state) as well as what they think the ideal place would be (i.e. desired state, target). The data gathered from the workshop-style discussions and field observations are analysed and presented in the following chapter (Section 4.1).

3.3.2 Questionnaire survey

An online survey was developed to better understand the information flows and knowledge processes across different organisational departments. It also helped in understanding the knowledge management culture within the organisation. As noted by Granello and Wheaton (2004), surveys delivered via the Internet (whether via the web or email) are easily and inexpensively developed, can be widely distributed and offer respondents a level of anonymity that may not be available with more traditional survey methods. The limitation to distributing the survey through the Internet though, is that respondents may

Table 3.2: The six different levels of the community maturity model

Maturity Level	*Description*
0 (non-existent)	The practice does not exist in the organisation
1 (initial, informal)	The practice within the organisation is ad hoc, and with no established standards or policies
2 (repeatable, formalised)	The practice has been established, documented and possibly resourced, but its actual usage is isolated
3 (defined, partially implemented)	The practice is being used but its usage is not standard, pervasive, consistent or measured
4 (managed, implemented)	The practice is fully implemented and consistently applied. Metrics have commenced
5 (optimised)	The practice is measured and continuously or regularly reviewed against best practice or improvement goals

give inaccurate results due to perceived social desirability among their peers. As Furnham (1986) noted, social desirability refers to a tendency for individuals to present themselves in a manner that will be viewed favourably by others. Crowne and Marlowe (1964) defined socially desirable responding as attributing qualities to oneself that are likely to elicit approval from others and rejecting qualities that are likely to elicit disapproval. This bias interferes with the interpretation of understanding average tendencies as well as individual differences. As a result, this was reduced by explaining that the survey was anonymous so participants could not be directly or personally identified.

The responses received from the web-delivered surveys were automatically recorded in a database, eliminating the potential for data entry and coding errors. Furthermore, in order to improve the overall response rate, a number of responses were also collected through paper survey forms and the data obtained were manually entered into the electronic database at a later stage.

The response rate was 37.5 percent; that is approximately 1000 surveys were sent by email, and 375 were successfully completed and returned. A number of factors were perceived to have affected the return rate, including the time the survey was open and organisational issues relating to work allocation, such as the limited time availability and interest of the participants; however it represented a diverse cross section of the employees of DefenceCo in terms of age, gender, geographical region, and subject specialisation (explored in further detail in Section 3.4.2). The sample size of the participants responding was therefore 375, including eighty-seven percent males and thirteen percent females.

The survey respondents reported a range of experience and backgrounds. Specifically,

the participants included, amongst others, functional directors, engineering authorities, commercial managers, project managers, business leaders and senior planning managers. The sample consisted of employees from more than fifteen different business areas (e.g. military air and information, avionics, maritime, land, electronic systems, shared services, business winning, security and space) and across nine different countries around the world, including the United States, Sweden, Australia, Saudi Arabia, India and the United Kingdom.

In total, forty-two questions were included in the survey to investigate the degree to which the organisation can apply and exploit knowledge effectively (see Appendix B for full survey questions). The survey included six sections:

- The first section (six questions) was designed to elicit basic details about the participants which were later used as attributes for the analysis and interpretation of the findings.
- The second section (six questions) focussed on understanding of the organisation's KM materials and investigated their effectiveness when applied in the organisation.
- The third section (eleven questions) explored the technological issues across different business units in the organisation.
- The fourth section (fifteen questions) explored the organisational issues in the organisation.
- The fifth section (three questions) investigated issues in regards to rewards and recognition within the organisation. This section was particularly useful in terms of data analysis as it offered an interesting insight into how organisational policies can influence employee productivity and enhance motivation.
- Finally, the sixth section (one question) gave participants the opportunity to provide comments and feedback on the survey method and data collection process, as well as indicate whether they would be willing to participate in a follow-up interview.

Further details about the statistical analysis of the quantitative results and questionnaire design (i.e. scaling, ranking and piloting) are presented in Section 3.4.2.

3.3.3 Interviews

The semi-structured interviews were designed to test the accuracy of the earlier findings as well as discuss and validate the quantitative data collected from the survey in a further qualitative medium. As the interviewees had previously responded to the questionnaire, they reflected upon their answers and had the opportunity to further discuss their personal opinions and attitudes on knowledge management practices within the workplace.

Valenzuela and Shrivastava (2002) describe interviews as seeking to understand the meaning of central themes in the life world of the subjects. Kvale (1996) supports this by saying that a qualitative research interview seeks to cover both a factual and a meaning level; it is particularly useful for getting the story behind a participant's experiences and describes interviews as "a conversation that has a structure and a purpose determined by the one party – the interviewer" (Kvale 2007, p.7). Through this conversation, the interviewer has a "unique opportunity to uncover rich and complex information" (Cavana *et al.* 2001, p.138). Moreover, interviews allow research participants to tell their own story in their own words while bringing new information and opening windows into the experiences of the people you meet. Kvale (2007, p.11) also notes that semi-structured interviews are "a uniquely sensitive and powerful method for capturing the experiences and lived meaning of the subject's everyday world". Also, conducting interviews is a far more personal technique than that of questionnaires, and unlike with online surveys, the interviewer is able to probe or follow up questions, something that is key to gathering the right level of detailed information rapidly. Therefore, this method of research was deemed appropriate for gathering additional detailed information about organisational knowledge and lifecycle management processes.

On average, the semi-structured interviews lasted approximately 45 to 50 minutes; however, there was no predetermined length for the interviews and participants were free to continue talking for as long as they wished, providing both breadth and depth results about the organisation's structure and processes. All interviews were conducted by telephone and were recorded using a digital voice recorder as the interview was being conducted. Once the interview had been finished, it was then transcribed in note form for further analysis. Each interviewee was assigned a unique reference code, which was used to identify the relevant documents; hence, by maintaining the anonymity of the interviewees, open and frank answers were encouraged.

The telephone approach used in the study allowed participants to be included from geographically remote locations. Given the focus of the study, this approach was important within the research methodology in order to overcome logistical difficulties and meet certain cost limitations imposed by the organisation. The main disadvantage with this approach is the lack of non-verbal cues. Kvale (2007, p.123) suggests that telephone interviews risk losing the interpersonal chemistry between the interviewer and respondent that is vital to generating the motivation and interest in an interview. He also notes that telephone interviews can be extremely hard work to keep going because the interviewer and respondent have only vocal communication to go by. To facilitate easier comprehension, the researcher encouraged all interviewees to speak distinctly and understandably using clear, simple and short questions while letting them proceed at their own rate of thinking and speaking.

The interview sample was selected from the list of people who provided their contact details at the end of the survey. In total, nine interviews were carried out supporting van der

Heijden's (2007, p.181) view, who notes that "it seldom proves necessary to interview more than fifteen or so people [...] but after say ten[11] interviews a lot has already surfaced and interviews become repetitive". The selection of interviewees was made to give as broad a cross section as possible, although not every permutation was covered, since focus was put mainly on UK senior executives and line managers, because of their position to manage KM projects and make decisions. However, the employees interviewed were people from various backgrounds and with different roles within the business, including line leaders, project managers, review chairpersons, assessors and functional directors, amongst others.

The style of interview carried out followed a standardised, open ended interview approach as suggested by Valenzuela and Shrivastava (2002). Thus, the same open-ended questions were asked of all interviewees, facilitating faster interviews that were more easily analysed and compared, but still allowing a degree of freedom and adaptability in getting the information from the interviewee. However, as Kvale (1996) notes, semi-structured interviews, perhaps more than any other type of interview, depend upon the rapport established between the interviewer and interviewee. The skill and ability of the interviewer is therefore very important in establishing an effective interview. To ensure this was achieved in the current interviews the researcher followed the advice of Kvale (2007). The researcher was sensitive to the respondent and listened actively to the content of what was said, and the many nuances of meaning in an answer. Also, the researcher was open and willing to hear which aspects of the interview topic were important to the interviewee.

The questions for the interviews were designed to explore better ways to manage the unknown, identify potential communication barriers around knowledge and information management processes, find out what 'real' constraints exist with corporate KM tool-sets and evaluate the KM practices in general. The majority of the interview questions were developed based on some interesting patterns that emerged from the analysis of the questionnaire data, and were mainly focussed on areas flagged by workshop participants. Prior to conducting the interview, the question framework was scrutinised by the author's supervisors and subsequent revisions were made.

Specifically, the types of questions asked during the interview were focussed on three main themes: knowledge management dynamics; tools and systems; knowledge and lifecycle management strategies.

Some question examples included:

- What is your understanding of the purpose of KM? Does the information available support this view?
- Can you give any examples where you felt that the information you received was

[11]The researcher had reached data saturation by the end of nine interviews, and no new themes were emerging.

inaccurate or incomplete in the last 6 months?

- Does KM add value? (How or why not?)
- What suggestions do you have for improving your training (related to quality)?
- Could you suggest any new methods/practices/tools that would provide sharing opportunities?
- What suggestions do you have to communicate more effectively our capabilities/benefits?
- The survey findings suggest that employees think that KM should be included within a yearly review process. Why do you think this might be?

In addition to the aforementioned KM related questions, LCM specific parts were included at the behest of the organisation. The full list of the semi-structured interview questions can be found in the Appendix C.

3.4 Data analysis methods

Given the qualitative and quantitative nature of the study, various data analysis methods were considered in order to ensure validity and reliability of results. Specifically, an online survey and statistical tool was used for the statistical analysis of the quantitative survey data, and a computer assisted qualitative data analysis software programme was utilised to elicit primary themes, using the approach of qualitative content analysis.

3.4.1 Quantitative survey design and analysis

An online software tool was used in order to build, implement and analyse the survey data. This decision was taken as a result of the large volume and complexity of the data. The choice of the most appropriate software tool was driven by a certain number of criteria, the main ones being the product licence fee, the support available to access and use the application as well as the features provided. Given the above factors, Bristol Online Surveys (BOS)[12], a software tool developed by the University of Bristol and widely used by numerous universities and organisations, was selected as the most appropriate application for this study. The questions of the survey, as illustrated in the Appendix, were manually entered into the system, and the statistical analysis of the quantitative survey results was performed using the built-in analysis tool provided by the software application.

The survey was initially tested by a small sample of respondents (eleven persons) in order to verify the format and quality of the questionnaire. No changes were made as a result

[12] `www.survey.bris.ac.uk`

of the piloting. Once fully tested, the survey was sent out electronically in order to make completion faster and easier. The data received were recorded in the tool's online database, enabling the accurate retrieval and analysis of data.

The use of the BOS software tool included various functionalities that could not be performed manually due to the amount and complexity of the data collected. Specifically, apart from having the ability to view an early analysis of the survey results during the data collection process, BOS also provided the following features: cross tabulating results (i.e. cross-referencing two questions to see the correlation of their answers), cross tabulating of the whole survey (i.e. cross-referencing the whole survey against a chosen question), filtering results by answers to specific questions, filtering results by excluding questions, or by using a previously stored filter, and automatically calculating additional statistics such as mean rank, variance and standard deviation. All the above features were extensively used in the quantitative data analysis in order to provide descriptive statistics of the data collected and identify correlations that are difficult to perceive by eye, while making the process less subjective to human interpretation.

Furthermore, question classification tags were added for advanced filtering and colour thresholds were added for the colour coding of questions. Survey results were also exported in text and coded format for use in other packages, such as MS Excel, to better manipulate the data-sets and generate visual representations.

In relation to the statistical validity of this analysis, the sample size of the participants responding was 375 and the population size was chosen to be 93500, i.e. the total number of employees as reported in the company's annual report. Based on the figures noted above, the margin of error (i.e. the desired level of precision that the researcher is willing to except) was calculated to be 0.05057 (i.e. confidence interval is 0.5 +/- 0.05057) for 95% confidence level, using Moore's formula (2004, p.327) for the mean of a Normally distributed population. This value is consistent with the general rule relative to acceptable margins of error for categorical data (Krejcie and Morgan 1970). However, it may be increased when a higher margin of error is acceptable or may be decreased when a higher degree of precision is needed.

3.4.2 Qualitative interview data analysis

Given the qualitative nature of the data gathered by the semi-structured interviews, the analysis was concentrated on identifying the key points and themes of discussion. Cavana *et al.* (2001, p.169) note that the analysis of qualitative data obtained is undertaken to "identify the underlying themes, insights and relationships within the phenomena being researched". Lisosseliti (2003) recommends that qualitative analysis should consider issues, ideas and themes in the participants' comments, inconsistent or contradictory comments and

shifts in opinion, vague comments versus specific responses, tone and intensity of comments, frequency and intensity of an idea and the balance of positive and negative comments about an issue or idea. Visek (2010, p.123) suggests that if we leave the contextual information out of the analysis process the researcher will arrive at "distorted conclusions" but factoring in the context can only lead to "richer and more illuminating" findings. Similarly, Carey (1995, p.488) recommends that "an appropriate description of the nature of the group dynamics is necessary to incorporate in analysis". Thus, this study included both contextual and thematic analysis of the data.

Because the identification and exploration of ideas and themes involves a considerable amount of subjective judgment, a computer assisted qualitative data analysis approach was used. Specifically, the computer software programme ATLAS.ti[13] (version 5.5.9) was selected due to the wide selection of built-in features and functionalities which fully supported the qualitative research process, providing assistance on transcription analysis, coding and text interpretation, text editing, note and memo taking, recursive abstraction and content analysis. It also incorporated a visual presentation module allowing the researcher to see the relationships between categories more clearly. Finally, it maintained automatic logs of coding changes, making it possible to keep track of the evolution of the analysis.

Furthermore, the use of this automated software tool enabled both thematic coding analysis (content analysis) and inductive content analysis (thematic analysis) to be performed. Although qualitative content analysis pays attention to unique themes that illustrate the range of the meanings of the phenomenon rather than the statistical significance of the occurrence of particular texts or concepts, two key measures were explored: groundedness, i.e. the number of quotations assigned to a given code, and density, i.e. the number of links between a given code and other codes. The data analysis process used inductive reasoning, by which themes and categories emerged from the data through the researcher's careful examination and constant comparison. But qualitative content analysis does not need to exclude deductive reasoning (Patton 2002). Generating concepts or variables from theory or previous studies was also very useful, especially at the inception of data analysis.

To support valid and reliable inference, qualitative content analysis involved a set of systematic and transparent procedures for processing data. Some of the steps overlap with the traditional quantitative content analysis procedures (Tesch 1990); however the method incorporated in this research was divided into the following steps, beginning with preparing the data and proceeding through writing up the findings.

1. Preparing the data

   In general, in Information Science, qualitative content analysis is most often used to

[13] http://www.atlasti.com

analyse interview transcripts in order to reveal or model people's information related behaviours and thoughts (Zhang and Wildemuth 2009). Thus, the data collected by the semi-structured interviews was transformed into written text form before the analysis could start. The transcription of each interview lasted approximately four to five hours, and the output text file produced was uploaded onto the software platform for further interpretation and analysis.

2. Defining the unit of analysis

   The unit of analysis refers to the basic unit of text to be classified during content analysis. As De Wever *et al.* (2006) note, messages have to be unitised before they can be coded, and differences in the unit definition can affect coding decisions as well as the comparability of outcomes with other similar studies. Also, defining the coding unit is one of the most fundamental and important decisions (Weber 1990). Therefore, the units for analysis were defined using both individual themes and physical linguistic units, such as words, sentences, and paragraphs. Minichiello *et al.* (1990) argue that when using a theme as the coding unit, you are primarily looking for the expressions of an idea. Thus, codes were assigned to a text chunk of any size, as long as that chunk represented a single theme or issue of relevance to the research.

3. Developing categories and a coding scheme

   Coding schemes were developed both inductively and deductively. If no theories were available to describe a particular phenomenon or verify an existing theory, categories were generated inductively from the data. Example codes included: location, networking, complex socio-technical systems, information anarchy, information overload, compliance, and good practice.

   Weber (1990) notes that categories need to be mutually exclusive because confounded variables would violate the assumptions of some statistical procedures. However, in several cases, assigning a particular text to a single category can be very difficult; hence, a unit of text was assigned to more than one category. To ensure the consistency of coding, a coding manual was developed, which consisted of category names, definitions and rules for assigning codes. Using the constant comparative method, the coding manual evolved throughout the process of data analysis, and was augmented with the use of interpretive memos.

4. Testing the coding scheme on a sample of text

   The coding scheme was developed and validated early in the data analysis process. A sample of data was coded in order to test the clarity and consistency of the category definitions. In general, a high level of consistency was achieved concerning the definitions of the categories, coding rules, and categorization of specific cases.

Nevertheless, coding sample text, checking coding consistency, and revising coding rules was an iterative process to ensure that sufficient coding consistency was maintained throughout the testing process.

5. Coding all the text

   When sufficient consistency was achieved in the testing phase, the coding rules were applied to the entire corpus of text. During the coding process, the coding was checked repeatedly, to prevent drifting into an idiosyncratic sense of what the codes mean (Schilling 2006). Hence, all codes applied were based on the same methodology and were free of individual beliefs and personal opinions.

6. Assessing the coding consistency

   After coding the entire data set, the consistency of the coding was re-checked since it was not safe to assume that, if a sample was coded in a consistent and reliable manner, the coding of the whole corpus of text is also consistent. As Weber (1990) notes, human coders are subject to fatigue and are likely to make more mistakes as the coding proceeds. Also, the researcher's understanding of the categories and coding rules may change subtly over the time, which may lead to greater inconsistency (Weber 1990). Hence, coding consistency was monitored and reassessed, if necessary.

7. Drawing conclusions from the coded data

   Bradley (1993) suggests that this step involves exploring the properties and dimensions of categories, identifying relationships between categories, uncovering patterns, and testing categories against the full range of data. This was a critical step in the analysis process which involved making sense of the themes and categories identified, as well as their properties. At this stage, inferences were made and reconstructions of meanings derived from the data were presented.

8. Reporting the findings

   In the final step of reporting and presenting the findings, every effort was taken to ensure confidentiality and integrity of information. Although it is a common practice to use typical quotations to justify conclusions (Schilling 2006), other options for data display, such as conceptual networks, i.e. theme maps, were also incorporated.

The data analysis uncovered patterns, themes, and categories of potential theoretical and practical interest. However, because qualitative research is fundamentally interpretive, the researcher made every effort to achieve a balance between description and interpretation, supporting Patton's view who argues that "an interesting and readable report provides sufficient description to allow the reader to understand the basis for an interpretation, and sufficient interpretation to allow the reader to understand the description" (Patton 2002, p.503-504).

3.5 Legal and ethical considerations

The Loughborough University Ethical Advisory Committee provides a set of guidance notes for data collection which has been considered in this thesis. This set of considerations has also been studied alongside the UK Data Protection Act (1998). The Act principally regulates the processing of personal data (i.e. the disclosure of data by transmission and dissemination) and the amount of personal data the researcher may hold. It also notes that personal data should not be transferred to a country outside the European Economic Community, unless that country or territory ensures adequate level of protection for rights and freedoms of data subjects in relation to the processing of personal data. Given that the data were stored in the United Kingdom, the researcher ensured that all data were processed and treated fairly and lawfully in accordance with subject rights under this Act.

Regarding confidentiality and anonymity, all personal data were kept secure and treated in the strictest confidence. The participants were made aware before taking part in the study that the survey remained anonymous, unless they agreed to be contacted for a follow up interview. The username and password specific for the tool used to collect the survey data was kept confidential and only known to the author of the thesis. Once the data had been collected a hard-copy was printed out and stored safely and securely in a locked room. A back-up was also made onto an external hard drive to prevent loss of data.

The ethical guidelines set out for the interviews were approved by both the University and the organisation. Participants' consent was recorded at the interview. Participants had the right to withdraw that consent at any time, including during the interview, and were not required to give any reason for the withdrawal. Also, participants were under no obligation to answer all or any of the questions at the interview and could withdraw their participation at any time, without an explanation. Notes were taken during the interview; the transcription was kept securely by the researcher and could not be used for any other research without the written consent of the interviewee and the researcher. Wherever possible the anonymity of the interviewee was maintained. Despite the fact that the nature of the data being sought was non-personal, each interviewee was assigned a reference code, which was then used to identify the relevant documents.

3.6 Summary

This chapter presented the methodology applied to this research along with justification for its adoption. In particular, it has aimed to present the rationale for the use of these methods, and to consider their appropriateness with reference to the extensive methodological literature available.

The research adopted a primarily interpretivist philosophy with inductive reasoning and was supplemented with consideration of theories on case study and mixed methods. Within the context of a primarily qualitative case study, methods including semi-structured interviews, workshop-style discussions and surveys were used to achieve the overall research aims and objectives. Finally, given the large volume and complexity of the data, computer assisted data analysis software programmes were used to elicit primary themes and ensure validity of results.

The next chapter of this thesis presents the findings of the three different phases of the research, the implications of which (meta-inferences and meta-analysis) will be discussed in Chapter Five.

Chapter 4

Findings

This chapter presents the findings that resulted from the three main data collection phases. Further meta-analysis and meta-inferences are discussed in Chapter Five – Discussion. Based on the methods described in the previous chapter, the results of this study are presented in three sections, as follows: The first section (Section 4.1) explores the first-set of data collected through qualitative sources, such as workshop-style discussions, company archives, observations, field notes and review of other documents and data. This initial section enables the reader to fully understand the dynamics behind the discussions with the staff members and sets the scene for the presentation of the remaining results. The second section (Section 4.2) analyses the quantitative data gathered from the survey. The third section (Section 4.3) examines the qualitative information derived from the interviews, demonstrating a clear picture of the knowledge management culture within the organisation. Finally, a synopsis of the findings is presented in the concluding section (Section 4.4) of this chapter.

4.1 Phase 1: Qualitative document review and workshop results

The initial qualitative component of the study included a combination of data collection methods as outlined in the previous chapter. First of all, the participant observation of the organisation, in combination with extensive document review and field note analysis (including individual files such as logs of meetings and checklists), gave the researcher the opportunity to better understand the knowledge management culture at DefenceCo and the wider industry in general. Specifically, as part of the lifecycle management document reviewing process, a total of 165 internal documents (obtained from a central portal) were studied, including thirty-six guides, ninety-seven handbooks, twenty-four templates

and eight training materials. Guides, handbooks and templates, with associated training materials, support both regular and discrete reviews conducted by experienced practitioners, and provide advice and guidance for managers on all aspects of the lifecycle management framework including good practice examples, check lists and documentation formats. These are intended to promote the application of best practice in all aspects relating to programme execution and to facilitate continuous improvement across the organisation providing a competitive advantage in the way in which the organisation manages its projects.

The analysis revealed inefficient use of the available information (e.g. duplication of the same information in different documents), difficulty in the identification and selection of relevant information (e.g. comments and notes on updated versions were either not relevant or out of scope), and the increasing diversity and complexity of information. Employees in DefenceCo could be expected to have difficulties in absorbing important information from documents due to the relatively large size of the materials. Precisely, the average number of pages per handbook was found to be 100, restricting and limiting therefore each individual's information processing capacity. Also, tagging and meta-data information appeared to be missing in a number of documents, potentially decreasing the employees' search capabilities and overall work performance in the organisation.

The initial data collection phase also produced a significant body of findings in relation to specific organisational processes, systems and materials. These were presented and disseminated internally in the case-study organisation and cannot be published in this thesis due to nondisclosure requirements and industrial proprietary rights. It is worth highlighting however that the organisation's evaluation and response to these findings was to perform a KM audit in order to resolve dysfunctional KM scenarios (explored further in Chapter Six).

As discussed in Section 3.3.1, workshop-style discussions were observed to analyse the strengths and weaknesses of heterogeneous knowledge communities or networks within an organisational context. Twenty-two participants reported on five different areas of impact which were sectioned into six different maturity levels. The different levels were associated in an ascending order (Level 0 indicated the lowest level and Level 5 the highest), and each maturity level represented an extension of the previous level in terms of the documentation, implementation and impact of each area reported, namely strategic alignment, governance, collaboration, information technology and valuable outputs. Hence communities of practice that score a higher maturity rating are in general considered to be more structured, optimised and well-managed.

From the analysis, six communities out of eighteen were found to be at Level 1 in regards to the strategic alignment of each network or community. However, by further analysing the desired state (i.e. target) of each community, it was found that their members had strong motivation to achieve better scoring. Nine communities were placed in Level 2 and only three were found to be within the acceptable standard of Level 3. The results also highlighted

that in relation to strategic alignment, the vast majority of the communities (fifteen communities) had demonstrated a lack of knowledge transfer and exchange mechanisms, indicating the difficulty in communicating and expressing their ideas to the management and their executives.

Furthermore, four of the participants placed their communities in Level 1 and three in Level 3 concerning the governance and structure of each network or community. Interestingly, more than half of the sample (eleven communities) claimed to be in Level 2 with little flexibility to adjust to any other level based on the participants' remarks.

In respect to the collaboration mechanisms of each network or community, the picture differs compared to the other categories presented. This is due to the observation that communities often have the notion of sharing and collaborating as a basic principle within their strategy. Thus, one community was found to have the ability to share ideas and collaborate with other communities, six were found to be at an acceptable collaborative level (Level 3), six were placed in Level 2 and only five showed signs of no collaboration and knowledge sharing.

On the subject of information technology, it was highlighted that four communities had little or no awareness of techniques and tools to communicate and share knowledge; two communities were using a range of tools including video, voice, web-conferencing, team-rooms and instant messaging and ten communities were found below the acceptable standard (Level 2).

Last but not least, regarding the valuable outputs of each network or community, the majority of the sample (twelve communities) was found to have no clear evidence of how their membership can help to solve daily work problems, making benefits to the organisation fragmented and hard to substantiate. Only one community performed to an acceptable standard (Level 3), while three were rated at Level 1.

Given the above findings, it appeared that within the case study organisation, self-created (spontaneously created or emergent) communities of practice lacked basic knowledge exchange mechanisms and hence were not inclined to produce new knowledge and foster innovation. All of the networks examined had something to learn but not necessarily something to share. This appears to be due to the fact that within these communities goals were not clearly stated and members were not engaged in developing good practice to help solve business challenges. An interesting statement expressed by a staff member showed that not engaging in developing good practice to help solve business challenges could contribute to the overall knowledge confusion in the organisation:

> *"I'm not part of any community and there are no communities or networks that I know of" (System Engineer at DefenceCo).*

In addition, it appeared that the network leaders were not given sufficient time for their role

while funding was limited for supporting face-to-face activities that address labour issues. The time issue, or more explicitly the notion of 'I can't spend time for KM unless I have a budget code', was identified in all three phases of the data collection processes and is a major obstacle for managing knowledge effectively. Hence, further meta-analysis using the totality of the data obtained is discussed in detail in the following chapter (Section 5.3). Figure 4.1 provides a visual representation of the data gathered during the workshop.

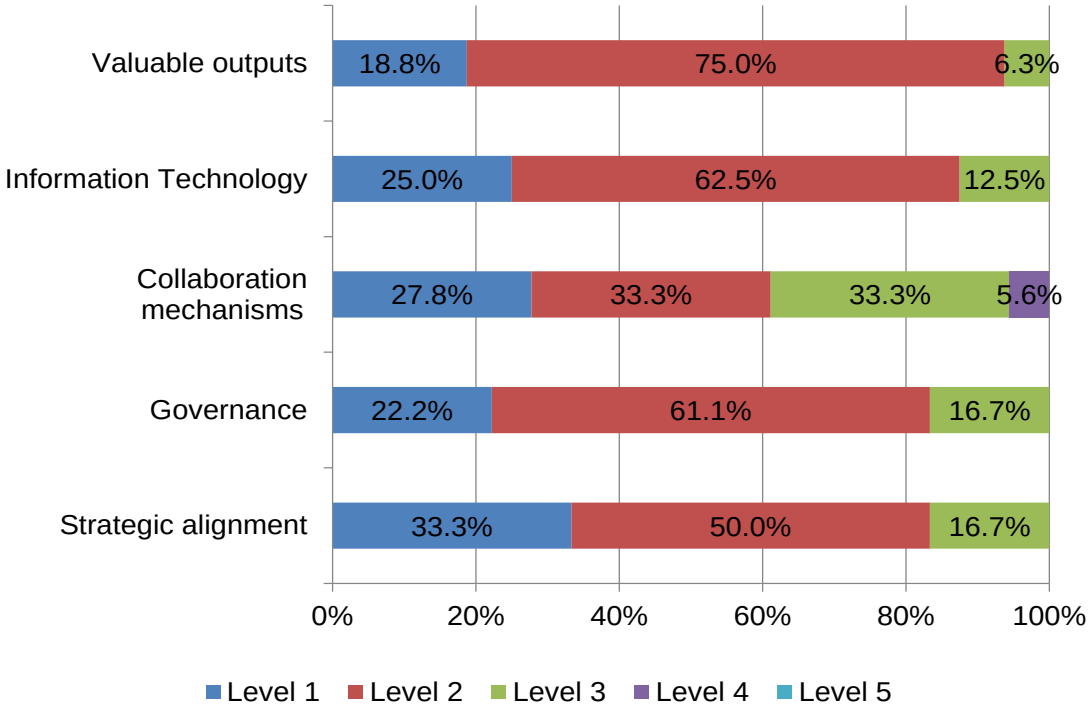

Figure 4.1: The results based on the five areas of impact in managing business networks

4.2 Phase 2: Quantitative survey results

As noted in Section 3.3.2, the sample size of the participants responding was 375, including eighty-seven percent males and thirteen percent females (Figure 4.2). The sample consisted of employees from more than fifteen different business areas, e.g. military air and information, avionics, maritime, land, electronic systems, shared services, business winning, security and space (Figure 4.3), and across nine different countries around the world, including the United States, Sweden, Australia, Saudi Arabia, India and the United Kingdom (Figure 4.4).

The vast majority of the participants surveyed (eighty-two percent) were over the age of forty-one; fourteen percent was found to be between thirty-one to forty years of age, and only four percent was under thirty years old (Figure 4.5). Furthermore, the majority of

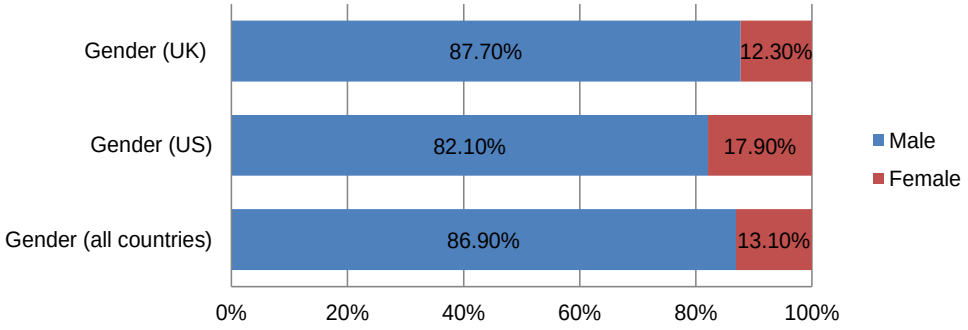

Figure 4.2: Gender of participants

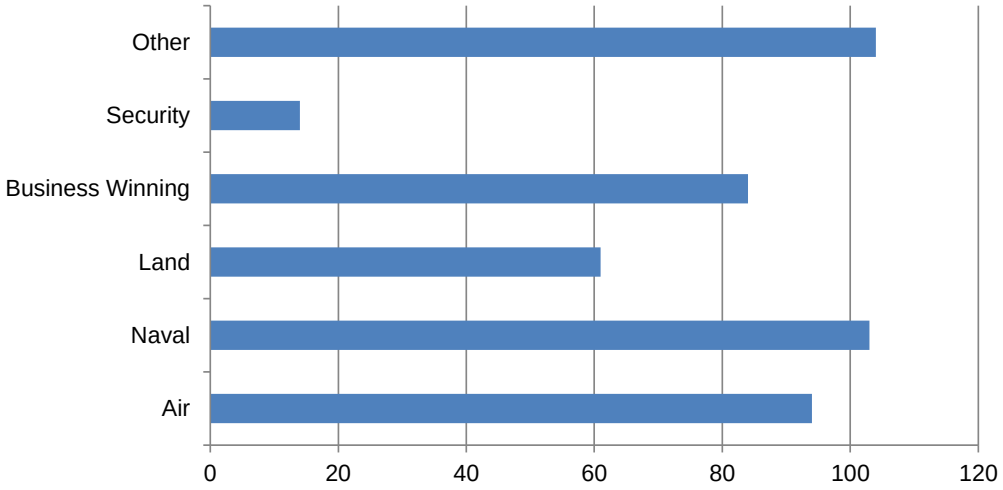

Figure 4.3: The business areas examined

the participants (sixty-nine percent) were found to be affiliated with the organisation for more than ten years, sixteen percent from five to ten years and fourteen percent from two to four years. Only one percent of the sample was found to be affiliated for one year or less (Figure 4.5). Based on the mathematical calculations performed in Section 3.4.2, these numbers can be considered representative of the organisation generally and provide evidence to support the literature in noting that the aging workforce is one of the biggest challenges companies face in the coming years, particularly within the Aerospace and Defence industry (see Section 2.2).

Moreover, it was interesting to find out that fourteen percent of the sample did not access the internal website to view or download corporate material and information regarding knowledge and lifecycle management processes (Figure 4.6). As noted by the Performance Excellence manager at DefenceCo during the first phase of data collection, the low traffic numbers were most likely due to the inefficient organisation of the available information

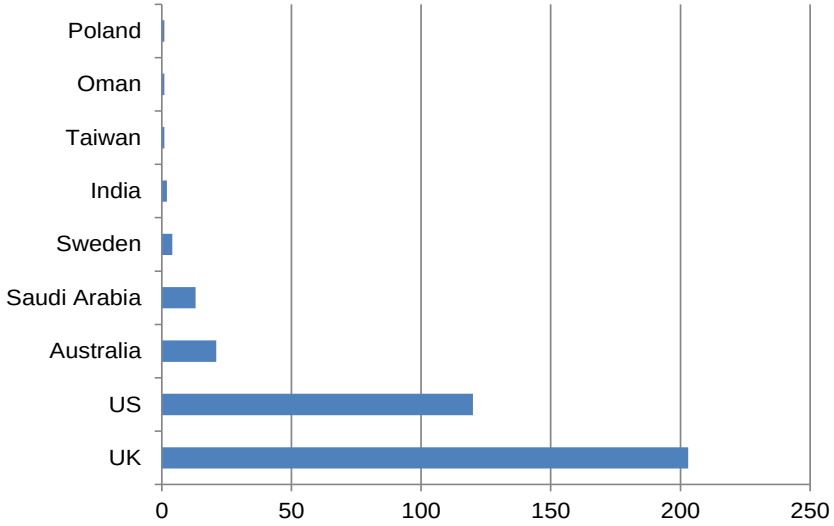

Figure 4.4: Current location of participants

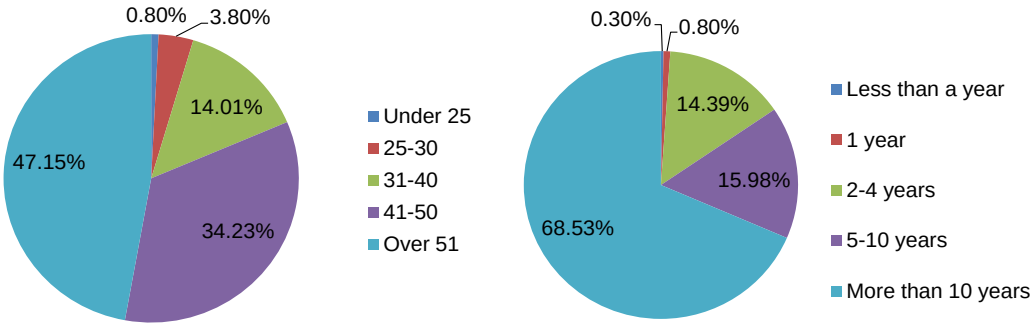

Figure 4.5: Age of participants surveyed (left) and their affiliation with the organisation (right)

(e.g. duplication of information) and the poor user interface design of the website (e.g. non user friendly graphics and structure, missing links to internal websites and other technical glitches).

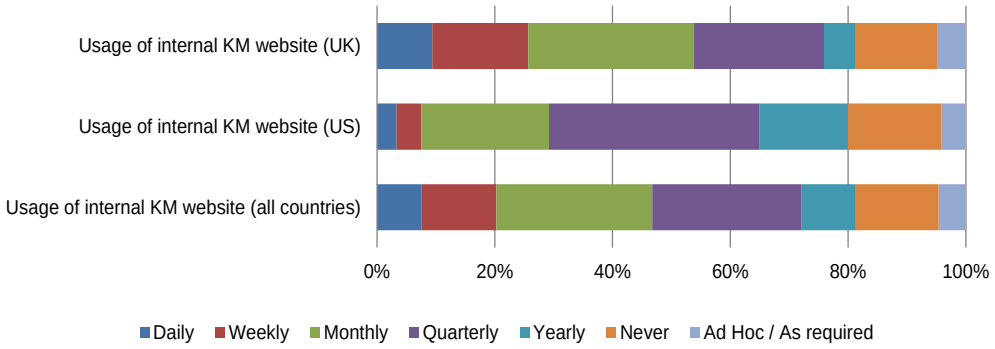

Figure 4.6: Usage of internal KM website

Another interesting point revealed from the survey was in regards to the frequency of use of such corporate information. Specifically, following feedback from the organisation on the initial presentation of findings, a micro-analysis on the British and United States responses was performed to identify similarities and differences in KM practices between the two nations. From this micro-analysis, it was evident that UK employees make use of the KM material on a more regular basis (mostly weekly, monthly) compared to the yearly and quarterly use in the US (Figure 4.7). Also, employees in both countries were found to be using similar material (that is mostly guides and handbooks as shown in Figure 4.8) and for similar purposes, mainly to set up projects or to organise, chair and perform phase reviews (Figure 4.9). The above results provided the basis for further comparative analysis of KM practices between the UK and the US in order to find out more information about correlations across cross-cultural (intra-organisational) processes and deficiencies in existing fragmented systems used by different business units in the organisation. Hence, additional meta-inferences between the two nations are extensively discussed in Section 5.5.

The quality of training that employees have received for using KM material, within the lifecycle management framework across different business units of the case-study organisation, was mostly found to be average across the organisation[14] (Figure 4.10), but it is also noteworthy that thirty-one percent rated it very good in the UK.

In relation to technology, employees felt that the benefits of new software over the old are not clearly explained within the organisation and believe that newly implemented systems do not live up to their expectations (Figure 4.11). Given that similar findings were reported

[14]To obtain an accurate and representative figure, the responses recorded were given by employees who had received information or instructions to improve their performance or help them attain a required level of knowledge or skill.

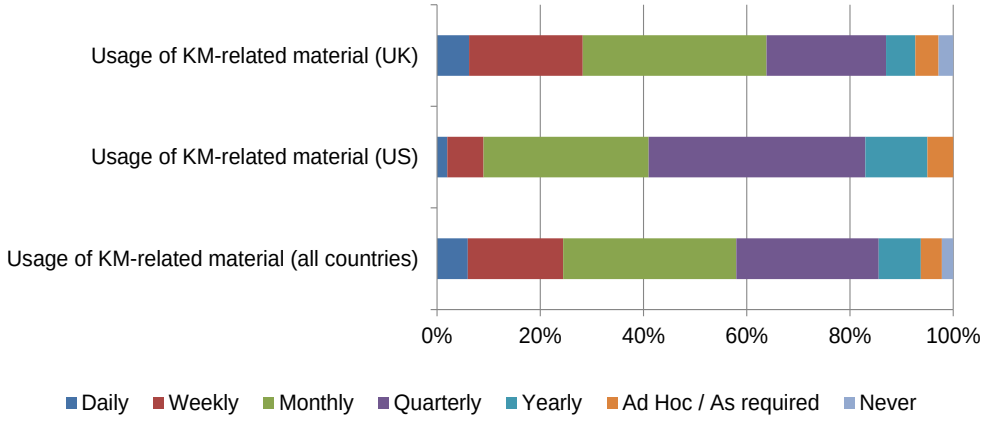

Figure 4.7: Usage of KM-related material by survey participants

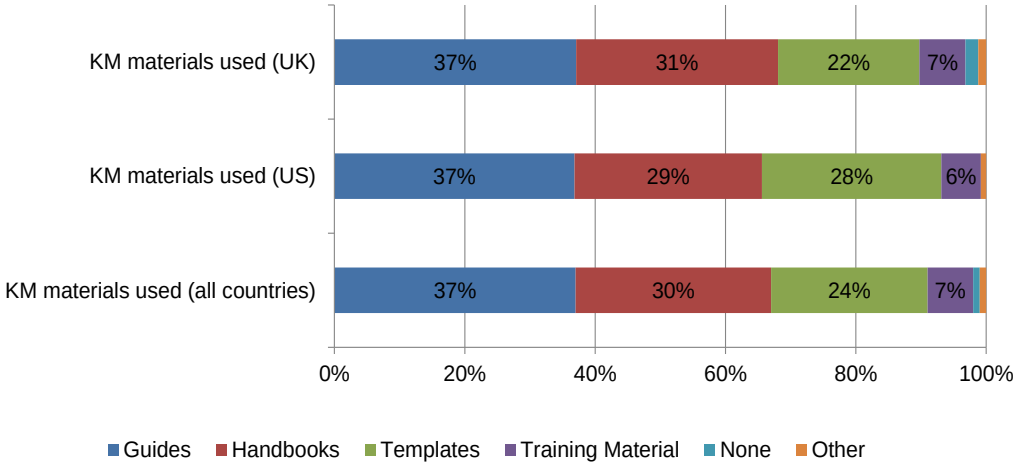

Figure 4.8: KM materials used by survey participants

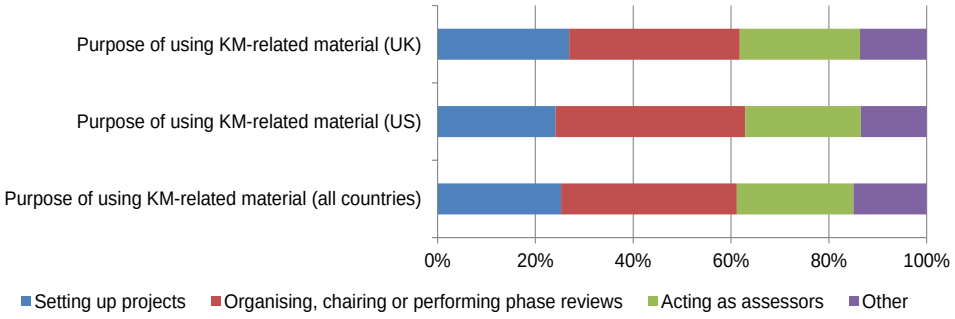

Figure 4.9: Purpose of using KM-related material

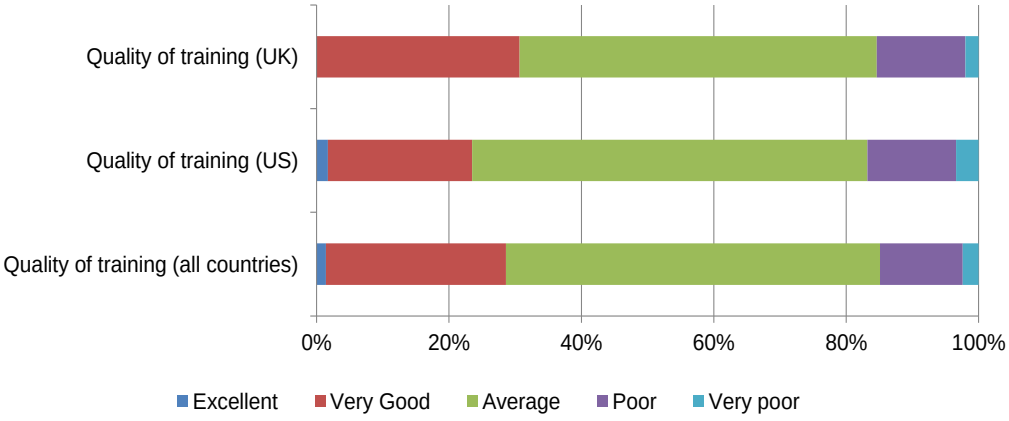

Figure 4.10: The quality of training that survey participants have received

through the interviews, a data compilation of knowledge management initiatives in relation to the use of technology is further discussed in the following chapter (Section 5.3).

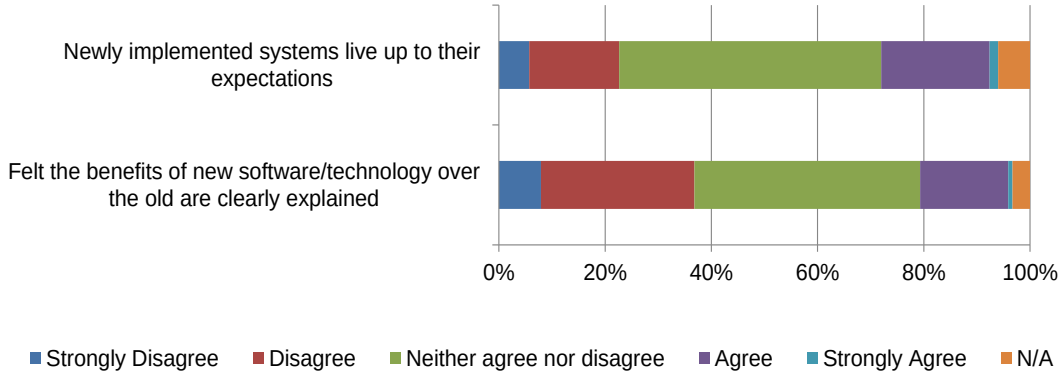

Figure 4.11: Technological factors in relation to system development

Despite the fact that the majority of the participants (fifty-seven percent) believe that the current tool-set provided by the organisation meets their working needs, thirty-five percent 'agree' or 'strongly agree' that they are not given sufficient opportunity to give feedback on the suitability of the material or tools that are provided (Figure 4.12). Forty percent of the sample indicated they are given sufficient technical support for the systems they use and forty-eight percent say that it is not difficult to find the knowledge required to do their job (Figure 4.12).

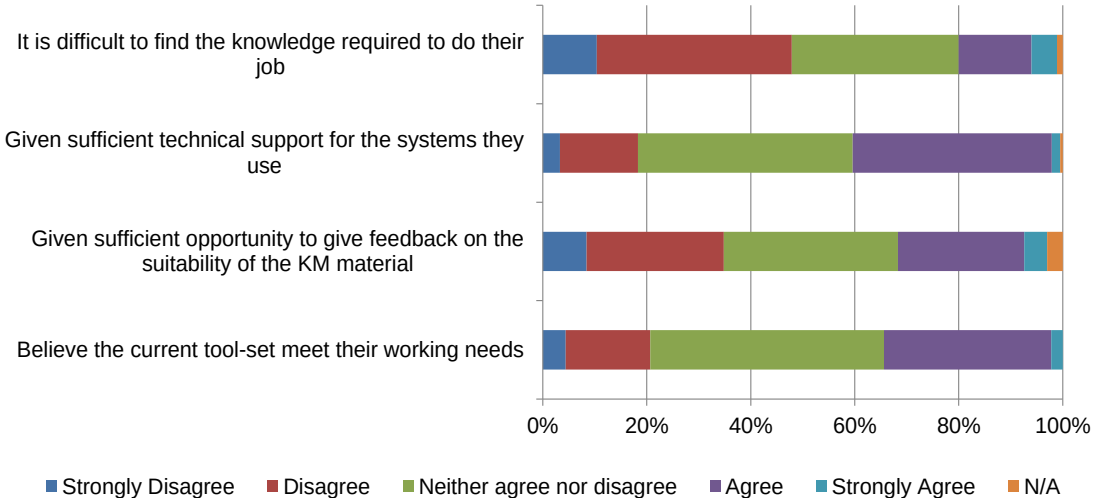

Figure 4.12: Technological factors that influence Knowledge Management practices

Moreover, sixty-three percent look forward to using a new piece of technology, twenty-five percent opt to use it only when required, six percent become apprehensive about using it, and six percent become enthusiastic based on its added value or benefit, the completeness of the effort introducing it, and the quality of the implementation (Figure 4.13). The

implications of these finding statements are discussed in detail in the following chapter (Section 5.3).

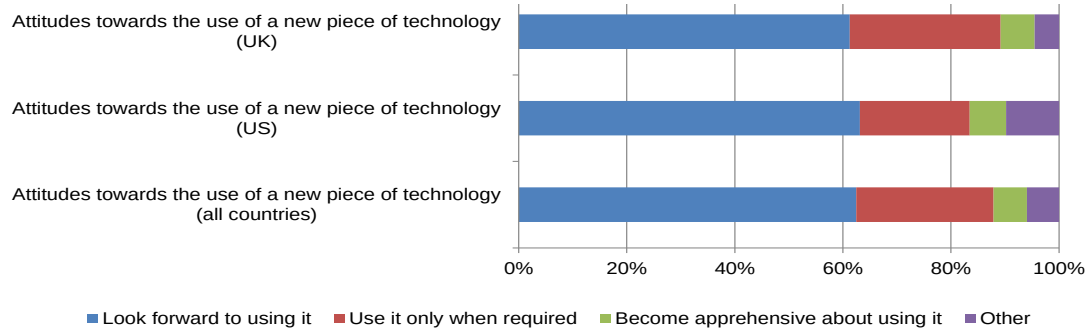

Figure 4.13: Attitudes towards the use of a new piece of technology

Regarding organisational factors that support knowledge sharing, the data indicate that employees are not given enough time to share knowledge. In particular, only thirty-nine percent 'agreed' or 'strongly agreed' that they are given sufficient opportunity to meet and identify colleagues that have the knowledge they seek and twenty-six percent claim they have met colleagues with a need for their knowledge (Figure 4.14).

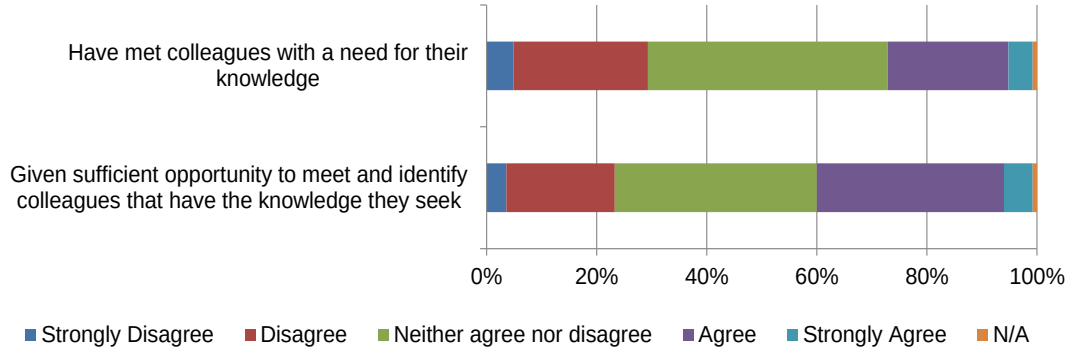

Figure 4.14: Organisational factors that support networking

Furthermore, thirty-four percent feel they receive sufficient credit when sharing knowledge and only twenty percent believe that there are sufficient knowledge capture tools available within the organisation (Figure 4.15).

The majority of the sample (seventy-six percent) has benefited through sharing knowledge with others (including receiving knowledge from others); seventy-five percent has shared knowledge outside their immediate area of expertise, fifty-one percent is encouraged to share knowledge by management, fifty-five percent claims that sharing knowledge outside their projects is part of their work process and fifty-three percent find it easy to share knowledge (Figure 4.16).

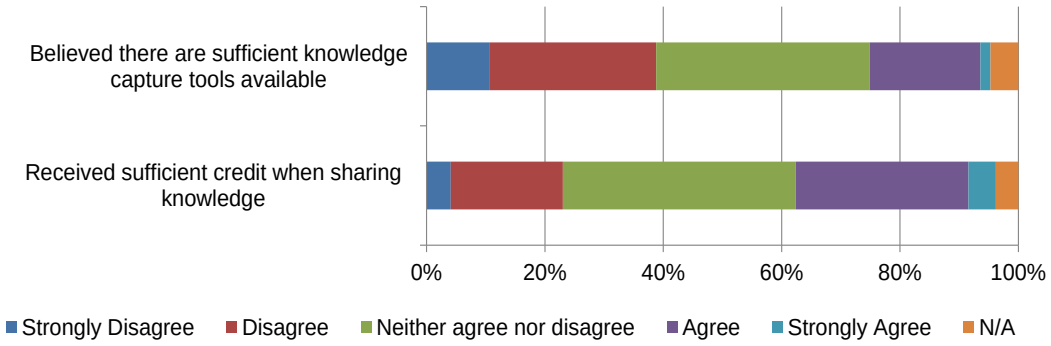

Figure 4.15: Organisational factors that influence employee attitudes

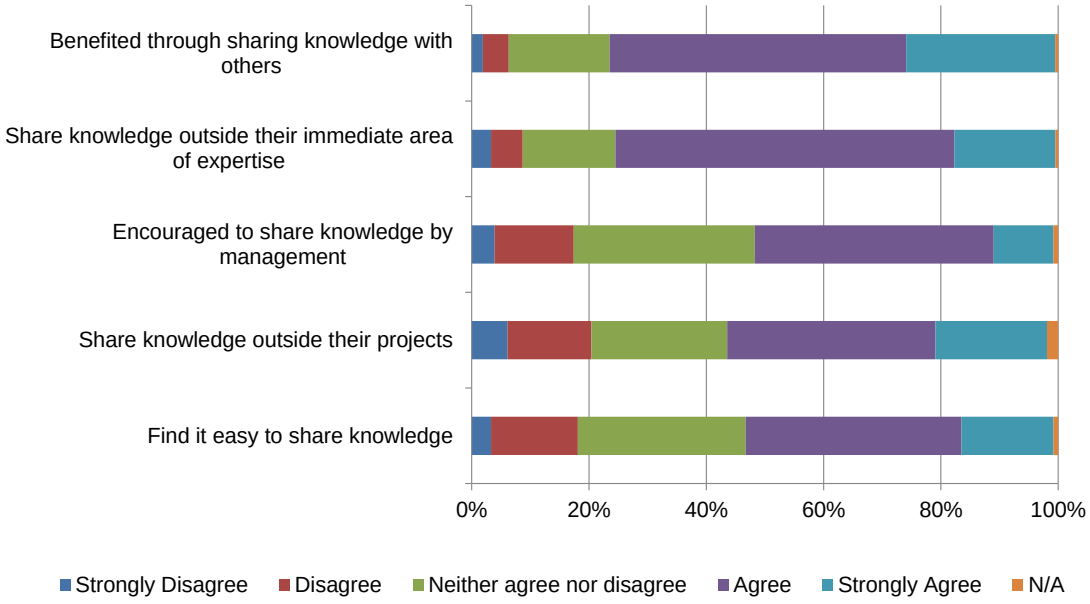

Figure 4.16: Organisational factors that support knowledge sharing

In addition, thirty-four percent indicate there are enough formal opportunities (e.g. within meetings) to share knowledge while thirty percent believe there are sufficient informal opportunities (e.g. knowledge cafés) to share, generate and reflect on new knowledge (Figure 4.17). Nevertheless, a strategic KM approach and a transparent reward scheme that would motivate people to share more of their knowledge were both found to be missing or unclear. Particularly in the US, eighty-five percent of the sample noted that knowledge sharing goals have to be solidly anchored in the organisational culture of the company.

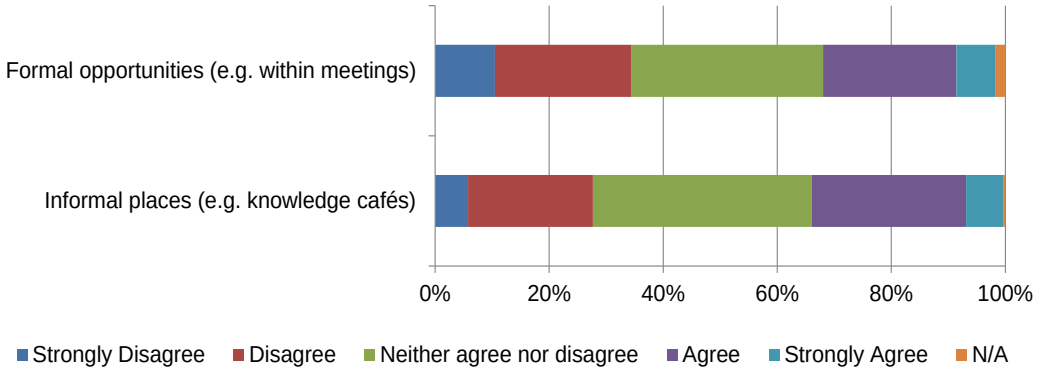

Figure 4.17: Formal and informal opportunities to share, generate, and reflect on new knowledge

In regards to rewards and recognition systems, fifty-five percent of the sample (sixty percent in the US and fifty-two percent in the UK) did not know of any reward scheme to encourage knowledge sharing (Figure 4.18).

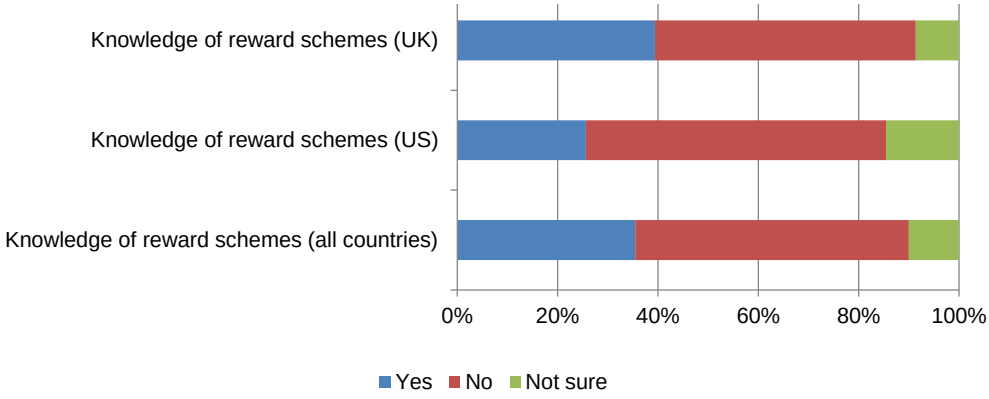

Figure 4.18: Knowledge of reward and recognition schemes

Finally, it was noted that if KM was included within a yearly review process, employees would spend more time developing their skills in knowledge sharing (Figure 4.19).

The quantitative findings presented in this section are integrated and compared with the qualitative data in order to produce a complete set of conclusions and recommendations.

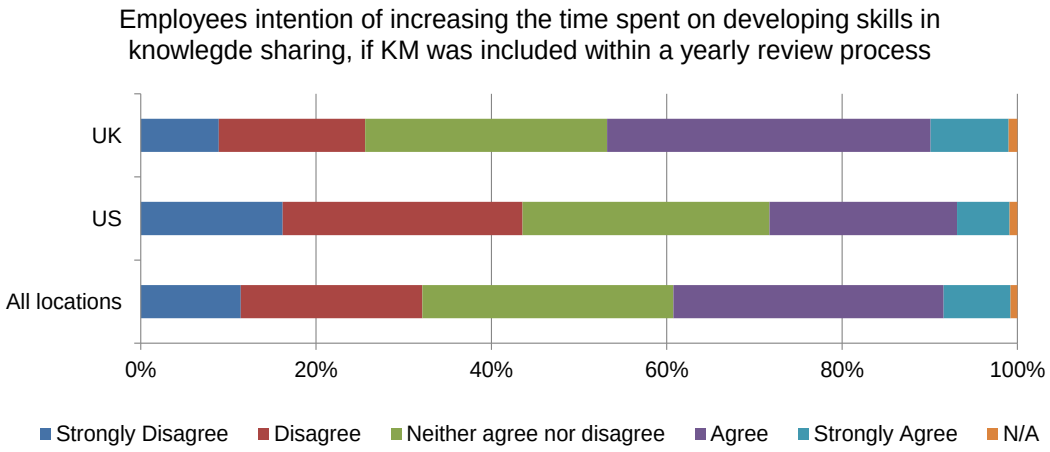

Figure 4.19: The benefit of reviewing KM processes in developing knowledge sharing skills

Hence, further meta-analysis and ramifications, illustrating whether these results support or inhibit organisational KM efforts, are presented and discussed extensively in the next chapter of this thesis (Chapter Five).

4.3 Phase 3: Qualitative interview results

As noted in Section 3.3.3, nine employees from various backgrounds and with different roles within the business were interviewed, including line managers, project managers, review chairpersons, assessors and functional directors. Despite being restricted by availability, and the self-selection of the initial population upon which to interview, data saturation had been reached by the end of nine interviews, and no new themes were emerging; hence the achieved sample size can be considered representative of the case-study organisation. The computer software programme ATLAS.ti was used due to the wide selection of built-in features and functionalities which fully supported the qualitative research process, providing assistance on transcription analysis, coding, text interpretation, text editing, note taking, recursive abstraction and content analysis.

The interviews conducted produced a plethora of findings highlighting novel ways of exchanging knowledge and expertise. Specific factors that are associated with creating and maintaining an effective KM strategy were identified and various capabilities which may exist in collaborative knowledge creation environments were also investigated and presented. Furthermore, the in-depth interview process covered multiple KM tools, techniques and processes across different organisational business units, from document administration and information management to communication, knowledge-sharing and learning initiatives.

4.3.1 Developing an effective strategy

It was suggested that Knowledge Management could help reduce the risk of fraudulent and unethical activity while ensuring that processes are followed correctly and efficiently. Specifically an employee noted:

> *"The whole point of KM is to protect the company - is to make sure that we're entering into business that we want to enter into, it's aligned with our strategy, it's ethical business, it's not going to lose its money, it's not going to harm our reputation [...] And I think some people do get frustrated because they think there seems to be an awful lot of extra work here; but it isn't extra work, it's just that you should actually know if you're doing the job properly" (DefenceCo employee working in Strategy and Business Development).*

Compliance is also another important characteristic of a successful KM policy. Particularly in the Aerospace and Defence industry, processes need to be compliant from the early stages of the bid submission. Failure to comply with internal and external policies could incur additional costs that can become expensive internally, affecting the overall effectiveness and efficiency of the organisation. For example, a common scenario noted is that project requirements (or final outcomes) may not match the customer's needs; hence new requirements, skills and competencies may be required increasing the overall production, development and operating costs. It is therefore particularly important to develop a KM strategy which can ensure that things are compliant throughout the duration of projects in order to reduce costs, improve performance and increase the number of sales.

In order for KM to add value to the organisation, it was found that it needs to be tailored accordingly. Specifically, different departments have different knowledge requirements; hence not all processes should be managed in the same way across different organisational environments. This was also emphasised by several interviewees who stated that in some cases KM should not be applied because it could act as a barrier to winning a bigger deal and making innovation. However, when the interviewees were asked to define where the exact threshold is on making such decision, no answers were given. This indicates either the lack of knowledge of certain employees to identify internal KM processes that could help them work more efficiently, or the lack of formalised KM mechanisms and other performance enablers. Also it was highlighted that KM can sometimes be used against individual employees, in that people can use it incorrectly, as a barrier to progress and it can occasionally be hindrance to the organisation's agility, if followed slavishly because of the need to get together a number of key personnel for certain reviews. Given the above discussion, it is clear that several KM dysfunctions can occur due to inappropriate KM mechanisms. A number of such dysfunctional KM scenarios, resulting in multiple dysfunctional situations for both managers and employees, are explored in further detail in the following chapters.

From a framework and checklist point of view, both the theory and actual use of Knowledge Management was considered as 'very good'. It was evident that KM processes provide employees with the assurance that they have considered what they need to do to complete a task and generally give ideas for processes while understanding why things are done the way they are. It was also found that KM provides the opportunity to engage more senior management to help.

Furthermore, KM provides a governance structure around the release of information to external organisations and customers. Hence, if the organisation is intending to submit a proposal to a customer that is capable of being contracted, it needs the information that has been through the relevant steps to ensure that it fits for purpose.

It was also apparent that leadership plays a vital role in administering change, influencing levels of employee engagement and establishing an effective knowledge management strategy.

> *"An independent chairman or your local management team should provide leadership by their judgement, take independent advice and take account of Lessons Learnt in relation to whether the bid or the project would allow at that point to share global best practice across our businesses" (Planner at DefenceCo).*
> *"I think you've got to stand up a team. The whole thing is about change culture, we're not particularly good in any of that. So first thing you need a senior sponsor, you need to stand up a team, empower them centrally to go away and do this" (Business Developer at DefenceCo).*

Also, the role of an experienced specialist, e.g. Chief Information Officer (CIO), appeared to be pivotal in monitoring knowledge flows and helping manage organisational knowledge more effectively.

> *"In my understanding, Information Management or Knowledge Management is not taken seriously like in some other companies. Some companies have had Chief Information Officers for years. But I do believe that we are making progress but my business for example still doesn't have a CIO. We are relying really only on the tools to provide the mechanism for sharing information rather than actually trying to drive that through our organisation" (DefenceCo employee working in the Naval Division).*
> *"I believe that there should be a CIO in every business unit to review how we manage our knowledge in an annual basis. I think KM is probably one issue that the company should address. I know we've tried to address it but it's still fractured in many areas" (DefenceCo employee working in the Naval Division).*

To sum up, five fundamental characteristics were identified for the development of an effective KM strategy:

- Corporate morality, i.e. adhering to regulations and company protocols;
- Compliance, i.e. making sure that legal, financial, operational and customer requirements are understood and met;
- Locality, i.e. different locations may require different knowledge requirements;
- Governance structure, i.e. developing a checklist-like framework which is easy to follow and review;
- Leadership, i.e. providing managerial direction to clarify each person's responsibilities and align KM efforts with the organisation's strategic objectives.

The above five characteristics for developing an effective KM strategy, together with supporting quotes and other key entities, are visually represented in a map of collectively held themes as shown in Figure 4.20. As noted in Section 3.4.1, the qualitative data analysis computer programme Atlas.ti was used to create this theme-style map by aggregating similar codes together and interrelating themes. For example, it is worth noting that the knowledge-related elements (soft-side skills) have been grouped to the right, whereas the information-related elements (codified assets) have been grouped to the left of the figure.

4.3.2 Fragmented documents and processes

According to employees at DefenceCo, KM documentation is primarily functionally driven; however, this is often a main cause of inefficiency in the overall operations of the business. This is illustrated by the following quote from an employee:

> *"I think it is the material that it's presented, it makes doing my job quite inefficient. I could be more effective and more efficient if access to the information I need was made easier" (Business Developer at DefenceCo).*

Two interviewees claimed that business activities should be process driven in order to enable easier and faster access to knowledge sources that move across many functions in an organisation. In product safety for example, documents are seen as an engineering activity, therefore people in procurement would never consider accessing them, despite the fact that everybody has a part to play in this area. By streamlining access to information across all domains, knowledge becomes more accessible and all the necessary information is picked up effectively and efficiently.

It was clear from both the survey and the interviews that documentation processes as well as KM processes should be reviewed regularly to enable management buy-in, facilitate knowledge sharing and learning, and avoid any inefficiency or disruption to the smooth running of the organisation's operations.

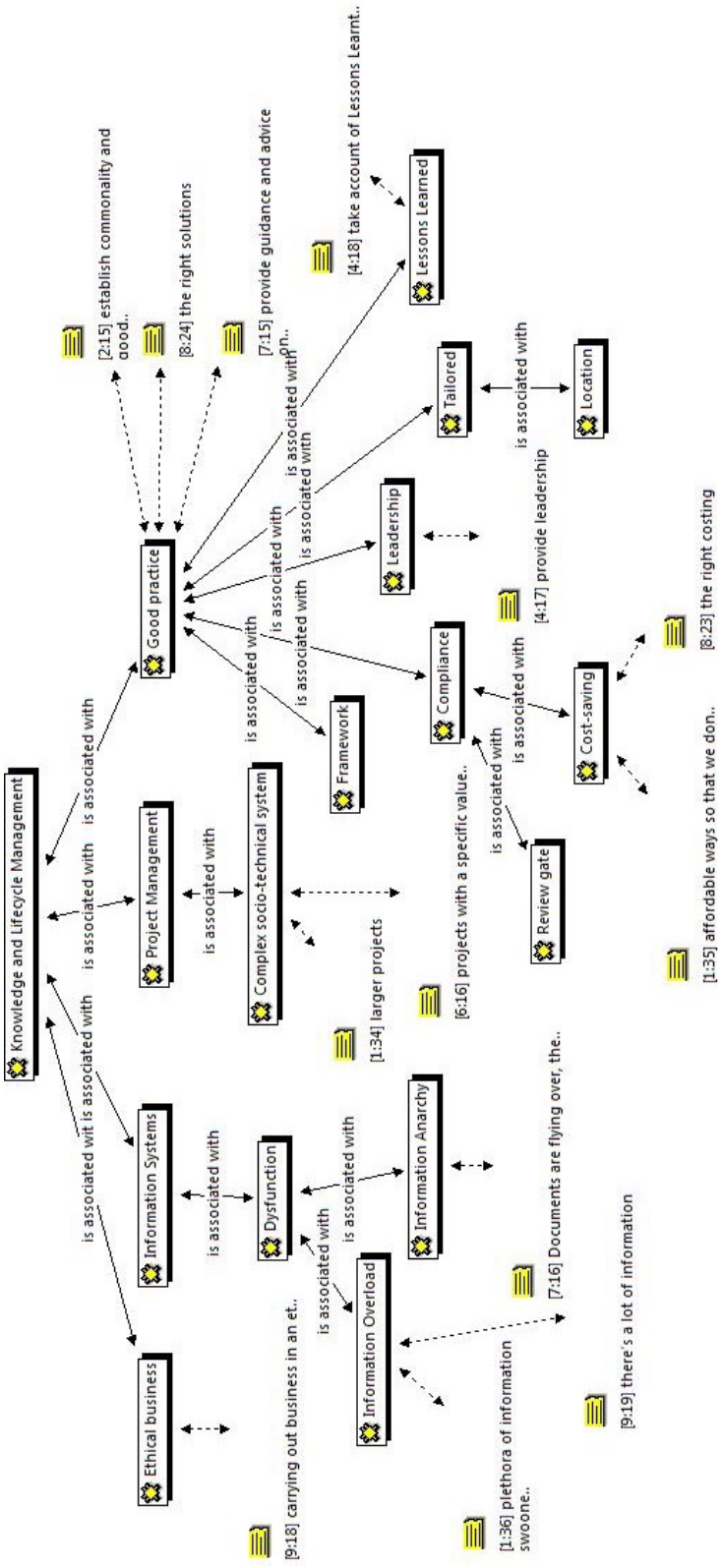

Figure 4.20: Knowledge Management theme map

"Every process should be subject to annual review. The quality management system, the business management system should require every process, certainly a major process like that to be subjected to review. Is it working? Does it do the job? Where's the evidence that it's working and how can we improve it? And then how can we communicate that improvement and make sure that the people implement them" (DefenceCo employee working in the Head Office).
"People should be encouraged and given time and then being given the time, you should annually review that through the annual appraisal system to make sure that people are doing what they are given time to do. So are they sharing, what have they learned, what they have shared with other people" (Business Developer at DefenceCo).

4.3.3 Identifying necessary knowledge sources

Some employees admitted to having difficulties in identifying the necessary knowledge sources to do their daily job. One of the main reasons for this, as revealed from the analysis of the interviews, was principally the actual physical location of each staff member. For example, one manager working at the Head Office appeared to have greater organisational knowledge over other employees situated in remote locations.

"I'm in the Headquarters, so I'm in a strategic position. [However] KM should be devolved down to business level so that we get the spread of knowledge across functions [...] I think we need something more localised" (DefenceCo employee working in the Head Office).

Furthermore, networking was also found to be critical in managing ignorance and exploring the unknown:

"I am getting more information through colleagues in my department and indeed from the businesses [...] usually, if I've got a query I can track down the right person to get a response and find a way through" (Business Developer at DefenceCo).

An important point made by three interviewees pointed out the problem of storing knowledge in different forms and media:

"There is a set of Handbooks and Guidelines that you can access, but there is also a material that's available from other practitioners – that is not necessarily on the system. I've recently used some material around Opportunity Assessment from our American businesses to work on an assessment of a small market in the UK" (DefenceCo employee working in the Naval Division).

> *"At the moment there's very little control over which media to use [. . .] It's like having 20 wikipedias to search through and I'm not quite sure which one I should believe. So if I search for information on an engineering task, I'll probably find something centrally but probably if I search each of the business units' websites I'd find a slightly different view or different way of doing something. And it's unclear which is the best way or which one to trust" (DefenceCo employee working in the Business Winning Division).*
> *"Our knowledge if you like is not concentrated in one structured sort of knowledge base, it's actually spread across quite a number systems and tools and not everybody chooses to access the same set of tools. Somebody can be left-out" (DefenceCo employee working in the Naval Division).*

These quotes however imply that if employees cannot find what they are looking for, then there is no official technical mechanism to help them track down the knowledge they require. The extent of this problem was also acknowledged by a large number of interviewees who indicated the importance of having a knowledge agent or mentor who could provide guidance on daily operations.

> *"I like it when I can turn around to someone say no that's fine but yes you need to do this and then you have that review and that" (DefenceCo employee working in the Land Division).*
> *"I'm thinking more of a mentor or a coach, someone in the system who is the point of excellence or whatever you like to call it, who is actually there and think of this wealth of experience they have. And they can actually make a decision and say, well you don't really need to do this, this is what you need to do" (DefenceCo employee working in the Land Division).*

Moreover, employees highlighted the significance of trying to get the balance right between documentation that is used purely for a KM review and documentation that should be used for projects. Specifically, it was noted that there are areas where people just generate documentation purely to get through the Lifecycle Management process and it is never used again.

> *"There are too many internal documents, and hence we create a lot of internal documents to answer them" (Project Manager at DefenceCo).*
> *"I'd like to see a much simpler form of KM. I mean at the moment if you go onto the website there are hundreds of documents and trying to read through and make sure you've picked up everything is really difficult. I've got the time sometimes to sit down and read through these things - but other people don't and they won't have because they've got their day job to do. There's too much out there and it needs to be simplified" (Business Developer at DefenceCo).*

Therefore, the documentation produced in each phase of a project must be rigorously reviewed to avoid inefficient duplication of information and emphasis should be put on ensuring that a team is actually working on a project on a day to day basis.

4.3.4 Supporting knowledge sharing

It appeared that all questions related to tools and systems were addressed in a similar way by the interviewees, revealing a general consensus of opinion. Specifically, the participants noted the benefits of interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively. It was also evident that within the organisation, several employees were not familiar with the term 'knowledge sharing tools' as they had never come across anything similar before. Furthermore, it was found that employees across different business units have developed their own tool-set based on their location and knowledge needs, producing a plethora of systems which are not interoperable and with limited searching capabilities from outside a given organisational unit. In relation to organisational KM methods and practices that would enhance sharing opportunities, the interviewees noted the importance of involving the management at a variety of levels to resolve deficiencies or compliance issues. It was apparent that more frequent communication between managers and staff members is required, especially during meetings and debriefing sessions. Furthermore, it was suggested that reward and recognition mechanisms should be established to increase productivity and motivation among employees. The research also identified the lack of effective search mechanisms in corporate tools and applications, reporting that the majority of tools could not filter down results based on the user's preferences (explored in detail in Section 5.3).

To present clearly key elements of the findings discussed above, representative quotes from the interviewees have been grouped into four categories and discussed in detail in Section 5.7. The output of this classification also examined the effect of employees' ignorance on knowledge sharing.

4.3.5 Training and employee development

The survey identified various issues regarding training, employee development and the career management function in the organisation. Hence, the participants were asked to make suggestions on how these areas could be improved (see Question B2 in Appendix - Interview questions).

It was interesting to find out that the majority of the interviewees would not be willing to enhance their training experience through online tutorials or other seminar-based courses due to the lack of time and motivation.

> *"Do we really need to do another course? I'm too busy doing my day job; that would be the first thing" (DefenceCo employee working in the Land Division).*
> *"There are some people who are course-mongers, they love courses you know, but for me, I can't see the benefit" (DefenceCo employee working in the Land Division).*

However, it was evident that current training organisational practices could shift towards a more personal and human approach.

> *"I think we place a lot of emphasis on the theoretical aspects of what we're trying to do. So it's all about the way we're doing a certain thing or what should be done. It tends to be a lack of emphasis on the how in training. You don't tend to get a sort of real life demonstration of actually somebody who is in a situation about doing the thing. I think it needs to be much more focussed down on helping someone to do their real job rather than a project manager should be doing these kind of things" (DefenceCo employee working in the Business Winning Division).*
> *"I don't know if I had any form of any kind of training. I usually discuss it with colleagues, humans what's required and then basically get their information and follow up on that from their guidance" (Project Leader at DefenceCo).*

Furthermore, training practices were found neither to be revised nor reviewed on a regular basis; hence, employees were ignorant about any new or updated methods and practices in the organisation. This in itself not only led to inefficiencies and extra costing, but also resulted in the inadequate use of knowledge processes for managing ignorance and the unknown across different parts of the business.

> *"I did the training 5 years ago, the world and KM have moved on considerably in 5 years, I don't have to re-qualify or re-train" (Business Developer at DefenceCo).*
> *"I think when new assets are rolled-out or revised, that's pretty poor. I think anything like that we do poorly in the business anyway. For example, earlier this year there was a whole new suite of engineering documents rolled-out, and I only discovered that they were there by looking at the list" (DefenceCo employee working in the Head Office).*
> *"I've done a few courses but I think if you quiz me hard about those courses I would probably get 2 out of 10" (DefenceCo employee working in the Land Division).*
> *"Training across the different parts of the business seems to be a little bit ad-hoc sometimes" (Business Developer at DefenceCo).*

In addition, it was found that most of the training courses provided were not directly

focussed on problems and knowledge issues facing managers in the organisation. It was therefore evident that information provided to the employees needed to be more specific and better filtered based on internal business specifications as well as customer requirements.

Another issue raised by the interviewees was in regards to the lack of quality control, co-ordination and standardisation mechanisms of the various training features. Particularly, some business units were found to be isolated from the rest of the business, and most importantly employees were unaware of how to use critical processes and corporate applications.

4.3.6 Applications for cost-saving ideas

The study examined whether an application where employees could input cost-saving ideas is worth the investment for the organisation (see Question B3 in Appendix - Interview questions). This was considered particularly important, since the organisation was thinking to develop such applications in their attempt to reduce future costs and develop new and effective mechanisms to promote innovation. Some notable quotes from employees are presented below:

> *"I think I would like to see a better approach to where we can share best practice which could actually involve cost-saving opportunities" (DefenceCo employee working in the Naval Division).*
> *"Some kind of ideas log or a way of sharing stuff can be quite useful" (DefenceCo employee working in the Business Winning Division).*
> *"What you're looking at is something where people would input from the ground level and then everyone would have access to that. Someone who will be tasked to that will say: oh my god I'm the thought's manager or the idea's manager great - everyone else would say: good I'm glad it was you not me and then walk away and leave him or her to it" (DefenceCo employee working in the Land Division).*
> *"I don't know how often it would get used, indeed how often I would use it. But it's always useful to have the facility" (DefenceCo employee working in the Head Office).*
> *"I think something like that would be possible [...] There's not been enough focus I don't think on cost-saving benefits looking on how to improve the business. We get very steeped into tradition and we're not necessary encourage people to think out of the box in a way of moving things forward" (Project Manager at DefenceCo).*

As shown above, the results were very vague and mixed. The majority of interviewees (seven participants) stated that such applications already exist within different business units, but are however fragmented and could be improved towards a more open and collaborative

form of governance. In contrast, two interviewees were against this proposition claiming that those sort of ideas are gathered in real time and cannot be replicated digitally. Hence, given the above findings regarding the need for more inter-personal communication, it is argued that such investment may not prove as rewarding and profitable.

4.3.7 Communication of organisational capabilities

The third part of the interviewing process was designed to explore knowledge management strategies and evaluate current organisational practices (see Questions C1-C4 in Appendix - Interview questions). This was deemed very important given that after the analysis of the first set of results, a lack of leadership and managerial direction in terms of clearly communicating the benefits and value of knowledge sharing practices was identified.

The interviewees noted the importance of having a well-structured website and a past-performance database in order to communicate effectively the capabilities and benefits of the organisation.

> *"I think the website looks a little bit cluttered and complex. It needs to be simple" (DefenceCo employee working in the Business Winning Division).*
> *"A proper website, that actually does articulate things better, that it does have updates, bulletins. At the moment it just seems to be a list of documents, templates and the like" (DefenceCo employee working in the Head Office).*
> *"We need to make use of the intranet - and actually putting information out there of what we do, how we do it, and who does it" (Business Developer at DefenceCo).*
> *"The best way is to highlight successes and then have them published regularly. Regarding the failures, I think that's something that we think we can't learn from them, we hide from it a lot, and I think as a business we really should highlight them and from that we should find people that could improve our processes" (Project Leader at DefenceCo).*

It was suggested that a tailored marketing strategy could be used to coordinate KM efforts in a distributed global team and further promote internal organisational capabilities.

> *"I think we need to do a lot of marketing of what the company is about and what it can do; internally because I think there's lots of people in business units, where a lot of things are happening but it's not necessary that all workforce is aware of it and hence you get duplication: people repeating doing things when they could send their excellence somewhere else. So I think an internal marketing that could be done better. And definitely on an external point of view, just from new customers, public section of the company and all that, I think we need to*

do a lot of marketing, PR around the company, and what our capabilities could bring" (Project Manager at DefenceCo).

"The way we communicate what we do should be more effectively tailored for the audience. We tend to use a lot of standard boiler plates in a way in which we describe our capability which is not always the best for that particular target audience [...] But I think because we're such a large company it's sometimes quite difficult for us to coordinate globally the sort of consistence of messages that we need to present" (DefenceCo employee working in the Naval Division).

Furthermore, enhanced knowledge sharing was reported to be a key parameter in accelerating innovation and future progress within the organisation.

"We certainly need to share more things. I attend reviews with different business units and often they are doing things that we would benefit from. So there should be more, certainly more Knowledge Sharing between similar areas of interest" (DefenceCo employee working in Maritime Services).

4.3.8 Goals and initiatives

The integration of KM strategies into the company's goals and strategic approach was found to be missing and unclear as evidenced by the survey findings (Section 4.2). In addition, the incorporation of knowledge sharing initiatives across the company was also found lacking. Hence, it was evident that organisational KM agendas should be reviewed and re-structured based on simple and practical criteria.

"Structure is important. I'm not saying we should drop structure, but we should have a simplified structure and system. Keep it simple. It's like Health and Safety. Do you remember, go back in Health and Safety some time ago it's quite simple, you said just don't walk under a ladder. Now we have to put bollards out, we have to measure how far the bollards are going to be apart, the angle of the ladder" (DefenceCo employee working in the Land Division).

"Every project seems to re-invent the wheel about the way in which it's going to store and retain its information. It seems to me that lots of knowledge is lost because everything is stored in a different way, there are different structures you never know where to go looking for it. And indeed I feel that within the projects themselves, you say can you send me such and such a document, well I think it's in here somewhere, and then there be 5 minutes of ticking with the mouse until you stumble across it. For me, it seems that it's so easy to lose stuff – it's not lost in a sense that it's gone forever – mainly because people just cannot find it" (DefenceCo employee working in the Head Office).

> *"You need to actually establish a strategy before we do anything I think. It is important that we get it right - I'm quite keen that we recognise that I suppose one of the most useful bits is knowledge rather than information, and whatever we've got to do has got to enable us to access knowledge" (DefenceCo employee working in the Business Winning Division).*

Moreover, it was evident that KM practices were found to be antiquated and over-complex.

> *"I just strongly suspect in some ways we're 5 years behind in the way we manage knowledge. And as I said, I don't think it's all about tools. And when it is about tools, I think it's not necessary with that complex database. I think it could be some more simple stuff" (DefenceCo employee working in the Business Winning Division).*

Furthermore, as shown in other parts of the interview, the effective communication of organisational KM goals is considered important by a number of employees, and therefore emphasis should be placed on supporting communities of practice, networking and process integration.

> *"I think it would be helpful to establish the communication of Knowledge Management goals. People actually need to understand what we're supposed to be doing with it" (DefenceCo employee working in the Business Winning Division).*
> *"Some more hand function, get together if you like, so more commercial lessons learned from commercial departments across the business" (DefenceCo employee working in the Naval Division).*
> *"I think the idea of having some kind of better networks around the business. Not based on the organisational structure but some kind of more matrix-like, where people can actually find points of contact for certain specialists' areas and can meet up, discuss information needs with people from other parts of the business" (DefenceCo employee working in the Business Winning Division).*
> *"Recently, we seem to be far more stove-piped, I don't think we get the spread of knowledge across functions in quite the same way" (DefenceCo employee working in the Business Winning Division).*

The time issue was once again found to be a critical factor in allowing employees to think creatively and solve problems by finding and applying relevant knowledge.

> *"We've got the intranet and all that, but people are busy and don't always have time to find the way through things. I think the idea of road shows is one of the ways of doing it, where people can go, possibly talk to people who got the knowledge, and then they can be pointed to the right direction and you can have all sort of conversations, we don't tend to have these workshops or things like*

that; just the drop-in type centre" (Project Manager at DefenceCo).
"What I want to see is give people time to share, and at the same time give people time to go and find out. We are very good, we talk about Knowledge Sharing and Information Sharing; we all talk about IT and systems. Part of the question is do you have time to go and do this? That would make the biggest difference and encourage people to take time to go and share and also find out" (Business Developer at DefenceCo).

It was also clear that within the organisation, Knowledge Management goals and initiatives should be rolled-out in a more global level rather than locally in order to promote improved access and use of knowledge resources.

"The adoption of various common work areas could improve our ability to share information and knowledge certainly locally; hence, I'd like to see that rolled-out more globally such that we can, where security and certain facilities allow, share data more easily" (DefenceCo employee working in the Naval Division).

Finally, it was interesting to hear reported that organisational KM strategies should be focussing on understanding the current corporate mechanisms rather than trying to build up a new knowledge base for solving a wide spectrum of problems.

"I don't think I understand the strategy because I think we are aiming too high. We need to drop down our engineering, so instead of up-scaling and up-scaling all the time and saying yes this is the best, we should be looking as an organisation at the lower end of the market, which we are not addressing" (DefenceCo employee working in the Land Division).

4.4 Summary

The results of this study highlight potential barriers for knowledge sharing and other knowledge management processes in several areas, including technology, individuals and the organisation.

Communication and social networking were identified as key in connecting people with expertise and relevant knowledge sources; however practices and methods to support such connections or communities were found to be missing. Employees appeared not to be engaged in developing good practice to help solve business challenges and managers were not given sufficient time for their role in demonstrating the capabilities, benefits and values of the business. The benefits of interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively were also highlighted.

Regarding technology, the benefits of new software over the old appeared not to be clearly articulated and known within the organisation, and newly implemented systems did not live up to employees' expectations.

In relation to organisational KM methods and practices that would enhance sharing opportunities, the analysis noted the importance of involving the management at a variety of levels in order to resolve deficiencies and compliance issues. The integration of KM strategies and sharing initiatives into the company's goals and strategic approach was often found to be lacking. It was also evident that reward and recognition mechanisms which could increase productivity and motivation among employees were missing or unclear.

It was interesting to find out that staff members would not be willing to enhance their training experience through online tutorials or other seminar-based courses due to the lack of time and motivation; however, it was evident that current training organisational practices should shift towards a more personal and human approach.

Moreover, knowledge management practices were found neither to be revised nor reviewed on a regular basis; hence, employees were ill-informed about any new or updated methods and practices in the organisation. This in itself not only led to inefficiencies and extra costing, but also resulted in the inadequate use of knowledge processes for managing nescience and the unknown across different parts of the business.

Finally, five fundamental characteristics were identified from the analysis for the development of an effective KM strategy: corporate morality, compliance, locality, governance structure, and leadership. These characteristics along with the aforementioned research findings are further discussed in the next chapter which also explores additional key concepts emerging from the researcher's interpretations and meta-inferences.

Chapter 5

Discussion

The previous chapter identified a number of factors that can cause knowledge confusion and explored the organisational design elements that act to inhibit the level of knowledge for an individual employee in a multinational organisation. It also investigated the heterogeneous structures of collaborative business networks, and analysed their strengths and weaknesses within knowledge intensive settings. Software tools as well as documents and internal processes used to facilitate knowledge management were also presented and evaluated. From the initial analysis conducted, it was clear that the development of an effective KM strategy in multinational organisations is associated with five fundamental characteristics: governance structure, locality (including the demographic composition of each location), leadership, corporate morality, and compliance. The following sections discuss the meta-analysis of the findings of the case study organisation and their implications for the wider industry in the context of the original research questions. The key findings presented in Chapter Four are further discussed and correlated with the relevant literature in sections 5.1 to 5.7. The eighth section (Section 5.8) discusses the associated benefits of managing knowledge and the ninth section (Section 5.9) evaluates the proposed recommendations. Finally, a synopsis of the discussion is presented in the concluding section (Section 5.10).

5.1 Networks and networking

The KM literature has extensively addressed issues in relation to the structure and coordination of organisational networks. Zhao and Aram (1995) note that business networks are deemed particularly important in the growth of technology intensive organisations. Liedtka (2000) links communities of practice to an organisation's competitive advantage and ability to deliver on-time customer performance. Zboralski (2009) notes that the existence of knowledge sharing communities and networks not only help to enhance knowledge sharing and collaboration, but also create a breeding ground for change and growth. The findings in

this study however suggest that some of the communities of practice and other organisational networks explored within this organisation lack basic knowledge exchange mechanisms and hence are not inclined to produce new knowledge, foster innovation, and share best practices from different projects. This can be explained by the fact that within these communities goals were not clearly defined and members were not actively engaged in developing good practice to help solve business challenges due to lack of time or management support.

Based on the literature, this is an important issue that multinational organisations need to address in order to enhance their intellectual capital. Specifically, it is clearly identified that understanding how knowledge flows across different business units "can yield a critical insight into where management should target efforts to promote collaboration that has a strategic payoff for the organization" (Cross *et al.* 2001, p.118-119). Organisations should establish mechanisms to support the sharing of knowledge both within and between communities by providing a holistic set of resources. As Hildreth and Kimble (2004) report, it is essential to identify suitable people to fill community roles and manage the community's activities, organise activities to bring the community together in meetings and events, invest in technological innovations to facilitate the flow of information between activities and finally manage the explicit knowledge that the community creates to increase organisational performance. Hence, in order to encourage the promotion of best practice across the organisation, it is argued that business executives should recognise the importance of knowledge sharing communities by not giving them day-to-day mundane tasks but only energising duties which will motivate the employees and develop a learning place where individuals will be able to share their experiences and expertise.

Furthermore, the current study appears to show that knowledge sharing between different groups is unlikely to be enhanced if both informal and formal business networks are not supported by management. Also, a robust network of networks is difficult to be created if knowledge sharing policies are not reviewed on an on-going basis. Moreover, smaller and more isolated knowledge exchange communities should be acknowledged and supported in order to allow each of the 'silo' networks to connect with the formal business communities and "increase the sharing of lessons learned, the exchange of insights and ideas and the transfer of expertise and hand-on experience" (Hildreth and Kimble 2004, p.2) within the organisation. Finally, organisational networks should provide the platform to easily identify and extract the knowledge of field experts or other key informants in critical business decisions.

5.2 Demographic composition

Another issue revealed by the study was the age differences of the employees working at DefenceCo. It was found that the majority of these were over the age of forty and affiliated

with the case study organisation for more than ten years. Given the restructuring and redundancy schemes in place after the 2008 economic crisis, this observation is common throughout most organisations (Deloitte 2012; Jafari *et al.* 2007) emphasising the need to create mechanisms that preserve the knowledge of the aging workforce. As Jafari *et al.* (2007) note, one million employees in the aerospace industry were made redundant over the last ten years and 'baby boomers' are approaching retirement. It is therefore argued that multinational organisations should develop a method to transfer job knowledge to high potentials in the company. One way of addressing this issue may be by using various KM strategies, including the creation of mandatory mentoring programmes and personal development schemes, amongst others. This view is supported by Deloitte (2012) which notes that organisations should make themselves more attractive to the next generation while addressing the changing trends in the industry. However, there are a number of scholars who express concerns about the notion and value of managing knowledge in organisations. For example, Stewart (2002) expresses a fundamental critique on the theory of knowledge management and the way it is implemented in organisations across the world:

> *"Technologists never evangelize without a disclaimer: 'Technology is just an enabler'. True enough - and the disclaimer discloses part of the problem: Enabling what? One flaw in knowledge management is that it often neglects to ask what knowledge to manage and toward what end. Knowledge management activities are all over the map: Building databases, measuring intellectual capital, establishing corporate libraries, building intranets, sharing best practices, installing groupware, leading training programs, leading cultural change, fostering collaboration, creating virtual organizations - all of these are knowledge management, and every functional and staff leader can lay claim to it. But no one claims the big question: Why?" (Stewart 2002, p.3).*

Moreover, Wilson (2002) argues that the Knowledge Management idea is nothing more than a "management fad, promulgated mainly by certain consultancy companies, and the probability is that it will fade away like previous fads" (Wilson 2002, p.19). Furthermore, after an extensive analysis of the 'wrong' use of the term KM by various organisations, Wilson critiques both universities and businesses for the way they promote and deliver knowledge management practices. This view however is not supported through this study. The findings clearly show that KM dysfunctions could be caused as a result of experienced staff leaving and inexperienced staff arriving. Hence, necessary actions (explored in further detail in Chapter Seven) should be employed within the workplace to increase business performance and provide accurate and timely resolution of issues associated with knowledge transfer, acquisition and sharing. It is true however that KM should be exercised with caution and not all business units (or by extension organisations) may require the same KM recipe. King *et al.* (2002) identify twenty issues they view as important in the

development of KM activities in organisations. Specifically, they highlight four categories (executive/strategy management, operation management, costs/benefits and risks, and standards) that may ultimately represent the basis for effective management as well as future KM directions. By analysing their findings it is important to note that a strategic KM policy should use the right incentives to encourage people to share their knowledge and use KM systems (King *et al.* 2002, p.96). In addition, since KM projects compete against numerous other business initiatives for improving organisational efficiency, they must be assessed in terms of measurable return to the organisation (King *et al.* 2002, p.96). KM should also be harmonised with the existing IT infrastructure organisations already have (King *et al.* 2002). It is therefore clear that "a good KM system or programme potentially represents the foundation for enhancing creativity and innovation in the organization" (King et al. 2002, p.96). Hence a series of KM interventions to enable organisations to deal with an ageing worker population and capitalise on aging workers' capacities is essential "not only as an operational vehicle, but as a systematic building block" (Park and Kim 2006, p.595).

5.3 Knowledge management initiatives

The findings of the study note the benefits of interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively and highlight that current organisational training practices should shift towards a more personal and human approach. However, during initial discussions with the Performance Excellence manager, it was clear that funding was limited for supporting face-to-face activities (such as knowledge cafés or other conversational processes) that provide a suitable (open and creative) environment to share or exchange knowledge between different groups in an organisation. It is also worth mentioning that unless a project could be found to charge an activity to, employees were loath (or in some cases forbidden) to do it whether it was face-to-face or tool facilitated. The literature does not give a clear picture on how the recent economic crisis has further affected knowledge transfer mechanisms within organisations; however this phenomenon is spreading rapidly throughout the corporate world leading to lower economic activity and knowledge process failures. The small number of studies and surveys conducted in this field reveal the need to develop an employee-centred approach that is aligned to existing, integrated workforce planning strategies and which will undoubtedly play a vital role when referring to a company's performance.

> *"Despite all of the organizational and benefit changes employers have been making in response to challenging economic conditions, only 42% of organizations spend time training their managers to talk about the company's*

> *Employee Value Proposition (EVP)*[15]*. As a result, many organizations are missing opportunities to realign their employees with the direction of the organization and reengage the talent they have" (Yates 2010, p.2).*

Israilidis and Jackson (2012) highlight that in the post-2009 era there has been a lack of structured processes regarding information and knowledge practices in agile knowledge intensive environments. They also note that organisational changes occurring due to the recession have had direct implications on collaboration and knowledge sharing in technology intensive environments. More specifically, important knowledge exchange and networking events such as training and mentoring schemes, welcome gifts and other de-briefing sessions that were taking place in the past ceased due to the financial crisis in 2008 and emphasis was given to pure project targets and goal deliveries. Given this observation and correlating it with the findings of this study, it can be argued that a progression to 'softer' KM approaches could assist in extracting valuable knowledge and skills, engendering trust, and encouraging teamwork, while avoiding KM dysfunctions associated with communication issues and poor management buy-in (explored in further detail in Chapter Seven).

Particularly within Aerospace and Defence organisations, issues referring to trust, leadership, culture and reward should be further emphasised, and core competences of the A&D industry, such as strategic vision, change management, creativity, innovation, global perspective and frequent, transparent communications, should be incorporated within a Knowledge Management framework to ensure a smooth post-recession recovery (Greaner and Hale 2009). Burke (2008) notes that in times of constant shifting change, organisations can be transformed from 'smart and corporate' to 'urban and edgy', i.e. characterised by diversity, controlled chaos and constant restlessness, yet fast growing and playing a central role in development of new ideas. Consequently, the need for holistic KM approaches is increasing in order to understand the cultural issues related to knowledge management processes, identify better practices in the context of a strategic KM policy and bridge the gap between organisational KM structures and employees working within these structures. As mentioned in the previous section, not all business units may require the same KM recipe. Hence, knowing the 'know-what' is not enough and an intangible viewpoint of 'know how' should be imported (Hansen *et al.* 1999; Polanyi 1958, 1966).

Regarding organisational factors that support knowledge sharing, the data indicate that employees were not given enough time to share knowledge (Section 4.2). Specifically, it was found that the leaders and managers within the organisation were not given sufficient time to share knowledge and identify colleagues in need of specific knowledge. This can also explain the low traffic numbers for viewing or downloading corporate material and

[15]EVP is the term used to denote the balance of the rewards and benefits that are received by employees in return for their performance at the workplace.

information regarding knowledge and lifecycle management processes[16]. In general, the time issue seems to be a wider problem for multinational organisations (Akhavan *et al.* 2005) and although a large number of researchers would argue that this is mainly due to the fragmented documents and inefficiencies in the overall operations of the business, it was clear from the analysis the employees supported the idea that KM, and in particular knowledge sharing, should be included as part of an employee's yearly review process. Arguably, this would encourage people to take time to share knowledge while enabling easier and faster access to knowledge sources that move across many functions in an organisation. In addition, organisational assessment techniques should ideally be based on the actual project success rather than merely on the length of time required to implement project activities and ensure financial closure of the project. Finally, despite the fact that in recent years a lot of effort has been placed to enable accurate and personalised results by improving ontologies, artificial intelligence and heuristics (Gauch *et al.* 2003), information provided to the employees needs to be more specific and better filtered based on internal business specifications as well as customer requirements in order to make processes more efficient.

In relation to the use of technology, the study highlights that employees often feel that the benefits of new software over the old are not clearly explained and believe that newly implemented systems do not live up to their expectations. It was also evident that people are not given sufficient opportunity to give feedback on the suitability of the material or tools that are provided. Specifically, it appeared that employees become apprehensive about using a new piece of technology depending on a number of factors including the training provided, the case for its added value or benefit, the completeness of the effort introducing it, and the quality of the implementation, amongst others. A poorly architected, designed or developed software application (or tool) that employees are mandated to use because it is embedded within an organisation's process and rules, even though better applications may exist elsewhere for the same task, could lead to several dysfunctions as explored in Chapter Seven. Moreover, failed KM systems which remain ineffective or unresponsive while adding little to productivity or knowledge in general, may also result in multiple dysfunctional situations for both managers and employees (see Section 4.2). Finally, the existence of a plethora of overlapping applications used for the same tasks, which may often clash with one another, could also cause confusion and tension to employees. These observations can partially be justified due to the fact that during the data collection process, the organisation was undergoing thorough preparations for introducing a new tool suite for managing documents and archiving information. However, such issues are generally widely acknowledged by the literature and are closely connected with concepts such as "information overload" (Nielsen 2003), "sticky knowledge" (Szulanski 2003), and "information fulfilment", i.e. having access to all the information needed in order to compete

[16] Although the KM documents appeared to be inconsistent, they were all stored in and accessible from a central portal.

a task (Burke 2009). Arguably, training and reward mechanisms could help resolve such issues and increase productivity and motivation among employees. Nonetheless, it was surprising to find out that most of the training courses provided were not directly focussed on problems and knowledge issues facing managers in the organisation. Also, in regards to reward and decision-making mechanisms, only one in three employees felt they received sufficient credit when sharing knowledge and only one in five believed that there are sufficient knowledge capture tools available within the organisation. Given the above discussion, it could be argued that organisations should provide tools that allow users to easily share and exchange knowledge while building avenues for cross-company collaboration. Employees should be regularly informed about the current reward schemes in place, and rewards should be linked with innovation management and knowledge sharing. Finally, a transparent and company-wide reward mechanism that would motivate people to share more of their knowledge, and help increase the level of knowledge across different organisational units is also highly recommended, particularly within multinational technology intensive industries such as the aerospace and defence industry.

5.4 Leadership and managerial direction

> *"Management is doing things right; leadership is doing the right things" (Drucker 1967, p.148).*

In addition to the aforementioned research implications, this study highlights the importance of maintaining leadership and managerial direction in developing knowledge sharing and networking. Specifically, it appeared that the poor communication strategy between management and the employees can often result in missed opportunities, loss of morale and enthusiasm, and cause new KM dysfunctions while aggravating old ones. Hence, several advantages derived from the existence of collaborative networks may not be explored, tacit knowledge may not be circulated effectively across the organisation, and judgements or other arguments may be subjective. This in itself may reduce the creation and promotion of new knowledge which is essential for the company's competitiveness (Leonard and Sensiper 1998) and could lead to unhealthy behaviours for the organisation since employees may be either in the centre of the organisation's operations or left aside without being given enough support to deal with daily business issues (see Chapter Seven).

Braganza and Möllenkramer (2002), Malhotra (2004) and Fontain and Lesser (2002) identify a number of roadblocks that organisations typically face when implementing knowledge management programmes and that can hinder the effectiveness of a corporate knowledge management effort. Two of these issues, which have also been identified and discussed in this study, include the failure to align knowledge management efforts with the organisation's strategic objectives and the need to clarify each person's responsibilities

in order to avoid problems affecting the business's operations and functionalities. For example, it was surprising to find out that most KM groups at DefenceCo had no clear connection to corporate strategy, no agreed way of working and limited stakeholder communications. Also, the organisation appeared to be unaware or uninterested in the future of its communities (Section 4.1) despite the preference of employees to see their services embedded in the business strategy and mentioned in strategic documents. Given the recent scandals reported in the banking, e.g. corruption in Irish banks and sanction-breaking (Knights and O'Leary 2005), and aerospace and defence industries, e.g. bribery to secure sales in developing countries (Kelley and Drinkard 2005), this thesis argues that the above-mentioned characteristics could increase the risk of fraudulent and unethical activity. Arguably, this issue could become even more acute in the absence of a vibrant economic recovery; hence developing and maintaining leadership capabilities is paramount to help manage individuals, projects and information resources effectively. In other words, unethical behaviour may be less likely to occur in knowledge sharing and collaborative environments where people and processes are closely monitored and evaluated using agreed protocols and documentation.

In the light of these observations, multinational organisations should make their knowledge sharing goals clear. Employees should be engaged in developing good practice to help solve business challenges and KM initiatives should be clearly connected to corporate strategy. An agreed way of working and improved stakeholder communications should also be established and different job roles and responsibilities should be made clear. Finally, the management should constantly be aware and interested in the future of business communities to facilitate better risk management and create mechanisms that promote capabilities while broadcasting the benefits and values of collaboration.

5.5 Comparative analysis between UK and US

As noted in the previous chapter (Section 4.2), the researcher performed a microanalysis on the British and American responses to help the organisation identify similarities and differences in Knowledge and Lifecycle Management processes between the two nations. This additional analysis highlighted some interesting patterns which illustrate the different implementation and optimisation approaches that should be used in KM across different countries.

First of all, it was noted that the age of employees in the US is slightly higher compared to the UK. This is plausibly because high-level employees in the US are more likely to report industry experience before joining a senior position (Blackburn *et al.* 2008), and usually spend more time in education than their UK counterparts (Kelly 2011), e.g. undergraduate lasts for four years in the US (compared to three years in the UK) and college begins at

the age of 18 in the US (compared to 16 in the UK), where students choose their field of study. Furthermore, it was surprising to find out that UK employees make use of the KM material on a more regular basis (mostly weekly, monthly) compared to the yearly and quarterly use in the US. This may imply that UK employees are more likely to follow protocols and procedures; however it does not necessarily result in increasing their daily performance and productivity, suggesting that further research is needed. Surprisingly, as evidenced by the survey findings, KM appeared to be applied to greater effect in the US despite the fewer knowledge capture tools available. A study to identify best practice in knowledge management in law organisations in the US and the UK conducted by Kay (2002) contradicts this observation arguing that most organisations, particularly in the US, are at the beginning of embarking on comprehensive knowledge management strategies whereas some leading UK organisations have already embraced this challenge or are currently in the process of implementing comprehensive knowledge management systems. The literature review does not provide any clear explanation as to why this is the case. However, it could be argued that possible causes may be related to the notion of volatility in performance since US managers are more likely to achieve their growth plans compared with managers in the UK (Blackburn *et al.* 2008). Moreover, UK employees were found to be given less time to share and reflect on new knowledge compared to their American colleagues, an issue which was also highlighted in Section 5.3. In relation to Technology, employees in both countries submitted similar ratings, i.e. a high percentage of employees from both countries was found not to be using the internal KM website, the quality of training was found to be average, and the benefits of new software over the old were not clearly explained. These conclusions confirmed the organisation's initial expectations in the UK and are believed to apply also in other industries both in the UK and the US.

Looking into each of the flagged up areas in detail, it is clear that a KM mechanism to support new employees is essential for the successful operation of an organisation. Given the demographic composition of multinational organisations (e.g. the majority of employees, especially in the UK, were found to be affiliated with the case study organisation for more than ten years), the need for fresh thinking and new ideas is evidently present. Also provided that UK employees would spend more time developing their skills in Knowledge Sharing if KM was included within a yearly review process, it is important to differentiate KM practices by providing country-tailored incentives based on local protocols and personal preferences. Hence, this study argues that multinational organisations may require tailored KM mechanisms, that are capable of improving customer satisfaction and performance excellence, depending upon their assigned market and customer base. This will allow them to determine not only how to manage knowledge more effectively but also how to achieve operational and corporate governance best practice.

5.6 Managing nescience

An important issue revealed through this study was a lack of acknowledging and understanding the unknowns as well as what we need to know. This was illustrated by the comments of several employees who remarked that without the correct degree of focus, it can be very time consuming with little return on investment.

> *"There is a danger of getting or transmitting half the story and thinking you know more than you do".*
> *"You don't know what you should know or what you're missing from the knowledge transfer".*
> *"Is the knowledge correct or are you getting bad data? Hard to find the right data at the right time (too much or not enough)".*
> *"If the context is wrong it could leave people with knowledge which does not add value but that position is defended because it is perceived as being a lesson learned and thus one to act on".*

In a recent study conducted by Dunning and Kruger, it was noted that humans find it intrinsically difficult to get a sense of what they don't know and the authors argue that incompetence deprives people of the ability to recognise their own incompetence – also known as the Dunning-Kruger effect (Kruger and Dunning 1999). Furthermore, Zack (1999) highlights that managing organisational ignorance can yield impressive benefits, if successfully incorporated within a company's KM strategy. Additionally, Pynchon (1984, p.15-16) argues that "ignorance is not just a blank space on a person's mental map. It has contours and coherence. [...] So as a corollary to [the advice of] writing about what we know, maybe we should add getting familiar with our ignorance, and the possibilities therein for writing a good story". It can therefore be deduced that nescience could be seen as a potential component for future success and achievement, and play a vital role in reducing the risks of making the wrong decision when using 'imperfect information'.

As revealed from the meta-analysis of the data, it appeared that a number of employees admitted to having difficulties in identifying the necessary knowledge sources to do their daily job. Such employees may be characterised by poor knowledge sharing and collaboration skills, due to the fact that they are more likely to give out wrong information and hence place the company in a high-risk position, both financially and knowledge-wise. Additionally, ill-informed employees may be prevented from participating in knowledge sharing activities since they are lacking prior knowledge and experience which in itself reduces (or in some cases may eliminate) their ability to absorb new knowledge. According to the seminal work of Cohen and Levinthal (1990, p. 128) on absorptive capacity, "one's ability to recognize the value of new information, assimilate it and apply it to commercial ends is largely a function of the level of prior related knowledge". Thus nescience can be seen

as an obstacle to knowledge sharing in terms of employees' unawareness of the information they possess. Unaware employees cannot estimate the real value of information which can often be transformed into significant organisational knowledge increasing efficiency and productivity, if shared effectively. It is also worth noting that lack of knowledge regarding the existence or utilisation of new technologies and tool-sets, such as current Knowledge Management Systems available to employees, could also restrict knowledge flows in various organisational team discussions.

It is therefore postulated that the critical question is not just managing what is known but also trying to find ways to manage the unknown. This viewpoint of acknowledging nescience, if successfully incorporated within a company's KM strategy, may not only facilitate and enhance knowledge management processes but can also foster innovation and increase the levels of new knowledge in multinational organisations.

5.7 Linking nescience to knowledge sharing

The sharing of knowledge is one of the most significant organisational processes for maximising learning (Bock and Kim 2002; Davenport and Prusak 2000; Nonaka and Toyama 2003) and predicts a variety of desirable organisational outcomes including increased productivity, decreased task completion time, increased organisational learning, innovativeness (e.g., Cummings 2004; Hansen 2002) and sustained competitive advantage (Gold *et al.* 2001). Brown and Duguid (2000) note that knowledge management is about sharing knowledge with others and not just keeping it for own use and power. Nonaka and Takeuchi (1995) argue that the creation of knowledge can be seen as a process of knowledge sharing through articulating and internalising knowledge processes. In addition, Jarvenpaa and Staples (2000) state that the sharing of ideas among employees is a key process underlying collective knowledge within an organisation without which a company may not be able to leverage its most valuable asset. Thus, the competitive and dynamic business environment increasingly requires employees to share knowledge with others (Davenport and Prusak 2000) either through formal or informal processes which take place within an organization (Cummings 2004).

The sharing of knowledge within organisations has received considerable attention from both researchers and practitioners throughout the world, also leading to the identification of a number of behavioural factors (variables) that affect it in either a positive or negative way. The most commonly cited factors include the nature of knowledge to be shared i.e., tacit versus explicit (Polanyi 1966) or codified versus personal (Hansen *et al.* 1999; Nonaka and Takeuchi 1995), the organisational context, structure or systems in which the sharing of knowledge takes place as well as the type of relationships (either formal or informal) formed between those who share knowledge (Gupta and Govindarajan 2000), among others. Based

on the interview findings however, an additional relationship between employees' nescience and knowledge sharing was identified.

Specifically, the majority of the interviewees identified a strong connection between nescience and knowledge sharing, illustrating further, the benefits of interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively. It was also found that within the case study organisation, several employees appeared not to be familiar with the term 'knowledge sharing tools' as they had never come across anything similar before. In relation to organisational KM methods and practices that would enhance sharing opportunities, the interviewees noted the importance of involving the management at a variety of levels to resolve deficiencies or compliance issues (also discussed in Section 5.4). Finally, it appeared that the majority of tools were lacking the ability to filter down results based on the user's preferences, despite recent efforts to enable accurate and personalised search results.

To present clearly key elements of the findings discussed above, representative quotes from the interviewees have been grouped into four categories, namely:

1. nescience of subject matter experts with specialist knowledge within the organisation;
2. nescience of Knowledge Management Systems (KMS) implemented by the organisation;
3. nescience of the corporate knowledge itself, and finally
4. the role of face-to-face interaction (as opposed to technology) in reducing nescience.

The output of this classification is portrayed in Table 5.1.

The main outcome of this micro-analysis is identification of the impact of nescience on knowledge sharing activities that take place within the case organisation of DefenseCo. The results revealed an interesting linkage between the aforementioned entities, viz., nescience and knowledge sharing, which has not been previously discussed in the KM literature. Specifically, the negative effect of nescience on employees' knowledge sharing behaviour demonstrates the importance of acknowledging the existence of unknowns when sharing knowledge and recognizes the potential value of managing nescience in the workplace. Also, employees who are found to be ill-informed about corporate knowledge, subject matter experts or existing KMS in their organisation, may inevitably transmit wrong information, if knowledge sharing occurs.

Table 5.1: Nescience classification – Detailed micro-analysis of findings

No	Quotes from employees	Classification
(1)	*"In an organisation like ours, we tend to think that it's got lots of information and data stored on computers and we need to access that. I think, actually, what you need to do is maximise the use of knowledge, and the knowledge bit is actually stored in the people. So you need to know who to go to and have access to them"*	1
(2)	*"At the moment it's just KM, I'm not quite sure that people understand what that is. Is it just retention of documents? How do we start to retain people's experiences as well which may have a bearing on the piece of work that we're about to undertake? Do we have a robust knowledge/register of qualified people? It's all about people - it's knowing who to go and talk to"*	1
(3)	*"You would do a search, for example Knowledge Capture, and within our database it came up with 7640 results. And then I thought well, what's the point in Knowledge Capture process"*	2
(4)	*"It needs to be more integrated with daily management. So maybe we could set some kind of objective around making sure that knowledge is not only captions stored but it's shared between the team"*	2
(5)	*"If I want to find out what's going on in other business areas for sharing best practice, the searching methodology doesn't work on our main corporate site. If you saw that number of results there was no way you would have the time to scroll through the results"*	2
(6)	*"I think lot of us struggled with that question around Knowledge Sharing and what those tools were, because we're not aware of any specific Knowledge Sharing tools"*	2
(7)	*"I'm not aware of any knowledge sharing tools [. . .] The only tools that I really use are my own eyeballs looking down the list of assets"*	2
(8)	*"More up and down feedback just in general communications would help"*	3

Continued on next page

Table 5.1 – *Continued from previous page*

No	Quotes from employees	Classification
(9)	*"I struggle a bit with this, because Knowledge Sharing across the company, I don't think it's done very well. We all go on to the main website and we can read the handbooks and the guidebooks and the templates and everything, but there isn't any database of perhaps Learning from Experience, things that tell people what's gone right, what's gone wrong. There isn't anywhere that pulls our knowledge together"*	3
(10)	*"Because we are very busy at times, the opportunity for face-to-face networking within the business is not as active as it was. I personally think that its better when people have the opportunity to work and to share ideas through working through a common tread"*	4
(11)	*"I suppose I'm more of a people person [...] I'm not really someone that interfaces with the screen. I do and in fact I'm looking at one now but it is a tool for me to pass information, not necessarily to learn from"*	4
(12)	*"Try not to get rid of the human element, keep the human element in and it will work"*	4
(13)	*"When we have team meetings, there should be a part at the end of that where suggestions can be made and then they should be communicated back at the next one"*	4
(14)	*"I think you have to go back to the human being to make it really work. Problem being is there are savings, you drop off all the people involved to try to make the system work and say you're actually going to be physically doing it rather than working on that digital cloud, you're actually going to be speaking with other people passing this information down, so human being; the human element"*	4

It is therefore inferred that employees' nescience may result in significant performance consequences to organisations. For instance, in terms of managing external knowledge, employees who are unaware of new technologies, modifications of already existing products or services, and cost-efficient ways of managing operations within the business may not be able to implement innovation, i.e., make the appropriate decisions to adopt innovation (Klein and Sorra 1996). Similarly, in terms of managing internal corporate

knowledge, ill-informed employees are likely to increase organisational costs by spending additional time and resources while searching for knowledge in various external and internal organisational memories. Employee's nescience could also lead to poor decision-making and communication, which may inevitably affect the performance of operations while limiting the ability to repel external threats or manage future crisis situations. Building on these observations and given the linkage between nescience and knowledge sharing, the necessity to re-examine KM strategies and improve the efficiency and effectiveness of existing knowledge sharing processes has never been greater. Managers should find ways of managing nescience, similar to how they would manage knowledge, while fostering knowledge sharing to help them overcome problems that might arise within their industry.

5.8 Associated benefits of managing knowledge

The meta-analysis presented above highlighted the degree to which employees apply and exploit knowledge related activities effectively. A number of drivers that could help stimulate an effective KM strategy were identified and discussed. Such drivers included characteristics in relation to corporate morality, policy and compliance, locality and demographics, governance structure, as well as leadership and managerial direction. As noted in the previous sections, all the aforementioned characteristics are associated with additional organisational benefits, a summary of which is presented below:

- To ensure that judgements or other arguments are objective and contextualised (see Section 5.4)
- To facilitate better risk management (see Section 5.4)
- To enable effective personal development schemes (see Sections 5.2 and 5.3)
- To provide the platform that identifies field experts (see Section 5.1)
- To make processes more efficient (see Section 5.3)
- To clarify job roles and responsibilities (see Section 5.4)
- To ensure compliance and customer requirements (see Section 5.4)
- To adhere to regulations and company protocols (see Sections 4.3.1 and 5.4)
- To increase sales and revenue (see Section 4.3.1)
- To identify dissimilar knowledge sharing behaviour and knowledge needs (see Section 5.5)
- To make clear what employees need to know to do their jobs (see Section 5.6)

- To reduce the risks of making the wrong decision when using 'imperfect information' (see Section 5.6)
- To predict the trajectories of an organisation (see Section 5.6)

Particularly, the analysis of the heterogeneous structures of internal collaborative business networks appeared to show that knowledge sharing between different groups is unlikely to be enhanced if both informal and formal business networks are not supported by management. Also, forming a resilient network of networks is difficult to achieve, if knowledge sharing policies are not reviewed on an on-going basis. Finally, it was clear that feedback on the suitability of the material or tools should be given on a more regular basis, and information provided to the employees needs to be more specific and better filtered based on internal business specifications as well as customer requirements.

5.9 Evaluation of discussion

Constructive feedback was given by the Performance Excellence manager at DefenceCo regarding the evaluation of the proposed solutions. Specifically, the organisation was really keen to provide feedback on recommendations in relation to specific applications or systems. It was reassuring to see that recommendations for simplifying the way people use content, i.e. linking or integrating communication channels, such as internal documents, processes and networks, were received very positively. Also, suggestions for governance structure of KM processes including specific resolutions to technical glitches, introduction of tools for attention management using the skills of the workforce, definition of clear objectives between seemingly similar processes, as well as enhancements to document management features to include meta-data and prevent outdated information, were highly appreciated. In regards to the time issue (discussed extensively in Section 5.3), it was made clear that, based on the findings of this study, the organisation would consider developing strategies and assigning resources to employees in a similar way they do to external customer projects. Furthermore, as part of ensuring compliance and corporate morality in the organisation, it was evident that knowledge sharing goals and initiatives would be made clearer, and an agreed way of working as well as improved stakeholder communications would be monitored. Given the findings around the demographic composition of the organisation, it was suggested that new knowledge transfer mechanisms and mentoring schemes would be created to preserve the knowledge of the aging workforce. Finally, a series of interventions to promote internal capabilities, provide tools that allow users to easily share and exchange knowledge, and build avenues for cross-company (i.e. between departments located in different countries) collaboration were all considered practical and appropriate.

Comments provided by the organisation were incorporated into this chapter, influencing the

final shape of the meta-inferences (i.e. filtering out any unnecessary dysfunctional scenarios) and the suggested actions to resolve dysfunctional KM situations. However, an unavoidable limitation to this study was that no employees were involved in the evaluation process due to organisational issues relating to work allocation, such as the limited time availability and interest of the participants.

5.10 Summary

This chapter looked at some of the interpretations that can be drawn from the findings in Chapter Four. Key is the formalisation and management of dysfunctional KM scenarios, along with a robust communications strategy and an enhanced tools suite. Specifically, business networks, both formal and informal, should be supported by management to enhance knowledge sharing between different organisational departments. Also, knowledge sharing policies should be reviewed on an on-going basis in order to create a robust network of networks while acknowledging the importance of smaller and more isolated knowledge exchange communities. Additionally, organisations should make knowledge sharing goals clear. An agreed way of working and improved stakeholder communications should be established and different job roles and responsibilities should also be made clear to ensure compliance and customers' requirements. Managers and leaders within the organisation should be given sufficient time to share knowledge and identify colleagues in need of specific knowledge. Organisational KM policies should also address age differences, particularly in technology intensive organisations such as the Aerospace and Defence industry, to increase the level of knowledge across different organisational units and capitalise on aging workers' capacities.

This discussion also noted the benefits of interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively and has highlighted that current training organisational practices should shift towards a more personalised and human approach. Organisations should provide tools that allow users to easily share and exchange knowledge while building avenues for cross-company collaboration. Furthermore, organisations should tailor their strategies based on local protocols and personal preferences, since employees across different nations may often have dissimilar knowledge sharing behaviour and knowledge needs.

Finally, this chapter discussed the difficulties employees face in understanding and comprehending what they need to know to do their jobs, and what implications this can have within global technology intensive environments. After highlighting why managing nescience is important for maintaining a strategic knowledge sharing culture within multinational organisations, this chapter explored the power of understanding the unknown and argued that there is no perfect knowledge to enhance and facilitate knowledge

management processes. This viewpoint of managing nescience was further extended to examine the effect of employees' nescience on knowledge sharing, revealing that the process of accumulating knowledge (e.g. knowing what needs to be known and also acknowledging the power of understanding the unknown) could enhance best practice in organisations while improving both short-term opportunistic value capture and longer term business sustainability. The next chapter presents the theoretical framework of the research and outlines the model derived from the study.

Chapter 6

Theoretical framework and model

This chapter presents the theoretical framework of the research and develops a pragmatic model for managing organisational KM dysfunctions and improving best practice in multinational organisations. The first section (Section 6.1) illustrates how the model was derived by discussing the key outputs of each data collection. The second section (Section 6.2) outlines the model derived from the study and discusses its applicability. The third section (Section 6.3) discusses the reasons associated with dysfunctional KM scenarios and explores ways of preventing and controlling KM inefficiencies. The fourth section (Section 6.4) develops a practical technique on how organisations can manage KM dysfunctions while producing new knowledge. Finally, a summary of this chapter is presented in Section 6.5.

6.1 Theory building

As presented in Chapters Three and Four, three different phases of data collection were conducted as part of this research. These phases were vital for exploring the value of knowledge to an organisation and have helped to derive the model of the study. Table 6.1 illustrates the key outcomes of each phase and how they fed into the follow-on study. Table 6.2 shows the process of model creation.

Table 6.1: The underpinning logic of the suggested model

Phase	Key outcomes	Formula for the model
1	Communities of Practice indicated that they were unable to support organisational goals and produce valuable outputs due to the lack of knowledge, managerial direction, time and resources of their members.	Isolated networks may lead to lack of organisational knowledge and ill-informed employees.
1	From the analysis of the KM material used, it was revealed that employees may have difficulty in identifying and selecting relevant information.	Ignorance may occur if KM materials are not fit for purpose and easily digestible to employees.
1	In general, this initial qualitative phase showed that knowledge enhancing mechanisms, such as knowledge networks and KM documentation, may not increase the value of knowledge to an organisation.	Knowledge networks and other knowledge sharing mechanisms may cause KM dysfunctions if not appropriately managed, drifting employees to high levels of ignorance.
2	The use of IT and technology appeared not to help increase the overall value of an individual's knowledge. In contrast, it appeared that employees would like to see more frequent interpersonal communications.	Face-to-face interaction (as opposed to technology) could help in reducing organisational ignorance.
2	Different locations may require different knowledge needs.	Ignorance may occur if employees are shifted from one location to another.
2	The management plays a vital role in in developing knowledge sharing, working efficiently and helping to solve organisational issues.	Staff churn may lead to ill-informed behaviours and inefficient working practices.

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Table 6.1 – *Continued from previous page*

Phase	Key outcomes	Formula for the model
2	Particularly in the Aerospace and Defence industry, organisations employ an aging workforce.	The result of an aging workforce is one of the main reasons for knowledge and expertise loss in multinational organisations.
2	The benefit of rewarding successful employees.	Employees appeared to be unaware of reward and recognition mechanisms.
2	The benefit of reviewing KM processes and giving employees the time to share and exchange knowledge.	An optimal corporate governance structure, particularly within and between communities of practice, could improve knowledge sharing and provide the platform for efficient knowledge transactions.
3	An important issue revealed was a lack of acknowledging and understanding the unknowns as well as what we need to know.	Need for creating a model to manage organisational ignorance.
3	Ignorance may negatively affect knowledge sharing within organisations.	Different types of employees' ignorance may differently affect knowledge sharing within organisations.

Table 6.2: The process of model creation

Sequence	Activity	Related objective(s)
Stage 1	Data from all three phases were collected and analysed.	1A, 1B, 1C, 1D
Stage 2	The role of ignorance in dysfunctional KM scenarios was identified (also discussed in Table 6.1).	1B, 2B
Stage 3	A model highlighting different assumptions about the nature of knowledge and ignorance was developed.	2B
Stage 4	Contributing factors discussed in this research, leading to unhealthy levels of ignorance along with their associated trajectories, namely the failure-prone path to knowledge, were embedded into the model.	1A, 1B, 2C

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Table 6.2 – *Continued from previous page*

Sequence	Activity	Related objective(s)
Stage 5	A KM pragmatic technique for eliminating ignorance and preventing KM inefficiencies was proposed.	1D, 2C, 2D

Moreover, in order to successfully build the model of this study, Dubin's (1978) and Mintzberg's (1979) work was also consulted. As Mintzberg (1979, p.584) notes, "data do not generate the theory only researchers do that". A theory tries to make sense of out of the observable world by ordering the relationships among elements that constitute the theorist's focus of attention (Dubin 1978, p.26).

> *"Theory building seems to require rich description, the richness that comes from anecdote. We uncover all kinds of relationships in our 'hard' data, but it is only through the use of this 'soft' data that we are able to 'explain' them, and explanation is, of course, the purpose of research. I believe that the researcher who never goes near the water, who collects quantitative data from a distance without anecdote to support them, will always have difficulty explaining interesting relationships" (Mintzberg 1979, p.587).*

The following sections of this chapter discuss in detail the theoretical framework and the suggested model of the study.

6.2 Ignorance Management

Following the idea presented in Section 2.6 and the findings discussed in Section 6.1, it was revealed that employees may lack the ability to acknowledge unknowns and understand what they need to know to do their jobs effectively. Hence managing ignorance could help avoid dysfunctional KM scenarios and prevent the wrong decision being made when using 'imperfect information'. However, due to the lack of literature reporting studies on managing ignorance and in order to further explore this alternative concept, a model which highlights different assumptions about the nature of knowledge and ignorance has been developed. Principally, the distinction between knowns and unknowns as well as between awareness and unawareness, i.e. ignorance, has been made. In the context of strategic knowledge management analysis this key theory will be referred to as '*Ignorance Management*', a term adopted by the researcher in his attempt to marry the words 'Ignorance' and 'Knowledge Management', especially in regards to the way multinational organisations should acknowledge the power of the unknown.

More specifically, the outcome of this work has proposed two axes that set up the four different paradigms (approaches) which can be identified in this theory:

I know that I know (high level of knowledge and low level of ignorance), *I don't know that I know* (high level of knowledge and ignorance), *I know that I don't know* (low level of knowledge and ignorance) and *I don't know that I don't know* (low level of knowledge and high level of ignorance).

The visualisation produced (Figure 6.1) allows us to better understand the scope of this model as well as its limitations in the context of multinational organisations while investigating the two sides of the graph. It also allows us to look at and predict the trajectories of an organisation within that diagram (explored in further detail in Section 6.2.4).

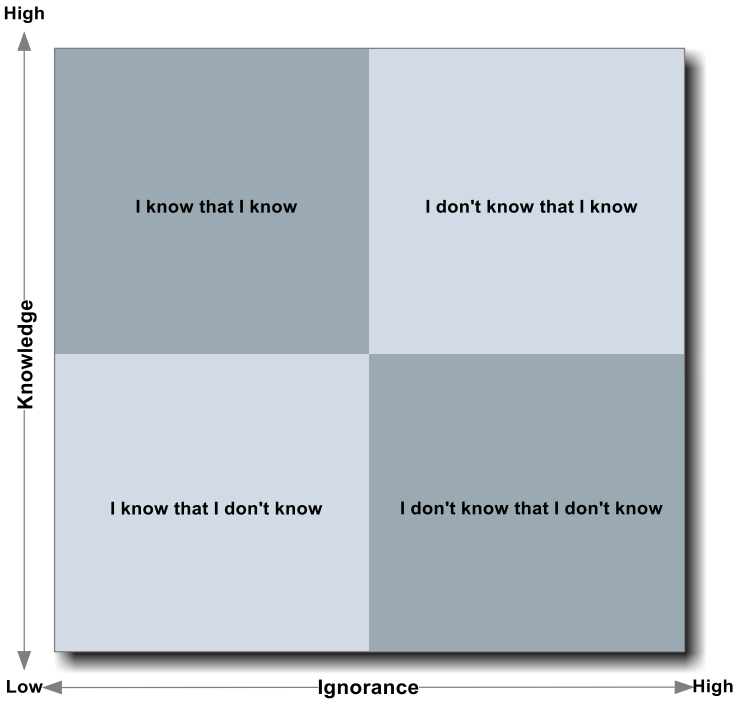

Figure 6.1: Overview of the Ignorance Management theory from the viewpoint of four paradigms

It must be highlighted at this point that the proposed model differs from current learning cycles which explore the stages of an individual's learning process, e.g. the 'Conscious Competence Learning Model' (Howell 1982), and try to understand the relationships between individuals within a group through self-awareness, e.g. the 'Johari window' (Luft 1969). Ignorance Management is an organisation-centric knowledge model that encompasses knowledge trajectories, i.e. it represents the knowledge-state of an organisation, and can be used to eliminate unhealthy levels of ignorance while preventing dysfunctional KM

scenarios in the workplace. Based on the analysis discussed in Section 2.7, this model lies within the fields of Knowledge Management and Organisational Knowledge, creating ways to disseminate and leverage knowledge in order to improve organisational performance, and trying to understand and conceptualise the nature of knowledge in organisations respectively (Easterby-Smith and Lyles 2003). It is therefore clear that this model identifies improved knowledge-channelling practices in multinational organisations, and is a novel way of achieving 'knowledge evangelism' and 'knowledge advocacy' across and between business units within knowledge intensive settings.

This model examines the importance of the ignorance dimension highlighting that being on the awareness side, people have 'free will' and can act capriciously; reality is perceived by individuals and created from perception and interpretation. Therefore, it is inferred that employees who demonstrate higher levels of ignorance may be characterised as ill-informed, whilst employees who demonstrate low levels of ignorance may be characterised as more competent, and are more likely to innovate and produce new knowledge. Also, in particular within collaborative groups, communities could create the social fabric of learning; foster interactions and relationships based on mutual respect and trust and encourage a willingness to share ideas, expose one's ignorance, ask difficult questions and listen carefully (Wenger *et al.* 2002, p.28). Hence, the emphasis of multinational KM organisational strategies should be given in providing the incentives to explore such new avenues while investigating any unknowns through new knowledge capture mechanisms. This will allow organisations to foster and innovate as well as gain competitive advantage through more effective knowledge management strategies.

The main ideas which have inevitably evolved from this model, namely knowing what needs to be known and also acknowledging the existence of unknowns that could transform knowledge strategies if successfully explored, have consequently supported the development of the theory of Ignorance Management. Hence, as no definition appears previously to have been given to support this key term, the following is proposed:

> *"Ignorance Management is a process of discovering, exploring, realising, recognising and managing ignorance outside and inside the organisation through an appropriate management process to meet current and future demands, design better policy and modify actions in order to achieve organisational objectives and sustain competitive advantage".*

Thus, this study argues that managing ignorance and adaptiveness in multinational organisations is not just a theoretical foundation, but also a pragmatic undertaking which has become increasingly important in multinational environments. Thus, the critical question is not just managing what is known but also trying to find ways to manage the unknown. Furthermore, according to the above definition, this viewpoint of acknowledging ignorance should be clearly defined in business documents with a strong connection to

corporate strategy. It is argued that if successfully incorporated within a company's KM policy, this form of knowledge (known knowledge) will be more powerful and explanatory (preconscious), and the organisation may build on it a sustainable competitive advantage.

6.3 Preventing and controlling KM inefficiencies

Given the model presented in the previous section, it is clear that employees, and consequently organisations, may be engaged (or operate) on different levels of knowledge and ignorance. In this thesis for example, employees appeared to have different knowledge requirements regarding KM processes, people or technology as discussed in the previous chapter. It is important therefore to identify the factors that lead to dysfunctional KM scenarios in order to prevent an organisation from ill-informed and ignorant behaviours. Also, it is vital to explore techniques that could help avoid the worst case scenario of low level knowledge and high level ignorance, as well as control KM inefficiencies. The following sections discuss a number of factors identified in the course of this research which could drift employees away from knowledge and increase the levels of ignorance within the workplace. Arguably, such factors are also associated with developing an effective KM strategy, and can contribute to the stability and growth of a multinational organisation if successfully managed.

6.3.1 Reasons for KM dysfunctions

> *"To know one's ignorance is the best part of knowledge" – Lao Tzu, c300BC (Tzu 1990).*

Based on the results of the case study and meta-inferences of the findings, it is affirmed that common reasons for dysfunctional knowledge management situations include a mixture of socio-technical factors which are strongly associated with ignorance. Several factors identified in this study support Riege's (2005) work on discussing and categorising knowledge sharing barriers. Examples include age differences, lack of contact time and interaction between knowledge sources and recipients, lack of leadership and managerial direction in terms of clearly communicating the benefits and values of knowledge sharing practices, lack of integration of IT systems and processes, lack of communication and demonstration of all advantages of any new systems over existing ones, lack of training regarding employee familiarisation of new IT systems and processes, and lack of a transparent rewards and recognition systems that would motivate people to share more of their knowledge.

Particularly, the research findings indicate that communities of practice (referred to as knowledge networks within a number of business units in the case-study organisation) are deemed especially important in the growth of technology intensive organisations. However,

knowledge sharing between different groups is unlikely to be enhanced if both informal and formal business networks are not supported by management, and employees may not harvest the full benefits of networking due to the lack of resources and time to promote a knowledge culture within the organisation.

Compliance is also strongly connected with KM success. All processes within an organisation are required to be compliant and subject to customer requirements and internal organisational regulations.

> *"There is one and only one responsibility of business: to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game" (Friedman 1962, p.133).*

The case study has shown that internal knowledge and lifecycle management frameworks could provide the platform to validate and review practices in order to ensure that legal, financial, operational and customer requirements are understood and met. In general, compliance plays a vital role in running a successful business. This was also evident through the meta-analysis of the findings which revealed that multiple losses could occur if projects requirements are not clearly defined and documented.

Furthermore, knowledge management practices should be tailored based on geographical location (local protocols) and other internal demographic characteristics to avoid dysfunctional KM situations (see Section 5.5). It is argued that different locations may require different knowledge requirements; hence a 'one size fits all' strategy could prove inefficient. This was also highlighted in this study where employees based in two seemingly similar locations (both western countries) were found to be accessing KM material in different ways and had different perceptions on how knowledge should be effectively managed and reviewed. Additionally, age differences could lead to organisational dysfunctions, and techniques may be required to be implemented for improving internal organisational KM practices (see Section 5.2).

Moreover, it is argued that several KM dysfunctions across the business could result from variation in the behaviours of individual employees.

> *"Failure seems to be regarded as the one unpardonable crime, success as the all-redeeming virtue, the acquisition of wealth as the single worthy aim of life" (Adams 1871, p.95).*

The literature notes that divergent (e.g. inappropriate or corrupt) behaviours are not managed effectively, and moral considerations have often become a secondary consideration when conducting or negotiating high-value business deals (Kelley and Drinkard 2005; Knights and O'Leary 2005). Hence, given the financial and reputation implications linked with allegations of corruption reported in Section 5.4, it is important to promote

principles of right or good behaviour that could help minimise immoral activities, reduce KM dysfunctions, and create a transparent and open collaborative environment.

In addition, an optimal corporate governance structure, particularly within and between communities of practice or other organisational networks, could improve knowledge sharing and provide the platform for efficient knowledge transactions, both internally (i.e. between different business units) and externally (i.e. between the organisation and external suppliers, consultants or third parties). For example, if the governance structure was well-defined and more simplified, multiple KM dysfunctions identified in this study could have been controlled or resolved, including the lack of time to share knowledge and expertise, the poor quality of training schemes, the communication and social networking issues amongst employees, and the lack of clear knowledge sharing goals and initiatives (explored in Sections 5.1 and 5.3).

Failure of leadership could also lead to multiple KM dysfunctions for both managers and employees in the organisation.

> *"Leadership is solving problems. The day soldiers stop bringing you their problems is the day you have stopped leading them. They have either lost confidence that you can help or concluded you do not care. Either case is a failure of leadership" (Powell and Persico 1995, p.50).*

In this study, leadership and managerial direction was found to be necessary for clarifying each person's responsibilities while aligning KM efforts with the organisation's strategic objectives. The management should enforce and apply such characteristics mentioned above to maintain an effective KM strategy and create a knowledge sharing culture within their organisation. The management should also be involved in performance improvement activities that motivate employees to produce new knowledge and generate value out of existing KM processes while demonstrating the capabilities and benefits of the organisation as a whole. It is affirmed that focus should be given to middle managers since both top management and non-executives are more likely to detect the different levels of awareness within their organisational structures and have generally similar interests in terms of keeping knowledge easily accessible and well-managed.

Moreover, training and reward mechanisms could motivate employees and help increase productivity and performance. In this study, most of the training programmes provided appeared not to be directly focussed on problems and knowledge issues facing managers in the organisation. Also, despite the existence of different reward mechanisms across the business, the majority of employees were unaware of their presence and no one seemed to understand how they worked. It is therefore inferred that particularly within technology intensive industries such as the aerospace and defence industry, employees should be regularly informed about the current reward schemes in place, and rewards should be linked with innovation management and knowledge sharing to prevent KM inefficiencies.

Finally, with regard to the use of technology, it appeared that employees become apprehensive about using a new piece of technology mainly due to their lack of knowledge of its added value or benefit. In addition, the existence of poorly architected or overlapping KM systems used for the same tasks, which may often clash with one another, could cause confusion and tension to employees, and may result in multiple dysfunctional situations for managers. This observation was also supported by the research findings, including the limits on usage of the internal KM website by staff members (Section 4.2) and the uncoordinated introduction of a new tool suite for managing documents and archiving information (Section 5.3).

All the aforementioned critical factors should be viewed as necessary components, i.e. building blocks, by executives in technology intensive settings when forming organisational KM strategies, and are associated with the creation (or resolution) of dysfunctional KM scenarios. Thus they are deemed particularly important in managing knowledge and lifecycle processes within technology intensive organisations, and can be viewed as possible causes of dysfunction in KM within an organisation. Figure 6.2 provides a visual representation of the suggested reasons of KM dysfunctions.

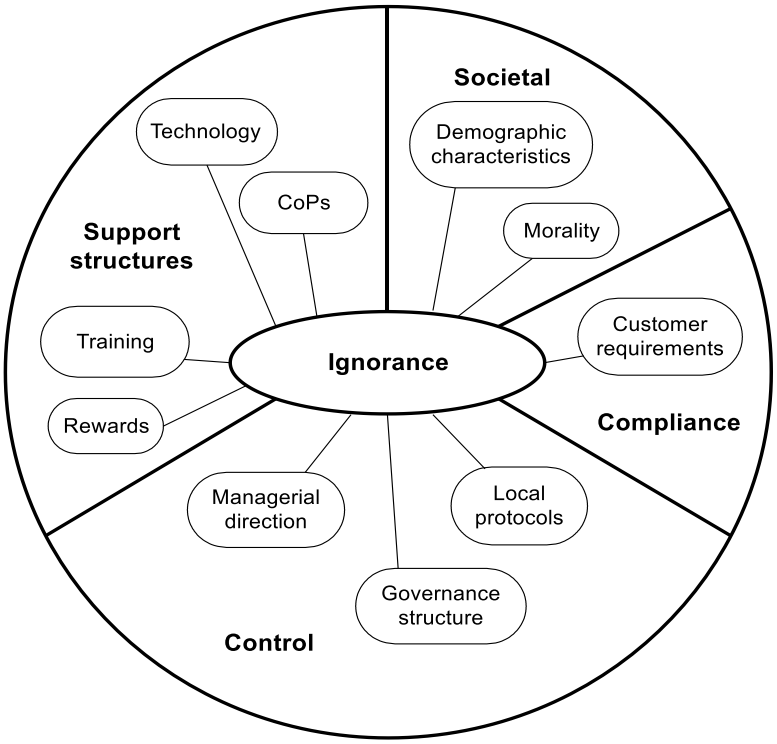

Figure 6.2: The role of ignorance in dysfunctional KM scenarios

6.3.2 Eliminating ignorance

Based on the model of Ignorance Management, it is relatively clear to identify how an organisation can start drifting away from knowledge; nevertheless, eliminating ignorance can also help avoid the creation of KM dysfunctions and lead to more healthy and sustainable knowledge sharing environments. To make this transition more gradual and successful, the following steps can be beneficial as depicted in Figure 6.3.

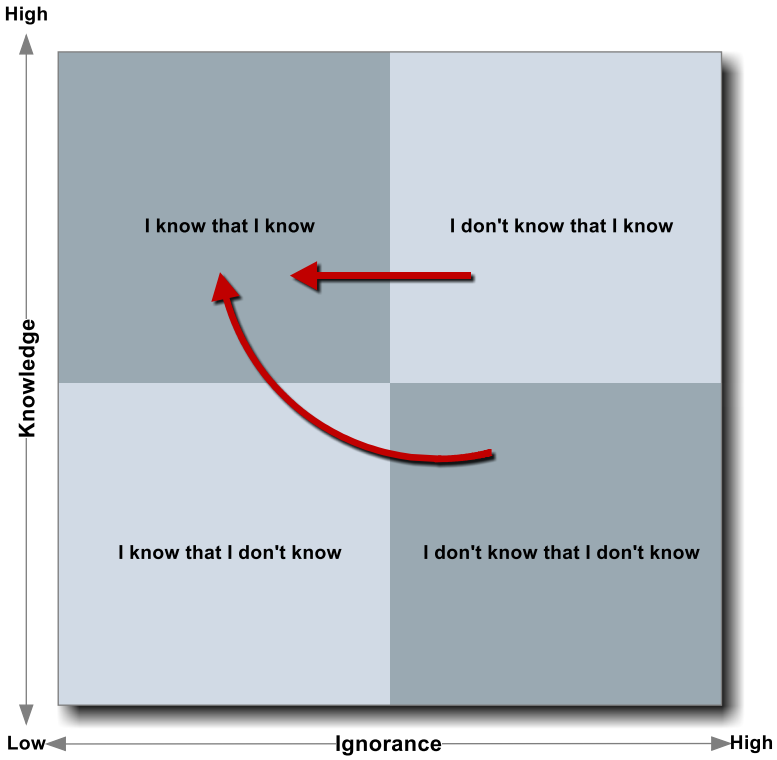

Figure 6.3: Exploring the transformation from the unknown to the known

Employees within the state of low level of knowledge and high level of ignorance (i.e. I don't know that I don't know) should first realise their state of ignorance by shifting to the intermediate state of low level of knowledge and ignorance (i.e. I know that I don't know). As discussed in Chapter Five, this could be achieved in multiple ways, such as developing mentoring and training schemes, fostering face-to-face communications, and creating personalised and location-based functionalities. Becoming more aware of the organisation's operations and KM mechanisms and given the right incentives by management, employees should then be able to produce new knowledge and foster innovation (i.e. I know that I know).

Additionally, employees within the state of high level knowledge and ignorance (i.e. I don't know that I know) who already have the necessary power to produce new knowledge should

become aware of this strength, and make the most of every opportunity for the benefits of the business. This transition could be achieved with direction from senior management, combined with buy-in from stakeholders throughout the organisation.

The transformation from the unknown to the known is not an easy process and requires time, resources and financial support. Hence, the question is whether managers are willing to re-examine their managerial strategies by acknowledging and understanding the existence of unknowns which could transform the current inefficient knowledge practices in multinational organisations. These interpretations are also supported by Dunning and Kruger who demonstrated that humans find it intrinsically difficult to get a sense of what we don't know and argue that incompetence deprives people of the ability to recognise their own incompetence (Kruger and Dunning 1999). The Ignorance Management theory could help explore and manage the unknown. However, the important aspect is for managers (in particular middle managers) to accept people's ignorance. In most cases, they do not see the different levels of awareness within their organisational structures or even if they do they happen to ignore them. Without taking the appropriate actions to manage ignorance, improvements to operations and processes within an organisation may ultimately fail, which can be costly and time consuming.

To sum up, the critical question is not just managing what is known but also trying to find ways to manage the unknown. Knowledge Management should be seen in line with 'Ignorance Management' due to the fact that it is impossible for someone to comprehend and understand everything in a complete way. The only real wisdom is in recognising the limits and extent of your knowledge and therefore, KM is essentially a matter of sharing the extent of our ignorance with other people and thus learning together. This viewpoint of managing ignorance (e.g. knowing what needs to be known and also acknowledging the power of understanding the unknown) could not only facilitate and enhance knowledge management processes but also foster innovation and increase the levels of new knowledge in multinational organisations.

6.3.3 Drifting away from knowledge

The research findings suggest that a number of employees were found to be within the different classifications of this theory (as discussed in Sections 4.3.3, 5.6 and 5.7). Specifically, several highly skilled employees were recorded into the categories of low level knowledge. This gave the researcher a better understanding of Ignorance Management and allowed him to explore how organisations should not just manage what is known but also try to find ways to manage the unknown. Hence, one way of maintaining the complete state of high level of knowledge and low level of ignorance is by preventing KM inefficiencies through acting upon those factors that cause dysfunctional KM scenarios. This will allow

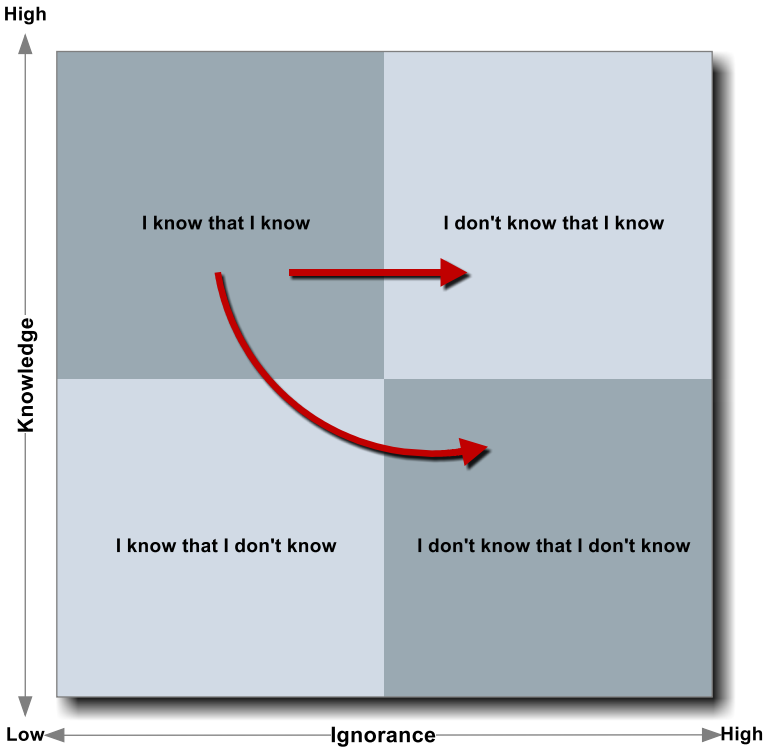

Figure 6.4: A growing dysfunction in terms of ignorance

the organisation to keep in control of its knowledge assets as well as eliminate the risks of drifting away from knowledge-related capabilities while moving towards ill-informed and ignorant levels as illustrated in Figure 6.4.

Specifically, a better awareness of the different knowledge networks in the organisation could reduce the time required for delivering a project. Also, knowing the experts or key members of each network could allow faster resolution of technical or operational issues as well as enable collaboration and knowledge sharing which can undoubtedly lead to innovation and cost-effective solutions. To prevent ignorance and support strategic collaboration, organisations could identify and map both internal and external knowledge networks using social network analysis or other network-analytic methods and use the findings diagnostically to plan future knowledge management related interventions.

Furthermore, legal, financial, operational and customer requirements should be made clear to avoid incorrect decision-making and avert business agreements that may prove inefficient or otherwise inappropriate. It was also evident that business units located in different countries may require different knowledge management strategies. Hence KM systems that are previously used in one part of the business may prove ineffective, if deployed across different organisational departments. Consequently employees may inevitability fall from a state of high level of knowledge to a state of high level of ignorance, if practices do not

adhere to local protocols and personal preferences (see Section 5.5). Given the demographic profile found in the case-study organisation (Section 4.2), another important issue that organisations are urged to act upon to avoid facing knowledge-related issues (e.g. loss of critical knowledge, loss of critical skills and decreased innovative capacity) is the growing number of aging employees. It is essential to develop methods to transfer job knowledge to on-boarders and newly hired employees while preserving the knowledge of the aging workforce. This may ultimately represent the basis for effective management as well as help employees to avoid slipping into the dysfunctional states of high levels of ignorance.

As derived from the interviews, there is some evidence to suggest that unethical behaviours could act to inhibit knowledge in the workplace. In general, issues relating to corporate morality and ethics have been extensively discussed in the literature as one of the main causes of dysfunction (Kelley and Drinkard 2005; Knights and O'Leary 2005), supporting the above observation. Despite the identification of this correlation however, it is not clear in this study whether employees who behave immorally will have the tendency to drift away from the desired goal state of high level of knowledge and low level of ignorance. Thus it is difficult to make conclusions for Ignorance Management based upon these factors, and further research is considered necessary in order to assess the level of knowledge or ignorance in the organisation over time.

In relation to governance structure, developing a checklist-like framework which is easy to follow and review could avert poor levels of knowledge. Moreover, providing leadership and managerial direction could resolve poor communication issues between management and employees, and may often motivate people to think imaginatively and creatively. Furthermore, as noted in Section 5.3, a poorly architected, designed or developed software application (or tool) could lead to several dysfunctions while reducing the level of knowledge of individual employees. Failed KM systems which stagger on cluttering the KM landscape whilst adding little to productivity or knowledge in general, may also result in multiple dysfunctional situations for both managers and employees.

Arguably, training and reward mechanisms are two main factors that can ensure high levels of knowledge and low levels of ignorance across the organisation. Through this case study however, it appeared that these two factors can have completely opposite results if not used effectively. For example, training courses should be focussed on problems and knowledge issues facing managers in the organisation, and employees should be regularly informed about the current reward and recognition mechanisms in place. Transparent and company-wide reward schemes should also be introduced in order to motivate people to share more of their knowledge, and help increase the level of knowledge across different organisational units.

6.3.4 Learning trajectories in unhealthy levels of ignorance

Expanding upon mechanisms to prevent and control KM inefficiencies, there is a critical question that needs to be addressed: Under what circumstances could organisations or individuals go from one level (quadrant) to the other?

The dynamics of interaction are complex, and attention must be given to understanding the reasons that cause employees to gradually drift towards low levels of knowledge and high levels of ignorance. As discussed in Section 6.2.1, there are a number of factors that can lead organisations to dysfunctional KM scenarios. Thus, it is useful to differentiate them based on the statistical results derived from the analysis in Chapter Four. Consequently, a mixture of characteristics such as training cutbacks, staff churn, and aging workforce, appeared to be highly significant in terms of managing knowledge effectively and shifting from knowledge-intensive to ignorance-based levels.

Specifically, practitioners require a high degree of accuracy and complete knowledge in order to successfully manage complex projects and meet customer requirements. However, low quality training (e.g. not personalised around issues facing managers and employees in their daily jobs), or ineffective reward and recognition mechanisms, could lead to lower levels of knowledge for the individual. It is therefore evident that training schemes should be tailored to address local protocols and personal traits. Each individual may have different knowledge requirements; hence a holistic knowledge management approach is essential for maintaining decreased levels of ignorance in regards to organisational processes as well as KM operations in general.

Furthermore, organisations experiencing a high churn rate of staff may promote ill-informed behaviours leading to poor decision-making and inefficient problem-solving due to loss of critical skills and knowledge. An interesting aspect in regards to this observation is that churn in lower ranked staff increases ignorance through impaired organisational memory, whereas staff turnover at the management level could potentially lead to a rash of KM initiatives that are never followed through and not picked up by their successors. Additionally, the knowledge of the aging workforce can rapidly be transposed into ignorance of on-boarders (organisational newcomers), if no mechanism is present to support this transition.

Similar symptoms are also apparent if systems are not properly introduced or if they are replaced by new ones without adequate management support. A non-formalised process (often used in most business units when KM systems are developed and introduced) can drift employees into unhealthy levels of knowledge. Multiple applications used for the same or similar tasks can cause tension amongst staff members, and initiate siloed behaviours with insufficient knowledge and poor awareness of the technology employed in the organisation. The same may also be experienced if time availability to share and exchange knowledge is

found to be limited.

Moreover, it is evident that intricate behaviours, which see knowledge as personal rather than a collective possession, may slip from a high-knowledge state to a low-knowledge state. Finally, job security and the feeling of power when possessing critical knowledge can also contribute to ignorance while triggering knowledge instability issues within the business, such as poor relationship management between internal teams and external partners, and the vulnerability to threats that jeopardise the growth and quality of important knowledge. Table 6.3 illustrates the aforementioned contributing factors leading to unhealthy levels of ignorance along with their associated trajectories, namely the failure-prone path to knowledge as explored in Section 6.2.3.

Table 6.3: Contributing factors leading to unhealthy levels of ignorance along with associated trajectories

Factors	**Organisational (group) trajectories**	**Individual trajectories**	**Quadrant destination**
Training cutbacks	The organisational memory fades gradually becoming less accurate. Additional costs are likely to occur as a result of faulty products.	Individuals become ignorant of both internal project requirements as well as new ways to improve efficiency and effectiveness (best practice).	Drift to both 'known ignorance' and 'unknown ignorance'.
Staff churn	Project disruption, decreased innovative capacity, and competitive disadvantage for the business.	Employees may not be able to follow up work produced by their predecessors. The worker population is likely to contain a high percentage of novice, ill-informed and demotivated workers.	Drift to 'unknown ignorance'

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Table 6.3 – *Continued from previous page*

Factors	**Organisational (group) trajectories**	**Individual trajectories**	**Quadrant destination**
Ignorance of on-boarders	Organisations which take for granted that newcomers already know the best practices and knowledge culture may be characterised by poor induction programmes and consequently poor work performance.	Not knowing the appropriate job etiquette, on-boarders may experience multiple difficulties in doing their daily job; hence may be easily demotivated and some may consider quitting if they get better offers.	Drift to 'unknown ignorance'
Low quality training	Similar trajectories to 'training cutbacks'. This factor may also lead to lack of creativity and innovation due to the lack of new knowledge in the organisation.	Similar trajectories to 'training cutbacks'. Additionally, employees may not be able to produce new products and services in order to fulfil the demands of the clients.	Drift to 'known ignorance'
Inefficient reward and recognition mechanisms	Decreased signs of 'battling for the best solution', low levels of innovation, and 'sticky knowledge' symptoms.	No incentive for employees to work more efficiently and effectively. Limited knowledge sharing activities impinging upon productivity.	Drift to 'unknown ignorance'
Demotivation	This factor could serve limited or inappropriate functionalities leading to multiple organisational anomalies, such as inefficient work practices, cognitive stress, lack of perspective, and incorrect decision-making.	Demotivated employees are less likely to work within a team towards a common goal. In most cases, job practices will be meeting the basic requirements and no extra effort will be made to share and exchange knowledge.	Drift to 'known ignorance'

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Table 6.3 – *Continued from previous page*

Factors	**Organisational (group) trajectories**	**Individual trajectories**	**Quadrant destination**
Limited time availability	Underestimating the time required for sharing knowledge may prevent the intensification of social capital, making the organisation vulnerable to threats that jeopardise the growth and quality of important knowledge.	Poor relationship management between internal teams and external partners.	Drift to both 'unknown ignorance' and 'known ignorance'
Lack of management support	Tacit knowledge may not be circulated effectively across the organisation. Critical decisions may be delayed unnecessarily and interest in new projects may be lost.	Employees may feel that feeding into KM activities is not part of their job.	Drift to 'known ignorance'
Informal KM processes	Patchy and inconsistent application of KM initiatives.	Employees may be confused as to which method or tool to use to do their job, and internal tensions may appear.	Drift to 'unknown ignorance'
Divergent behaviours	Decreased level of institutional knowledge within different business units.	Employees may either be in the centre of the organisation's operations or left aside without being given enough support to deal with daily business issues.	Drift to both 'unknown ignorance' and 'known ignorance'
The power of possessing critical knowledge	This factor may ensure the continuity of operations and availability of critical resources for the smooth running of the organisation.	Although employees may feel more confident with the knowledge they possess, they could often see it as a personal rather than a collective possession.	Drift to 'unknown ignorance'

Continued on next page

Table 6.3 – *Continued from previous page*

Factors	**Organisational (group) trajectories**	**Individual trajectories**	**Quadrant destination**
Poor relationship management	Isolated knowledge exchange communities, and 'silo' networks unable to connect with the formal business communities may be developed. The knowledge of field experts or other key informants may not be easily identified or extracted.	Employees may not be inclined to produce new knowledge and actively engage in developing good practice to help solve business challenges. Knowledge sharing between different groups is unlikely to be enhanced.	Drift to 'unknown ignorance'

As discussed above, it is clear that several factors could lead organisations from a knowledge-rich level to either knowledge-poor or ignorance-high levels. Hence it is essential, particularly for managers within technology intensive organisations, to act upon such dysfunctions in order to avert unhealthy levels of knowledge, prevent KM inefficiencies, and eliminate ignorance in the workplace.

6.4 Dealing with the worst case scenario

Based on the literature review and meta-analysis of the findings, it was clear that current techniques which aim to increase the knowledge efficiency and effectiveness of multinational organisations need to be re-examined and greater emphasis should be placed on identifying and resolving KM dysfunctions (i.e. shift towards a problem-oriented approach) within different business units or departments. Hence, targeting socio-technical issues that impact on human performance and organisational effectiveness is essential to increasing productivity and motivation, while at the same time facilitating day to day business and setting the basis for efficient and effective working practices. It was evident therefore that organisations should principally address dysfunctional scenarios rather than trying to identify ways of improving knowledge flows and access to information in general. Managers within the case-study organisation supported this claim, and suggested performing a KM audit, or more precisely, a problem audit, in order to resolve dysfunctional KM scenarios that could lead to ineffective practices and KM failure. With this in mind, this thesis develops a practical technique, namely 'KM anti-patterns' (explored in further detail in Chapter Seven), aimed primarily at practitioners, i.e., managers and senior executives, in

order to enable fast and effective problem identification and resolution, as well as cut costs for managing knowledge due to dysfunctional, inefficient or otherwise inappropriate KM practices. The proposed technique consists of different organisational KM dysfunctions with four main components:

- The reasons that lead to the KM dysfunction.
- The dysfunctional KM scenario per se.
- The necessary actions to resolve the KM dysfunction.
- A small checklist to help managers diagnose if they suffer from the particular KM dysfunction.

Along with the aforementioned components, each dysfunction has its own name and description. The combination of the aforementioned pieces of organisational advice can be viewed as a pragmatic KM technique for practitioners in order to manage knowledge more effectively as well as improve knowledge loss across different business units or corporate systems. This paradigm of tackling dysfunctions to improve KM is portrayed into the following diagrammatic representation (Figure 6.5), bringing together all the components of the proposed technique.

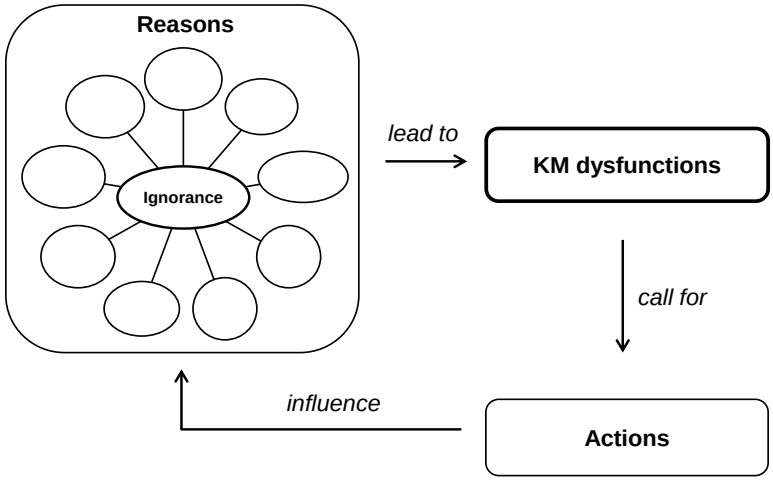

Figure 6.5: The suggested flow diagram for managing organisational KM dysfunctions

The proposed technique suggests that the reasons addressed in Section 6.2.1 (and also discussed in Chapter Five) could lead to ineffective practices and KM failure; therefore it is important, particularly for managers and senior executives, to recognise and act upon such matters in order to avoid tensions and increase performance within their business. Given the analysis around preventing KM inefficiencies in Section 6.2, it is clear that this technique covers a wide spectrum of KM dysfunctional situations where both managers and

employees are involved in multiple knowledge management activities such as knowledge creation, validation, presentation, distribution and application processes. Furthermore, these KM dysfunctions call for necessary actions to resolve such issues. A number of actions to achieve desired efficiencies have been extensively discussed throughout Chapters Five and Six. It is affirmed however that these actions should not form the only solutions and other approaches outlined in the literature (Section 2.8) could also be beneficial in managing KM dysfunctions. Finally, the proposed technique suggests that these actions can influence the reasons of dysfunctional scenarios. Thus the recommended reasons of KM dysfunctions are likely to evolve and change over time, leading to new or unforeseen dysfunctional KM situations.

As with any proposed technique, caution should be exercised when making changes to current organisational KM processes and practices. Fundamentally however, the strategy to manage organisational KM dysfunctions effectively should adhere to the following principles:

- *Elaborate*: Planned or carried out with great care – involves participation from all departments and should not be exercised by employees as a bolt-on activity.
- *Flexible*: There is not a perfect model to fit all situations – not even within the same organisation. Hence a holistic approach is required.
- *Tangible*: Some tangible outcomes should always be noted. Managers, project teams and anyone involved in such knowledge projects will not be engaged if there is no satisfactory output – this should be closely connected with an employee's motivation and productivity.
- *Inclusive*: Because of the nature of the discipline, people in management positions tend to set out the instructions for the implementation of such strategies. However this excludes the participation of the vast majority of employees who use systems, tools or applications in a daily basis. ROI should not merely be based on financial figures that quantify the value of knowledge (or ignorance) in the organisation. Policies should be people-oriented rather than task-focused.

The underlying reasons for KM dysfunctions emerging from the findings and researcher's interpretations, as well as the analysis of dysfunctional KM scenarios by definition of the concept of KM anti-patterns, are extensively discussed in the following chapter (Chapter Seven). However, it is worth mentioning at this point that the approach needs to be supported by the organisation in terms of embedding, distributing, maintaining and evolving this technique. Therefore, as part of this technique, a new role that will facilitate and enhance knowledge storage and transmission processes while contributing to the social network lifecycle is introduced. Specifically, this dedicated knowledge specialist will help to detect, analyse and categorise dysfunctional KM situations, and also foster a shift to a more value-centric perspective of organisational knowledge management. In the context

of socio-technical knowledge management analysis this unique process will be referred to as a Knowledge Evangelist (KE). It must be noted that the Knowledge Management literature has already identified specific roles in leadership positions within multinational organisations, including Chief Knowledge Officers (Earl and Scott 1999), Knowledge Processors (Siachou and Ioannidis 2008), and Knowledge Champions (Jones *et al.* 2003), among others. However, the role of KEs differs from existing paradigms in its responsibility to manage dysfunctional KM situations in identifying their causes, symptoms as well as possible actions for improvement. Simultaneously, KEs get actively involved in knowledge management activities by distributing the appropriate knowledge to various organisational units accurately and on time while providing recommendations for best practice on managing KM dysfunctions. In addition, KEs can act as 'knowledge brokers' between organisational networks, fostering communication and collaboration among employees, managers, customers and stakeholders. Chapter Seven (Section 7.3) discusses in further detail the role of the KE and outlines a reference process for how the use and evolution of the current technique could be handled.

6.5 Summary

This chapter identified an alternative perspective on Knowledge Management by definition of the concept of Ignorance Management in multinational organisations. It discussed the difficulties employees face in understanding and comprehending what they need to know to do their jobs, and what implications this can have within global technology intensive environments. Also, after highlighting why managing ignorance is important for maintaining a strategic knowledge sharing culture within multinational organisations, this chapter developed a model on the nature of knowledge and ignorance while making the distinction between knowns and unknowns as well as between awareness and unawareness, i.e. ignorance. Very little of this discussion is captured by the current KM literature and no definition has previously been given to support this theory. Hence, in an attempt to address the existing gap, this chapter argued that managing ignorance and adaptivity in multinational organisations is not just a theoretical foundation but also a pragmatic exercise which has become increasingly important in multinational environments.

Furthermore, the reasons associated with dysfunctional KM scenarios as identified in the course of this study were discussed. The key conclusion drawn from this analysis was to re-examine managerial strategies in multinational organisations in order to prevent and control current inefficient knowledge practices. Hence, the critical question is not just managing what is known but also trying to find ways to manage the unknown. This viewpoint of ignorance, if successfully incorporated within a company's KM strategy, will not only facilitate and enhance knowledge storage and transmission processes but will also

undoubtedly play a vital role when referring to a company's efficiency, productivity and overall performance. Finally, another point noted was to explore and predict the trajectories of an organisation based on the Ignorance Management theory. For example, it was apparent from the research that employees classified within the domain of high level ignorance could produce new knowledge and foster innovation within the business.

This chapter concluded by providing a practical technique for managing KM dysfunctions, which is followed up in the next chapter.

Chapter 7

A KM technique for practitioners

This chapter discusses the implications of ignorance for practitioners involved in managing knowledge practices. The first section (Section 7.1) analyses dysfunctional KM scenarios by definition of the concept of KM anti-patterns. The second section (Section 7.2) discusses case examples of KM anti-patterns identified in the course of the research and formally describes necessary actions to resolve them. It also categorises them in order to help practitioners, i.e. managers and senior executives, efficiently locate the KM dysfunction appropriate to their situation. The third section (Section 7.3) discusses a reference process for how KM anti-pattern use and evolution could be managed. The fourth section (Section 7.4) discusses the implementation and evaluation of the proposed technique. Finally, a summary of this chapter is presented in Section 7.5.

7.1 KM anti-patterns

An anti-pattern is a relatively new concept used for describing ineffective patterns or counter-productive practices. It was coined in 1995 by Koenig (Koenig 1995) and more recently has been popularised in the fields of software development (Long 2001) as well as social interaction (Laplante and Neill 2006). The main advantage for organisations of identifying and analysing anti-patterns is that it allows managers to get a better understanding of current problems – or future issues – within the workplace, while giving them the opportunity to highlight any relevant causes and seek appropriate short and long term solutions.

Ambler (1998, p.5) argues that an anti-pattern is "the description of an approach to solving a common problem, an approach that in time proves to be wrong or highly ineffective". Laplante and Neill (2006, p.5) describe anti-patterns as "situations that we often find ourselves in, [and which] are not healthy for the individual or the organization".

Furthermore, in the context of software design, Long (2001) sees anti-patterns as obvious, but incorrect solutions to recurring problems. In general, the concept of anti-patterns is aimed primarily at practitioners (i.e., managers and senior executives) and therefore catchy memorable titles are used, such as 'mushroom management' and 'cash cow' among others, in order to enable fast and effective problem identification and resolution.

Given the above examples, it is evident that the notion of anti-patterns has, up to now, been predominantly explored within the disciplines of programming and project management. As far as can be deduced from the extant academic literature, discussions on identifying and resolving anti-patterns specific to Knowledge Management are neither reported nor investigated. Hence, in an attempt to address the existing gap, this thesis defines the concept of 'KM anti-patterns' and develops a structural technique that identifies dysfunctional situations and remedies while enabling executives to manage knowledge effectively within the business.

Bhatt (2001, p.75) noted that "knowledge management is a comprehensive process of knowledge creation, knowledge validation, knowledge presentation, knowledge distribution, and knowledge application". However, in the broader KM literature, it has been noted that organisations typically face a number of roadblocks when implementing such processes, which can hinder the effectiveness of a corporate knowledge management effort (Fontain and Lesser, 2002; Malhotra, 2004). For example, failure to align knowledge management efforts with the organisation's strategic objectives and to clarify each person's responsibilities could turn the situation within departments into a disorganised and messy environment. Additionally, particularly in agile environments where flexibility and agility impact on knowledge sharing communities, resistance can occur due to the pace of change, potentially affecting the business's operations and functionalities (Israilidis and Jackson, 2012).

It can therefore be deduced that there are a plethora of cases in which KM initiatives fail to deliver cost-effective solutions, support knowledge transfer mechanisms, and measure up to expectations, possibly due to the lack of formally describing KM dysfunctions as well as identifying necessary actions to resolve such issues. The main idea evolved from the above analysis is the creation of anti-patterns for Knowledge Management to help managers identify problems easily, and cut costs for knowledge sharing due to dysfunctional, inefficient or otherwise inappropriate practices. Consequently, this concept has led to the creation of the term *'KM anti-pattern'*, and as no previous definition appears previously to have been given to support this key term, the following is proposed:

> *"KM anti-patterns are templates for dysfunctional situations identified in Knowledge Management systems and practices, followed by the necessary modifications to resolve this dysfunction".*

Brown *et al.* (1998) proposed a comprehensive format for structuring anti-patterns which

is similar to the structure of patterns, i.e. forming a vocabulary of communication. Thus anti-patterns have a unique and meaningful name, keywords (relating to the anti-pattern) as well as a short description of the problem and solution, using the anti-pattern. Based on the previous work carried out by Brown *et al.* (1998), Laplante and Neill (2006) adopted a similar approach in developing the structures of anti-patterns, but including less formal structure while concentrating on the identification of the dysfunctional situation. The proposed structure of a KM anti-pattern is influenced by the template proposed by Laplante and Neill (2006) but contains minor differences both in terms of wording (terminology) and number of characteristics used, due to the uniqueness of knowledge management as a management science. The proposed template of a KM anti-pattern is portrayed in Table 7.1.

Table 7.1: The KM anti-pattern template

Name	A unique and meaningful name describing the KM anti-pattern accurately.
Description	A short description of the KM anti-pattern including some keywords, if appropriate.
Reason	The causes that may lead to the KM anti-pattern.
Dysfunction	The symptoms and problems noticed by knowledge workers and managers.
Symptom checker	A small checklist to help managers diagnose if they suffer from the particular KM anti-pattern.
Action	The short and long term actions required to counteract the KM anti-pattern.

Similar to other anti-patterns, KM anti-patterns can either be isolated or related to other KM anti-patterns, through their causes, symptoms and countermeasures (namely, interacting KM anti-patterns). Studying the relationship between different KM anti-patterns can be beneficial for managers to trace the most relevant starting KM anti-pattern as well as the causes that brought them dysfunction. However, in the scope of this thesis, KM anti-pattern interrelationships will not be further explored.

7.2 Case examples of KM anti-patterns

As discussed in Chapters Five and Six, there are a number of cases in which KM initiatives fail to deliver cost-effective solutions and support knowledge transfer mechanisms. Specifically, this study has extensively discussed the age differences of the employees working in Aerospace and Defence organisations and the obstacles that this could cause in working effectively and efficiently (Section 5.2). The situation where KM systems are developed and

introduced without management support or direction was also clearly identified through the current case study (see Section 5.3). Furthermore, the findings suggest that in certain circumstances employees could often see knowledge as a personal rather than a collective possession, and unhealthy knowledge sharing behaviours may be developed in cases of poor communication strategy between management and the employees. Finally, the adverse impact on overall organisational memory of experienced staff leaving and inexperienced staff arriving, the role of technology in managing knowledge effectively, and the issue of failed KM systems which stagger on cluttering the KM landscape were outlined in this study.

Based on the aforementioned findings and meta-inferences, nine dysfunctional KM scenarios were identified and are extensively discussed in the following subsections (Sections 7.2.1 to 7.2.9) based on the template presented in Section 7.1 (Table 7.1). Specifically, KM dysfunctions associated with:

- demographics and age differences are discussed in Section 7.2.1
- the lack of management support and managerial direction are discussed in Section 7.2.2
- the lack of effective training, personal development and reward schemes are discussed in Section 7.2.3
- the power of possessing critical knowledge and the lack of effective knowledge sharing are discussed in Section 7.2.4
- divergent behaviours and poor relationship management are discussed in Section 7.2.5
- non-formalised (informal) KM documentation and processes are discussed in Section 7.2.6
- the lack of appropriate tools and software applications, and de-motivation are discussed in Section 7.2.7
- staff churn and ignorance of on-boarders are discussed in Section 7.2.8
- managing knowledge through an IT-centric and tool-driven approach are discussed in Section 7.2.9

Although they are not meant to form an exhaustive list, they represent common issues that can hinder the effectiveness of a knowledge management effort, costing organisations time, resources, and perhaps, most importantly, reputational damage. As research in this area continues, it is likely that new KM dysfunctions will be identified through interactions with practitioners and KM researchers.

As noted in the previous section, anti-patterns should be memorable, allowing practitioners

to easily identify and analyse their associated dysfunction. With this in mind, all the suggested KM anti-patterns have a unique name providing a clear and accurate description of their profile. Furthermore, each individual KM anti-pattern describes the causes, symptoms and problems as noticed by employees and managers in technology intensive settings in order to provide a holistic picture of each dysfunctional situation. In addition to the above, it is important to note both the short and long term actions required to counteract each KM anti-pattern, with particular attention to managing knowledge more effectively as well as gaining competitive advantage, by providing opportunities to combine and share knowledge within the organisation. Finally, it is argued that a simple checklist could also be beneficial in order to help managers, and practitioners in general, diagnose whether they suffer from a particular KM anti-pattern. Hence, a symptom checker is included with each KM anti-pattern, and advice is provided based on answers to the questions listed.

It must be noted at this point that the KM-anti-patterns discussed in this thesis have been identified by the researcher in the course of this study at DefenceCo; however the concepts proposed here are purposively generic to ensure applicability across different sectors. The conclusions therefore made from this chapter could be generalised and applied to a variety of knowledge intensive settings, including Defence and Aerospace, Enterprise Application Software, Information Security, Technology and Education, amongst others.

7.2.1 The Pluralists vs. the Old Guard

Name: The Pluralists vs. the Old Guard.

Description: Conflict between generation Z (digital native employees) who demonstrate a strong commitment to social media and use mobile devices for working purposes, and those less comfortable with the pressure for change within corporate organisations.

Reason: Generation Z (or simply Gen Z) employees are not a cause of a faulty KM practice or an ineffective KM strategy. They are people born from 1989 onwards, and have a close connection to technology and social networking. Gen Z is the first generation considered to be native to high speed internet and the use of media technologies, including the World Wide Web, instant messaging and mobile devices among others.

Dysfunction: Gen Z is used to managing knowledge and sharing information at a rapid pace and on a variety of platforms. This generation is reflective of a pluralistic society and has been brought up in an era of post-modernism, multiculturalism, and globalisation. Many corporate organisations however have not yet adapted to such working rhythms. In most cases, they are very gradual in adapting and introducing new technologies, and tend to ignore any shifts in employee attitudes and behaviour in the short term. Given the pace with which social networking has evolved, this can be the source of friction within organisations.

As noted by Conley (2011), Gen Z is characterised by continuous partial attention to the working environment, and their ability to multi-task is often seen as negative. However, it is not only the attention to detail that is seen as negative; the friction caused by the different platforms of communication preferred by the different generations (i.e. Gen Z do not do email as well) and the temporary problems often associated with changes to company rules regarding the acceptable social platforms and collaborative tools (such as Skype, YouTube and Facebook) could unavoidably cause numerous dysfunctions within an organisation, particularly in relation to knowledge management and sharing practices. Moreover, the result of an aging workforce is one of the main reasons for knowledge and expertise loss in multinational organisations. Deloitte (2012) has highlighted that loss of talent is one of the biggest challenges companies face in the coming years, particularly in technology intensive industries, given their demographic composition. Specifically, they note that within the Aerospace and Defence industry the facilities are old and closed while access to information is controlled. Also progress is often slow, hierarchies are firm, and many people work a single programme for 10 or more years (Deloitte 2012). It is therefore clear that "the loss of corporate knowledge caused by retirements and layoffs is known as considerable impact on the industries" (Jafari *et al.* 2007, p.376); hence organisations should address and alleviate the Gen Z issue in order to attain sustainability for their KM efforts.

Symptom Checker: Consider the following questions:

- Are requests for the use of new communication platforms routinely blocked by management?
- Is there an increasing pressure to review rules around acceptable social platforms or collaborative tools in the business?
- Is there employee resistance to using communication platforms beyond email and phone?
- Can you see an 'on-demand' culture in the organisation?
- Are employees eager to update their social or business status online or via text messaging while using new technologies, such as portable devices and mobile phones, more regularly than their desktop computer?

If you answered 'yes' to one or more questions, the organisation is likely to suffer the effects of 'The Pluralists vs. the Old Guard'.

Action: To address this dysfunction, managers should make themselves more attractive to the next generation "while retaining the core elements that have made them successful" (Deloitte 2012, p.17). Particularly, actions for Gen Z could be expanded to include harnessing the opportunities offered by Gen Z employees, for example by involving them in designing social media strategies. *McKinsey's Social Economy* report (2012, p.4) notes that

"organizations that fail to invest in understanding social technologies will be at greater risk of having their business models disrupted by social technologies [hence] transformational changes in organizational structures, processes, and practices, as well as a culture compatible with sharing and openness [are required]". It is argued that creating open, non-hierarchical and knowledge-sharing cultures can contribute towards an effective KM effort. Furthermore, "shifting communications among interaction workers from channels designed for one-to-one communication (e.g. e-mail, phone calls) to social channels, which are optimized for many-to-many communication" (McKinsey Global Institute 2012, p.10) could also assist this effort. However practitioners should understand that these IT and management innovations can take years to demonstrate their full potential, can disrupt traditional business models and carry multiple risks, including censorship, identity theft, abuse, and loss of intellectual property among others.

7.2.2 Headless Chicken

Name: Headless Chicken.

Description: A situation where KM systems are developed and introduced without management support or direction.

Reason: It is often observed that the majority of KM systems are usually designed and implemented without first carrying out extensive stakeholder consultation. Particularly in large organisations, the infrastructure to support executive or senior management buy-in is not provided or is often seen as a non-formalised process. It is therefore common to encounter situations where KM systems are developed and introduced without management support or direction, leading to inadequate technical, human, procedural or financial resources being allocated to continuous improvement activities and other system-related skills training.

Dysfunction: 'Headless Chickens' could result in multiple dysfunctional situations for both managers and employees in the organisation. In the presence of inappropriate, insufficient or unsupported functionality, KM systems could lead to incorrect decision-making and ineffective work practices. In addition to the above implications, it is also important to maintain leadership and managerial direction in order to facilitate knowledge sharing and enhance networking. Specifically, the poor communication strategy between management and the employees could cause a chaotic knowledge exchange environment across departments, and the lack of management support for KM activities and tools can often make employees feel that feeding into KM activities is not part of their job (Israilidis and Jackson 2012). Several advantages derived from the existence of collaborative networks, namely engaging communities in conversation, recruiting skilful employees, developing new innovative ideas, offering product, marketing and contact information, gaining project

support and brainstorming with others on how best to complete a project (Moore and Neely 2011), may not be fully explored and tacit knowledge may not be circulated effectively across the organisation. This in itself could reduce the creation and promotion of new knowledge which is essential for the company's competitiveness (Leonard and Sensiper 1998).

Symptom Checker: Consider the following questions:

- Do KM systems lack active management support and involvement?
- Are there platforms in use for KM which are not formally recognised by management?
- Is there a lack of appropriate tools to support bottom-up communications?
- Do managers neglect the importance of Knowledge Management in facilitating knowledge sharing and learning?
- Do employees feel unsupported in taking time from their working schedules to engage in KM activities?

If you answered 'yes' to one or more questions, the organisation is likely to suffer the effects of Headless Chicken.

Action: To help resolve this dysfunction, KM systems that have been developed and successfully adopted by employees should be embedded within business strategy and outlined in relevant organisational documentation, such as induction and training materials. Further actions could include, but are not limited to, engaging employees in developing good practice to help solve business challenges, establishing a clear connection to corporate strategy, supporting an agreed way of working, and designing strategies for introducing new systems.

7.2.3 Course-mongers

Name: Course-mongers.

Description: Employees who attend irrelevant training or personal development courses.

Reason: This dysfunction is possibly caused due to the lack of incentives to work on new tasks, as well as the lack of motivation of certain employees to deal with unforeseen circumstances they may experience, particularly within technology intensive organisations. Specifically, in an attempt to gain their manager's support by showing involvement in such KM activities, or to avoid other work tasks, and without willingness to genuinely share and exchange knowledge amongst their co-workers, employees sign-up to attend irrelevant (to them) personal development programmes.

Dysfunction: There are multiple symptoms associated with this dysfunction. At an organisational level, there could be a lack of knowledge sharing and exchange between

related business units leading to duplication of KM efforts (Israilidis and Jackson 2012). If people are not willing to genuinely interact with other co-workers then avoidance behaviours could develop in the workplace. As a result internal tensions could also be unnecessarily fostered. Finally, group discussions and decision-making are stifled, leaving less room for innovation and constructive new knowledge development.

Symptom Checker: Consider the following questions:

- Are there an unexpectedly large number of people in the organisation who want to sign up for training schemes?
- Have you noted any problematic or unhealthy behaviour among employees interacting in training sessions?
- Does the organisation provide out-of-date or inappropriate training schemes using dated or inefficient training methods?

If you answered 'yes' to one or more questions, the organisation is likely to encourage course-mongers.

Action: In order to prevent the appearance of 'course-mongers', the organisation needs to establish both short and long term actions. First of all, practitioners should monitor the available training and personal development courses offered by the organisation and keep records of who attends what. This will allow for transparent and effective processes for knowledge management while making it difficult for staff members to get into this dysfunctional situation. In addition, learning logs and personal development plans could also be used to enhance individual and team performance. Furthermore, long term actions could include the implementation of strategic steps towards developing higher quality and more relevant training courses. Specifically, mentoring schemes should be reviewed accordingly to provide a holistic and comprehensive training experience that will require employees to use the medium of training to disseminate their experiences and knowledge. Also, incentives and other recognition mechanisms should be used to increase productivity and motivation while improving the information flows in the business.

7.2.4 Larry the Leach

Name: Larry the Leach.

Description: Someone with knowledge who is loathe to share it with others, preferring to be in a situation of supreme power on a given topic. Leaches therefore approach KM in terms of what they can get and not what they can give.

Reason: The cause behind this KM anti-pattern lies mainly on the perception of Francis Bacon's famous dictum that "knowledge is power" (Bacon 2000) rather than "knowledge

sharing is power". Particularly in knowledge intensive environments, employees often see knowledge as a personal rather than a collective possession. Knowledge is also viewed as a form of job security and power, making employees less willing to share tacit knowledge with co-workers (Davenport and Prusak 1998). Moreover, inappropriate reward mechanisms could also influence knowledge sharing behaviours within high technology companies promoting the KM dysfunction of leaches with little motivation to share new knowledge and expertise.

Dysfunction: Undoubtedly, one of the many downsides of this KM dysfunction is that leaches are a single point of failure for organisational processes, i.e. no back-up (redundancy) exists to ensure the continuity of operations and availability of critical resources. In management, a potential single point of failure is highly undesirable in order to maintain high performance and increase reliability (Lynch 2009). However, it is affirmed that such design structures often create knowledge silos as well as bottlenecks, which in most cases act as barriers to knowledge sharing, leading to dysfunction and failure across multiple organisational levels. Furthermore, this KM dysfunction is also related to poor relationship management between internal teams and external partners, preventing the intensification of social capital and making the organisation vulnerable to threats that jeopardise the growth and quality of important knowledge.

Symptom Checker: Consider the following questions:

- Are employees seeking to avoid knowledge sharing and exchange events?
- Have you noticed a high number of ignorant and unaware employees in the organisation?
- Is knowledge parochial and sticky in some environments?
- Have you noticed limited collaboration or communication activity?

If you answered 'yes' to one or more questions, the organisation is likely to promote the issue of Larry the Leach.

Action: A necessary prerequisite to promote knowledge sharing and transmission processes in the organisation is to incentivise employees with attractive rewards or other recognition mechanisms that meet the different motivations of each knowledge worker involved in KM processes. Moreover, particularly within knowledge intensive organisations, the social climate may encourage, or indeed discourage, employees to interact with others as they do their job (Ashkanasy *et al.* 2000). Hence, promoting a social climate which facilitates knowledge exchange and collaboration can be regarded as critically important. Finally, engaging employees in a process of knowledge exchange and combination by providing opportunities to combine and share knowledge within the organisation (Nahapiet and Ghoshal 1998), could increase the performance of decision-making processes and promote

new knowledge and innovation.

7.2.5 Knowledge Ma(nage)rmite

Name: Knowledge Ma(nage)rmite.

Description: Employees who either intensely like or dislike Knowledge Management, i.e. they either love or hate mechanisms that support identifying, capturing, evaluating, retrieving, and sharing the information assets of the organisation.

Reason: The cause behind this KM anti-pattern lies mainly on the personal perception of each employee to perform effectively organisational tasks, such as knowledge sharing and innovation. Furthermore, employees who want to gain the acceptance of their superiors or to show they are closely connected to KM-related activities are likely to develop this KM dysfunction. Equally, employees who lack motivation and aspiration from managers and senior executives are likely to develop distant and remote working habits; hence may lose interest in harnessing KM and other knowledge-sharing practices.

Dysfunction: In cases of 'Knowledge Ma(nage)rmite', employees are either in the centre of the organisation's operations or left aside without being given enough support to deal with daily business issues. Both situations are unhealthy for the organisation and decrease the level of institutional knowledge within different business units. If managers are not able to provide a balanced environment, particularly in terms of communication and collaboration, employees will be reluctant to share their knowledge and skills, let alone generate new knowledge and innovate. Trust and honesty are likely to be broken affecting employees' decision-making and knowledge capabilities. Additionally, various challenging behaviours and internal tensions may appear leading to unstable knowledge exchange and acquiring mechanisms.

Symptom Checker: Consider the following questions:

- Are there employees who feel disenfranchised and unsupported by management to participate in KM activities?
- Do those who advocate KM within the organisation seem to have developed into a clique?
- Are employees unaware of the KM projects and performance improvement activities held in the organisation?

If you answered 'yes' to one or more questions, the organisation is likely to promote the issue of knowledge ma(nage)rmite.

Action: With regard to 'knowledge ma(nage)rmite', actions could include using

Social Networking Analysis to gain better understanding of workplace interactions and collaboration. Cross *et al.* (2001, p.118-119) note that "understanding how knowledge flows (or more frequently does not flow) across these various boundaries within an organization can yield critical insight into where management should target efforts to promote collaboration that has a strategic payoff for the organization". Using this citation makes it clear and easier to understand the dynamics of today's social networks which can increase importance to effectiveness of business processes. A further action could be to use targeted interventions, such as the use of cross-functional (and cross-level) teams, and team-building activities, to increase collaboration and communication in the organisation. This approach is possibly more costly in the short run, however can be cost-effective in the long run.

7.2.6 Multi(ap)plications

Name: Multi(ap)plications.

Description: The existence of a plethora of overlapping applications used for the same tasks, which may often clash with one another causing confusion and tension to employees.

Reason: Multiple applications used for the same or similar tasks are often found in large organisations, plausibly due to the tendency of organisations to create and develop new applications from scratch rather than improving and tailoring software programmes that are already available in the corporate system portfolio, perhaps within related siloed departments. Also, in a number of organisations, individual employees may be given the flexibility and time to design and create new tools in order to improve best practice and increase performance; however, it is often the case that this process is done without prior consultation or research as to whether similar systems are in place (often due to a lack of visibility between departments). Additionally, if two or more systems happen to be in place, there is often no process or strategy responsible for ensuring which system to preserve and which to replace, as it is often left to the employees to decide what is best and more convenient for them to use. Although such competitions can be a valuable technique to find the best tool, unless intentional it instead appears to the employees to be the result of mismanagement.

Dysfunction: It is affirmed that multiple applications could lead to functionally driven KM documentation and processes (Section 4.3.2), which is one of the main causes of inefficiency in the overall operations of the business (De Bruin and Doebeli 2008). In general, it is claimed that processes should be process driven in order to enable easier and faster access to knowledge sources that move across many functions in an organisation. This was also clearly illustrated through the findings of this research which highlighted that knowledge becomes more accessible and all the necessary information is picked up effectively by streamlining

access to information across different domains (Section 4.3.2).

Symptom Checker: Consider the following questions:

- Is there more than one application in place for the same job, and if so do people not know why?
- Are employees confused by which application to use when asked to carry out a task?
- Is information stored in multiple media making it difficult for employees to easily access and process data?
- Are employees keen to develop additional applications despite the fact that there are already similar applications in place?

If you answered 'yes' to one or more questions, the organisation is likely to promote the issue of multi(ap)plications.

Action: Considering the multiplicity of over-lapping systems, practitioners could conduct an extensive systems analysis to ascertain end-user requirements, identify technical dysfunctions, as well as determine whether current KM systems are economically and technologically sound. Additional actions to improve performance and manage knowledge more effectively could include the removal of unwanted or unused applications, and the conduct of regular meetings between developers from different business units in order to avoid duplication and overlapping functionality.

7.2.7 PUP – Poor Unsuccessful Programmes

Name: PUP Poor Unsuccessful Programmes.

Description: A poorly architected, designed or developed software application (or tool) that employees are mandated to use because it is embedded within an organisations process and rules, even though better applications may exist for the same task.

Reason: Knowledge Management systems are often developed for political and economic reasons which in retrospect prove unwise. The funding for KM systems may well be sourced from outside the department that the system is intended to help, and the needs of the user base may not feature highly when the system is designed or customised for use. Such issues can be exacerbated by poorly supported outsourcing of system development to third parties. One example of this that the author has noted on multiple occasions relates to the adoption of Microsoft SharePoint by organisations without taking the time to redesign organisational processes to take full advantage of it. This situation could lead to the creation of systems with inadvisable user requirements and inappropriate interfaces; therefore they

may inevitably fail to support basic knowledge management processes, including knowledge sharing, transmission, and acquisition, among others.

Dysfunction: Poor Unsuccessful Programmes could serve limited or inappropriate functionalities leading to multiple organisational anomalies, such as inefficient work practices, cognitive stress, lack of perspective, incorrect decision-making and de-motivation, with effects both on individuals and decision processes. In addition, the aforementioned anomalies could cause physical, psychological, social or emotional distress to employees, which in turn may inevitably lead to knowledge confusion and management failure. It is also worth noting that such anomalies may dishearten people from involvement in KM making them loathe to share tacit knowledge with others.

Symptom Checker: Consider the following questions:

- Are the KM tools or systems in the organisation designed and developed by outsourcing partners?
- Do employees express concerns about the quality, practicality, and usability of specific programmes or applications in the organisation?
- Does the organisation promote the use of specific programmes as corporate standards, even though more appropriate applications may exist for the same task?
- Is maintenance and troubleshooting of KM systems and applications regarded as a secondary consideration to system designers?

If you answered 'yes' to one or more questions, the organisation is likely to promote the use of Poor Unsuccessful Programmes – PUP.

Action: The action for this KM dysfunction should focus not only on preventing Poor Unsuccessful Programmes from being used within the organisation but also knowing when to stop or re-scope KM developments exhibiting these characteristics. This can be achieved through a rigorous monitoring scheme during the design and implementation phases in order to carefully assess different user requirements while taking into account existing corporate practices and structures. Moreover, continuous feedback on the systems' functionalities and features should be recorded to enable the fast resolution of any technical or operational issues that might arise. Failure to do so could, once deployed, quickly lead to the 'Dead Parrot' dysfunction mentioned in Section 7.3.9.

7.2.8 Turnover turmoil

Name: Turnover turmoil.

Description: The KM effect of experienced staff leaving and inexperienced staff arriving.

Reason: This knowledge management dysfunction is mainly caused due to the incoming of new staff members replacing the old. The lack of career opportunities and personal development schemes, the conflict of certain staff members with the management, as well as the type of job content which is intrinsically satisfying to employees (including appropriate reward and recognising mechanisms) could also be reported as predictors of high turnover.

Dysfunction: 'Turnover turmoil' may be harmful to an organisations productivity if skilled workers leave their current positions and the worker population contains a high percentage of novice workers. Schlesinger and Heskett (1991) note that the cost of employee turnover for organisations, including both real costs, i.e. time taken to select and recruit a replacement, and also opportunity costs, i.e. lost productivity, reduced performance levels, unnecessary overtime and low morale, is estimated to be up to 150 per cent of the employees' remuneration package. Moreover, high turnover rates of skilled professionals could lead to human capital loss in the form of skills, training, and knowledge. Arguably, the loss of expertise of skilled professionals could result in project disruption, decreased innovative capacity, and competitive disadvantage to the business since organisational newcomers are not as adept as experienced employees, and are ill-informed about business products and services.

Symptom Checker: Consider the following questions:

- Are employees unhappy with their current job role?
- Do employees have a shorter average tenure than those of other organisations in the same industry?
- Are skilled professionals poorly trained and less eager to help organisational newcomers?

If you answered 'yes' to one or more questions, the organisation is likely to be at risk of 'turnover turmoil'.

Action: In order to prevent the appearance of 'turnover turmoil', organisations need to adopt employee incentive and motivational programmes to retain valuable resources and capitalise on aging workers capabilities. For example, they may benefit from keeping employees in service longer by providing learning opportunities for older workers to remain productive, motivated, innovative and employable. Additionally, promoting life-long learning and innovation between the generations, also known as intergenerational learning (Ropes 2010), could stimulate knowledge creation and foster change, development and capacity building across different business units. Furthermore, mentoring and succession planning could drive performance, prevent knowledge leakage, and increase the longevity of an organisation's talent pool.

7.2.9 Dead Parrot

Name: Dead Parrot.

Description: Failed KM systems which stagger on cluttering the KM landscape whilst adding little to productivity or knowledge in general.

Reason: The extant literature has discussed various reasons associated with the failure of KM tools and applications in the workplace. According to Malhotra (2004), knowledge management systems fail because of two broad reasons:

> *"First, knowledge management systems are often defined in terms of inputs (such as data, information technology, best practices and so on) that alone may be inadequate for effective business performance. [...] Second, the efficacy of inputs and how they are strategically deployed are important issues often left unquestioned as 'expected' performance outcomes are achieved" (Malhotra, 2004, p.99).*

It is clear that knowledge management systems can easily fail to support organisational evolving needs, if intervening and moderating variables, such as attention, motivation, commitment, creativity, and innovation, are not accounted for in the business model design (Malhotra 2004). Furthermore, the design and development of KM systems should not be driven by the value of specific, pre-defined performance outcomes as they may easily erode by the dynamic shifts in the business and competitive environments (Malhotra 2004); hence, add little to productivity or knowledge in general.

Dysfunction: 'Dead Parrots' could generally hinder the effectiveness of a knowledge management effort, costing organisations time, money and resources. Specifically, this KM dysfunction shares similar dysfunctions with the issue of 'Headless Chickens' (Section 7.3.2), in terms of incorrect decision-making and ineffective work practices. Furthermore, failed KM systems can often be unproductive and unsuccessful in both accomplishing business goals and improving operating efficiency; thus they may stagger on cluttering the KM landscape, whilst leading to ineffective business practices and unsatisfactory work performance.

Symptom Checker: Consider the following questions:

- Are there KM systems in use which have either historically had high volumes of usage and now do not, or new KM systems which have not flourished since introduction?
- Are employees nescient or uninformed about given KM tools or applications in the business?
- Do any KM systems contain unnecessarily out-of-date information or appear otherwise antiquated?

– Do employees seek out alternative tools and applications that could help them do their job and manage their knowledge more effectively?

If you answered 'yes' to one or more questions, the organisation is likely to promote the issue of Dead Parrots.

Action: The key action here is to know when to either, 'pull the plug' on a given KM system, or divert new resources into maintaining and improving the system, and re-invigorating the user base to utilise it. Additionally, conducting an extensive knowledge audit could also be beneficial in order to reveal unanticipated knowledge needs as well as identify if any former, unexplored, KM systems could be used to improve the areas of knowledge gaps identified in the organisation. Finally, a rolling policy of review and replacement could also prove useful.

7.2.10 Clustering possible KM anti-patterns

Based on Bhatt's (2001) work on the characteristics that knowledge management processes should have in order to be effective, the aforementioned KM anti-patterns have been clustered into five categories in order to help managers efficiently locate the KM dysfunction appropriate to their situation. These characteristics could capture the type of knowledge management problems within organisations, and help practitioners both identify and recognise common KM dysfunctions in their respective industries. Table 7.2 depicts the complete list of the KM dysfunctional situations along with the common influencing factors of each KM anti-pattern.

7.3 Management of KM anti-patterns

As discussed in Section 6.3, a new role that would help to detect, analyse and categorise dysfunctional KM situations is necessary within the context of socio-technical knowledge management in order to introduce, maintain and evolve the KM anti-patterns technique within an organisation. Arguably, a Knowledge Evangelist can act as a 'knowledge aggregator', preventing inefficiencies and eliminating KM dysfunctions that could lead to multiple organisational anomalies as noted in the previous sections. The role of the KE is not necessarily performed by top-level management. It can be supported by one or multiple employees who adhere to the principles of Ignorance Management and are keen to evangelise (advocate) knowledge across and between business units within knowledge intensive settings. In addition, in order to make this role economically viable for the organisation, it should aim to cut costs and increase productivity by eliminating KM dysfunctions and inefficiencies (both in terms of technology and processes). Thus, in addition to getting a ROI, KEs help organisations to foster a knowledge sharing culture while contributing to the social network

Table 7.2: Classification of possible KM dysfunctional scenarios

	Knowledge creation	Knowledge validation	Knowledge presentation	Knowledge distribution	Knowledge application
The Pluralists vs. the Old Guard			✓	✓	✓
Headless Chicken		✓	✓	✓	✓
Course-mongers	✓			✓	
Larry the Leach	✓	✓		✓	
Knowledge Ma(nage)rmite	✓			✓	
Multi(ap)plications		✓			✓
PUP – Poor Unsuccessful Programmes			✓	✓	✓
Turnover turmoil	✓	✓		✓	✓
Dead Parrot	✓		✓		✓

lifecycle. To enable KEs to manage KM anti-patterns successfully however, it is important to develop a reference implementation process for how they can be used and evolved within the workplace. The reference scenario discussed in the following subsections is based on the KM anti-pattern lifecycle illustrated in Figure 7.1. It must be highlighted that this process is an example scenario, appropriate for the case-study organisation, but may well be applicable to other corporate environments.

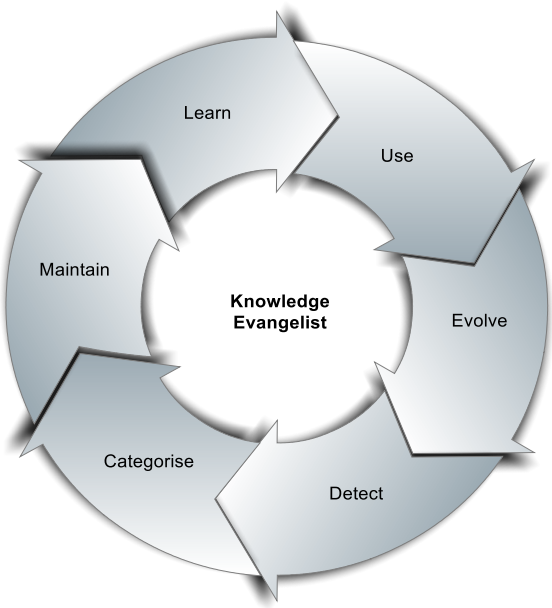

Figure 7.1: The lifecycle of KM anti-patterns

7.3.1 Learning of KM anti-patterns

In Section 7.2, nine case-examples of KM anti-patterns were introduced based on the findings and meta-inferences of this study. These KM anti-patterns are a good starting point for KEs should organisations experience KM dysfunctions. To make employees aware of their existence, they can either be distributed directly to each individual or stored centrally, e.g. in the organisation's portal, if employees have been taught about where to find them as well as how to access them. Due to regulations and procedures set by the case-study organisation, the approach taken was to make top-level management aware of their existence by developing a guide for managing organisational knowledge management dysfunctions; thereafter, it was their responsibility to distribute and appropriately inform the workforce. As discussed throughout this thesis, ignorance may lead to multiple dysfunctional KM situations, hence not knowing of KM anti-patterns as a technique that defines and analyses KM dysfunctions can only aggravate the situation.

7.3.2 Use and evolution of KM anti-patterns

Individuals can benefit from a KM anti-pattern's structure by making correct use of the 'symptom checker' found in each one of them. This process will give employees an indication as to whether they suffer from the effects of the particular KM anti-pattern they are referring to which they can later confirm by looking at the possible cause discussed in each one. Having this information on hand, employees can try to make use of the KM anti-pattern in order to resolve the KM dysfunction they had initially detected. In the case where employees think that no KM anti-pattern matches with their dysfunctional KM scenario, they can develop new KM anti-patterns, growing the current list of case-examples and evangelising knowledge among their peers. However caution must be exercised in order to maintain the same template (i.e. name, description, reason, dysfunction, symptom checker and action) to avoid confusion in the event of future use, and ensure they are generic enough to be of use to the organisation as a whole. It is clear from the above, that the concept of KM anti-patterns is self-centric (or at a greater scale organisation-centric) which supports the 'evangelisation' principle of the Ignorance Management model, making each employee a KE of their own. It also empowers individuals to invent new KM anti-patterns based on their needs or job requirements, evolving this technique for more effective management of dysfunctional KM scenarios.

7.3.3 Detection of new KM anti-patterns and categorisation

As noted in the previous section, the process of evolving KM anti-patterns is easily derived from their usage, and is vital for maintaining a 'knowledge-rich' organisation. It is also likely that new KM dysfunctions will be identified through interactions with practitioners and KM researchers. Once detected and analysed, new KM anti-patterns should be incorporated into the list of KM anti-patterns foci (see Table 7.2), in order to form a complete list of KM anti-patterns, which can help practitioners identify and recognise common KM dysfunctions in their respective industries. As discussed in Section 7.2.10, the categorisation of KM anti-patterns is currently based on Bhatt's (2001) work on the characteristics that knowledge management processes should have in order to be effective. This categorisation however can change and may be subject to different characteristics that reflect the language and culture of the organisation.

7.3.4 Maintenance of KM anti-patterns

The maintenance of KM anti-patterns is subject to the place they are stored. Consequently, if they are stored on a server or in a database, then KEs should be responsible for updating them while ensuring that they are accessible to the rest of the workforce. If kept by the

KEs only, then it is the sole responsibility of the KE to protect and maintain the KM anti-patterns. This is a rather dangerous scenario however, since KEs may either leave the organisation, or consider themselves owners of the KM anti-pattern technique, being likely to suffer the effects of 'Larry the Leach', as discussed in Section 7.2.4. Hence, an open, transparent and collaborative way of maintenance is strongly suggested. Finally, if KM anti-patterns are just stored within people's minds, then training and mentoring programmes are essential for keeping individuals up-to-date and knowledgeable about their subject.

7.4 Implementation of KM anti-patterns

At a theoretical level, the literature review shows that previous KM techniques have been mainly based on increasing organisational knowledge, either tacit or explicit, or improving new and existing organisational knowledge management processes (see Section 2.7). In many cases however, where there are no signs of dysfunctions or inefficiencies, there is no need to modify and re-deploy existing organisational practices and applications, just to facilitate learning and new knowledge within an organisation. It is therefore argued that a direct comparison of KM anti-patterns, which focus on identifying and solving KM-related problems in cases where they exist, with current KM learning techniques is irrelevant due to the problem-oriented approach of this research.

At a methodological level, it is worth highlighting the individual components of the technique while comparing them with current methods or techniques that help manage organisational knowledge. Regarding the reasons identified in this model, it is evident that the majority of them have been previously discussed in the literature and are widely acknowledged within the academic community. The most common examples include issues of corporate morality, leadership and compliance which have been extensively cited and reported. However the classification presented in Section 6.2.1, differs from what is currently known; the main objective was to investigate and indicate which areas have a higher impact on KM processes in technology intensive settings, particularly within the Aerospace and Defence industry, and find out whether they are associated with the creation of KM dysfunctions. Hence additional reasons were presented, including that of ignorance as a key variable in managing dysfunctional KM scenarios, addressing the current gap in the literature around acknowledging the power of understanding the unknowns as well as knowing what needs to be known to work efficiently and effectively.

Furthermore, as outlined in the extant literature (Section 2.8), common approaches towards KM include content management systems, communities of practice, customer portals, knowledge repositories, management buy-in, intellectual capital management systems and employee tool-kits, amongst others. By definition and presentation of the concept of KM

anti-patterns, such approaches can be considered as the short and long term actions required to counteract certain KM anti-patterns. Additionally, a number of dysfunctional KM scenarios along with additional actions highlighted in the study (also discussed in Chapter Five) were found to be relatively un-explored in the literature but can support previous techniques for managing knowledge processes effectively by extending existing techniques for targeting KM dysfunctions in multinational organisations.

Finally, as noted in Section 5.9, the majority of the components of the proposed technique were also reviewed by the Performance Excellence manager in the case-study organisation. The overall feedback on the suggested actions was very positive and comments provided by employees were incorporated into the suggested technique, influencing the final shape of its components. Also, the KM anti-patterns and discussions presented in the chapter were developed into a guide for managing organisational knowledge management dysfunctions and were sent to the organisation for further exploration, utilisation, and evaluation.

7.5 Summary

This chapter discussed the implications for practitioners involved in managing knowledge practices and presented a pragmatic technique for managing dysfunctional KM scenarios by definition of the concept of 'KM anti-patterns'. Furthermore, it explored a number of dysfunctional KM scenarios in order to help organisations identify problems efficiently, and cut costs for knowledge sharing due to malfunctioning mechanisms. In addition, it proposed a comprehensive format for structuring KM anti-patterns based on characteristics that knowledge management processes should have in order to be effective, enabling practitioners to easily diagnose common KM dysfunctions in their respective industries. The concepts proposed in this chapter were purposively generic to ensure applicability across different industries and settings. The next chapter discusses the conclusions of the research and explores areas for future work.

Chapter 8

Conclusion

This concluding chapter considers how the findings of the study achieved the aims and objectives outlined at the beginning of this thesis, and presents the conclusions of the research. The first two sections in this chapter (Section 8.1 and Section 8.2) discuss important macro and micro level conclusions for managing knowledge practices. The third section (Section 8.3) draws the theoretical conclusions derived from this study. The fourth section (Section 8.4) suggests some recommendations for managers and senior executives in multinational organisations. The fifth section (Section 8.5) examines the novelty of the research which has been carried out. The sixth section (Section 8.6) discusses the research scope and limitations. Finally, the possible areas for future work are outlined in Section 8.7.

8.1 Managing knowledge practices – macro level approaches

In the absence of a vibrant economic recovery, several KM changes have taken place. A movement from a 'hard' and natural approach to a 'softer' and more social-like perspective is now a reality. This change has happened because organisations are starting to admit the importance of human factors within their structures. They can see that by taking into account the knowledge of their employees, the overall value of their businesses rise, becoming at the same time more profitable and successful (Jarvenpaa and Staples 2000; Nahapiet and Ghoshal 1998; Nonaka 1991). It is true, that there is no recipe to follow in order to end up with the same result. Hence, knowing the 'know-what' is not enough and an intangible viewpoint of 'know how' should be imported.

From the early stages of management science, most of the disciplines were bounded. There was a hard route to follow and 'problems' were connected to a specific 'solution' which people were trying to solve through sterile mathematical equations. So when facing a problem,

there used to be an assumption that it had a correct answer and that the solution to this answer could only be found by using technology. People started developing databases and other IT and computer-based systems trying to encounter knowledge managing issues. But having developed Information and Communication Technologies (ICTs), little significant change was made since there is more than one solution to a problem and 'situations' and 'improvements' are often messy. Technology and computer-based systems can have problems and are "not the answer to improved knowledge-sharing within and between people and organisations" (Walsham 2001, p.607). It is true that a development in the KM movement has already been noted in multinational organisations. A progression to 'softer' KM approaches has been made; humans have become the centre of a company's structure and issues referring to trust, leadership, culture and reward have been identified and analysed. Given that managing knowledge is a complex and difficult issue to handle (Szulanski 2003), the necessity to invest in people and introduce a human-centred approach could facilitate and simplify this process. This observation was also supported by the findings of this study. Especially in the Aerospace and Defence industry, trust needs to be built for knowledge sharing and much more democratic views should be established. Arguably, a different ethos is conceptualised and various theories of knowledge have been examined to improve the KM practices of employees, particularly those working within technology intensive settings. However, the gap between organisational KM structures and employees working within these structures in the context of a strategic KM policy still remains current. This thesis argues that managing organisational ignorance while focusing on resolving KM dysfunctions could help eliminate knowledge loss across different business units or corporate systems, and address socio-technical and cultural issues related to information and knowledge management processes within knowledge intensive settings.

8.2 Managing knowledge practices – micro level approaches

The analysis of knowledge intensive situations at DefenceCo enabled a better understanding of the knowledge practices of the organisation, improving the emergence of best practices in the wider A&D industry. There were eight objectives defined for the research (Section 1.3).

- Objective 1A: Drawing on analysis from a specific case context within the Aerospace and Defence sector, to identify the specific factors that cause knowledge confusion and management failure.

Objective 1A was achieved by developing an in depth case-study to analyse the working practices of individual businesses in the Aerospace and Defence industry. As noted in the Introduction, the organisation under study is one of the largest military contractors in the world employing over 100,000 people across the globe. The company's employees are

highly skilled within their respective fields and the organisation has attempted to create an environment specifically suited to knowledge exchange, transfer and sharing. Moreover, this thesis identified a number of factors (reasons) associated with the creation of dysfunctional KM situations. Some of these reasons have already been reported in the current literature as possible causes of inefficiency and mismanagement. In this study however, these issues have been further discussed to clarify which areas have a higher impact on KM processes in technology intensive settings as well as identify their connection with the creation of KM dysfunctions. Hence, novel concepts, such as the role of ignorance in dysfunctional KM scenarios, were added and extensively discussed in the analysis (see Chapter Six).

– Objective 1B: To explore the organisational design elements that help to optimise the level of knowledge for an individual employee or group in knowledge intensive settings.

A number of organisational design elements that appeared to help optimise the level of knowledge for an individual employee or group emerged from the case study. These include, but are not limited to, corporate morality, compliance, local protocols, governance structure, technology, leadership and managerial direction (see Chapter Five). It is argued that the aforementioned areas are strongly associated with developing an effective KM strategy, and can contribute to the stability and growth of a multinational organisation if successfully managed.

– Objective 1C: To investigate the heterogeneous structures of collaborative business networks, and analyse their strengths and weaknesses within knowledge intensive organisations.

Objective 1C was achieved by investigating intra-organisational knowledge networks, including characteristics of good practice, behavioural perspectives, individual factors and management approaches that can help avoid the creation of KM dysfunctions and lead to more healthy and sustainable knowledge sharing environments. It is important to note that knowledge sharing between different groups is unlikely to be enhanced if both informal and formal business networks are not supported by management. Hence, organisations should establish mechanisms to support the sharing of knowledge both within and between communities by providing a holistic set of resources such as identifying suitable people to fill community roles. Organisations should also manage its community's interests by organising activities to bring the community together in meetings and events, and investing in technological innovations to facilitate the flow of information between activities, amongst others (Hildreth and Kimble 2004).

– Objective 1D: To provide recommendations for practice on how to improve the implementation of knowledge management strategies in the case study organisation and the wider aerospace and defence sector.

Finally, this thesis noted specific case examples of dysfunctional KM situations by definition of the notion of KM anti-patterns (see Chapter Seven). Each individual KM anti-pattern described the causes, symptoms and problems as noticed by employees and managers in technology intensive settings in order to provide a holistic picture of each dysfunctional situation. Also recommendations for practice on how to counteract each KM anti-pattern, while improving the implementation of knowledge management strategies in the case study organisation and the wider aerospace and defence industry, were provided to achieve objective 1D of this study.

From a theoretical perspective, this thesis contributes to the theory of Knowledge Management by developing alternative concepts based on socio-technical characteristics and Ignorance Management.

- Objective 2A: To critically review the literature relating to information and knowledge management processes in organisations with particular focus on knowledge sharing and information value.

Objective 2A was achieved by presenting theoretical concepts of knowledge management while identifying key themes about how an organisation learns and adapts to new environments (see Chapter Two). The article journals, books, and other sources consulted were mainly focussed on knowledge sharing, information value, intellectual capital, knowledge strategies as well as communities of practice. The findings from the Literature Review were also used in the Findings and Discussion chapters, giving both breadth and depth to the analysis.

- Objective 2B: To develop a theory on the nature of knowledge and ignorance and address the existing gap in the literature around managing adaptivity and the unknown in multinational organisations.

After critically reviewing the extant literature related to information and knowledge management processes, objective 2B was achieved by developing a novel theory on the nature of knowledge and ignorance, while addressing the current research gap around managing adaptivity and the unknown in multinational organisations (see Chapter Six).

- Objective 2C: To detect, analyse and categorise dysfunctional Knowledge Management situations.

Objective 2C was achieved by analysing and categorising a number of dysfunctional Knowledge Management situations, using a systematic KM anti-pattern template. The KM anti-patterns, as previously defined, can be found in Chapter Seven.

- Objective 2D: To create a pragmatic model for managing KM dysfunctions and improving knowledge management practices in multinational organisations.

Objective 2D was achieved by developing a model for improved knowledge management practices in multinational organisations. This model, based on managing ignorance and adaptiveness, can be found in Chapter Six.

8.3 Theoretical conclusions

The key theoretical conclusion drawn from the study is the need to re-examine managerial strategies in multinational organisations by acknowledging and understanding the existence of unknowns which could transform the current inefficient knowledge practices. Hence, the critical question is not just managing what is known but also trying to find ways to manage the unknown. This viewpoint of acknowledging ignorance, if successfully incorporated within a company's KM strategy, could not only facilitate and enhance knowledge storage and transmission processes but could also undoubtedly play a vital role when referring to a company's efficiency, productivity and overall performance. Based on this viewpoint, the trajectories of knowledge could also be better explored and predicted. For example, it was apparent from the research that employees who demonstrate higher levels of ignorance may be characterised as ill-informed, whilst employees who demonstrate low levels of ignorance may be characterised as more competent and productive, having the potential to produce new knowledge and foster innovation within the business.

In the context of organisations which operate in knowledge intensive environments, ignorance may negatively affect knowledge sharing, by preventing employees from exchanging knowledge and ideas with their work teams in which they interact frequently and perform various routine tasks and activities. Specifically, employees unwillingness or tendency not to share the personal knowledge they possess is likely to be affected by the recipients lack of appropriate cognitive background. Cohen and Levinthal (1990, p. 128) note that the level of prior related knowledge is determined by one's ability to recognise the value of new information, assimilate it and apply it to commercial ends. Thus, highly ignorant employees may be prevented from participating in knowledge sharing activities since they are lacking prior knowledge and experience which in itself reduces (or in some cases may eliminate) their ability to absorb new knowledge. Additionally, based on their unknowns, employees may underestimate the value of new knowledge which they could acquire in the course of knowledge exchange processes, thus may justifiably feel that their participation in knowledge sharing activities is a futile learning process. However, such difficulties are effectively managed when both recipients and sources of knowledge, recognise the limits and extent of their knowledge while exchanging knowledge and ideas. In other words, they perceive the extent of their ignorance, by exploring unknowns; therefore, managing the knowledge they possess more effectively and learning together. Little of this discussion is captured by the current KM literature and no definition appears previously to

have been given to support this theory. Hence, in an attempt to address the existing gap, it is argued that this thesis has shed new insights into KM in the Aerospace and Defence industry.

Furthermore, the findings of this study support and extend previous research conducted by Nonaka (1991), Granovetter (1985), Vestal (2002), Akhavan *et al.* (2005), Braganza and Möllenkramer (2002), Wenger *et al.* (2002) and Zhao and Aram (1995) among others, on how organisations learn and adapt to new environments, and what characteristics or incentives might increase the level of knowledge across different business units within an organisation. It is claimed that emphasis should be put on the development of holistic knowledge sharing communities within multinational organisations, as this is especially important for boosting internal communications and individual capabilities, and can be viewed as an on-going performance evaluation for employees and large organisations. Specifically, the study's findings show that knowledge sharing communities should be cultivated with great care in order to gain competitive advantage through more effective knowledge management strategies. This leads us to conclude that there could be benefit in re-examining managerial strategies on a regular basis by providing additional resources and support to knowledge sharing communities.

Moreover, in the broader KM literature, theoretical conclusions were also deduced in regard to the role of technology in Knowledge Management. Building on the work of Davenport and Prusak (2000), Fontain and Lesser (2002), Malhotra (2004) and Sommerville (2006), several capabilities which may exist in collaborative knowledge creation environments were highlighted, and new techniques to facilitate the exchange, transmission, sharing and utilisation of knowledge were suggested. Taking into account the implications to managing knowledge due to the 2008 economic crisis, recommendations on better KM practices were identified in the context of both critical projects and regular day-to-day operations.

8.4 Recommendations for managers and executives

At a time of recession where businesses look to cut costs it is critical that managers are making the right investments for tomorrow's workforce. It is clear from the research that there needs to be a focus from companies on changing their culture alongside their technology. Hence, part of the suggested model was to introduce drivers that would facilitate and enhance knowledge storage and transmission processes while contributing to the social network lifecycle. Specific techniques that appeared to help avoid potential confusion originating in management failure and also foster a shift to a more value-centric perspective of organisational knowledge management were linked to the proposed recommendations of this thesis.

In the context of socio-technical knowledge management analysis, this thesis also identified dysfunctional KM scenarios, referred to as 'KM anti-patterns', and formally described necessary actions to resolve such issues while improving knowledge loss across different business units or corporate systems. It is clear that much of this work is aimed primarily at practitioners in order to enable fast and effective problem identification and resolution, as well as cut costs for managing knowledge due to dysfunctional, inefficient or otherwise inappropriate KM practices. Thus, implications of this study are relevant and important for both managers and employees within multinational organisations.

8.5 Novelty of the research

Due to the researcher's position within the organisation, the study has enabled the detailed assessment of the subject area and implementation of changes in a real industry setting. By looking into ways of facilitating the information and knowledge processes, this study has come up with concrete and tangible solutions which have a potential significant positive impact on the way knowledge is accessed and processed, increasing the organisation's efficiency and know-how. Specifically, a pragmatic model for managing organisational ignorance is proposed, aiming to reduce knowledge loss while enhancing the level of organisational knowledge through knowledge generation, knowledge transfer and sharing.

Furthermore, the original contribution of the study lies in suggesting new ways of developing an effective KM strategy while identifying the necessary knowledge sources to support knowledge sharing and transmission processes. These key outcomes allowed the researcher to recommend measures to address poor KM performance in the industry and contribute to a field of research that has not received enough attention to date.

More specifically, the research has made the following contributions to the field:

- The creation of an alternative perspective on Knowledge Management and the definition of the novel concept of 'Ignorance Management', i.e. managing ignorance and acknowledging the power of understanding the unknown.
- The identification of new perspectives and paradigms on knowledge strategies for increasing knowledge dynamics in intercultural business contexts.
- The creation of a pragmatic model for improved knowledge management practices in organisations.
- The creation of an alternative technique for managing dysfunctional KM scenarios by definition of the concept of 'KM anti-patterns'.

Finally, it is worth highlighting that parts of this research on the theory of 'Ignorance Management' have been defined and publicised in Wikipedia encyclopaedia, receiving over

600 monthly page-views from users and academic scholars across the globe.

8.6 Research scope and limitations

Knowledge Management in multinational organisations is a broad and complex subject area. In order to achieve the aims and objectives of the study and deliver this project within the required timeframe, there was a need to carefully specify the scope of the research. Broadly, this research study focussed on designing new approaches for senior management in order to integrate KM into the organisational culture, and link it with alternative concepts to managing KM dysfunctions based on socio-technical characteristics and ignorance management. However, mainly due to budget restrictions and organisational rules and regulations, this research experienced some limitations in regards to the scope of the analysis, the data collection methods, and the feedback of the proposed solutions.

In particular, the study was conducted for an Aerospace and Defence organisation; hence it may not reflect other corporate environments where agile and less hierarchical structures are established. Also the focus was put on analysing technology-intensive departments with a high volume of expected knowledge exchange activities; hence, Knowledge Management practices were mainly analysed in the context of current organisational frameworks such as the LCM. The primary advantage of limiting the scope in this way however, is that the researcher could maintain control of the project, while making innovative recommendations within the project's constraints. In regards to the research methodology, several software programmes were used as the basis for the data collection and analysis in order to meet certain cost limitations imposed by the organisation and in cases when physical communication could not be established (i.e. at the organisation's headquarters). Also, the participants for interview were primarily selected based on their job post and location, something that directly limited the scope to mainly UK senior managers. Further details on the limitations experienced during the data collection process are explored in Chapter Three – Methodology and Methods. Finally, in regards to the evaluation of the proposed solutions, only brief feedback was given by the Performance Excellence manager, due to organisational issues relating to work allocation, such as the limited time availability and interest of the participants.

8.7 Future work

From the current study, it appeared that processes within the case-study organisation related to information and knowledge practices should be standardised offering better control and administration. Thus, the requirements for managing and improving the

framework to support knowledge-related activities should be further assessed. In addition, further work on modelling knowledge intensive situations after defining various KM processes would be beneficial.

Further work on analysing the characteristics that make an organisation innovative and how that is correlated with an employee's ignorance would be beneficial and is highly recommended. Moreover, the complementary nature of this theory merits further study to make Ignorance Management usable in more general contexts. It is also strongly suggested that organisations assess and calculate the benefits of Ignorance Management since a complete evaluation of the model was beyond the scope of this thesis.

As far as it can be deduced from the extant academic literature, the listed KM anti-patterns in this thesis are the first and only attempt made to suggest ways on how to manage dysfunctional KM situations in multinational organisations by reference to a specific KM anti-pattern; hence future work is highly recommended both to identify new KM anti-patterns, and in order to explore KM anti-pattern interrelationships.

Finally, this study reflects the experience of a large multinational organisation and much remains to be done in analysing small and agile corporate environments.

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List of Abbreviations

A&D	Aerospace and Defence
BOS	Bristol Online Surveys
CAD	Computer Aided Dispatch
CIO	Chief Information Officer
CMM	Community Maturity Model
CoP	Community of Practice
EVP	Employee Value Proposition
IC	Intellectual Capital
ICT	Information and Communication Technology
IT	Information Technology
KE	Knowledge Evangelist
KM	Knowledge Management
KMS	Knowledge Management Systems
LAS	London Ambulance Service
LCM	Lifecycle Management
LO	Learning Organisation
OL	Organisational Learning
ONS	Office for National Statistics
ROI	Return on Investment
SECI	Socialization Externalization Combination Internalization
SIPRI	Stockholm International Peace Research Institute
TVP	Target Value Proposition
UK	United Kingdom
US	United States

Appendices

A. Peer reviewed papers

Management Dynamics in the Knowledge Economy
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Ignorance Management

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Abstract: *This paper identifies an alternative perspective on Knowledge Management (KM) in multinational organisations by definition of the concept of Ignorance Management. Furthermore, this paper discusses the difficulties employees face in understanding and comprehending what they need to know to do their jobs, and what implications this can have within global technology intensive environments. The focus is given in particular on multinational organisations where innovation and new knowledge is essential to both short-term opportunistic value capture and long-term business sustainability. Hence, this paper discusses why managing ignorance is essential for maintaining a strategic knowledge sharing culture within multinational organisations. Furthermore, it develops a novel theory on the nature of knowledge and ignorance while making the distinction between knowns and unknowns as well as between consciousness and ignorance. The theoretical findings have been applied to technology intensive and innovative environments. A case study is explored within the paper, based on findings from one of the largest military contractors in the world, which employs over 100,000 people across the globe. The paper adopts an interpretative philosophy, using the primary strategy of qualitative research. In addition, due to the complexity of the topic, a mixed methods approach has been used for the data collection process. Moreover, participatory action research is undertaken to study individuals' actions in a particular context and improve organisational strategies and KM practices. The study shows that managing ignorance and adaptiveness in multinational organisations is becoming increasingly important. Thus, the critical question is not just managing what is known but also trying to find ways to manage the unknown. This viewpoint of acknowledging ignorance, if successfully incorporated within a company's KM strategy, will not only facilitate and enhance knowledge storage and transmission processes but will also undoubtedly play a vital role when referring to a company's efficiency, productivity and overall performance.*

Keywords: ignorance management, knowledge management, ignorance, multinational organisations, performance improvement

Introduction

"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns -- the ones we don't know we don't know" (United States Department of Defence, Secretary Rumsfeld, 2002)

One of the proponents of the KM concept, Nonaka (1991) is concerned with the transfer process between tacit and explicit knowledge. In particular, knowledge creation can be seen as a process of articulating (converting tacit knowledge into explicit) and internalising (using that explicit knowledge to extend one's own tacit knowledge base) knowledge processes. Arguments for the distinction between tacit and explicit knowledge and the difficulty in communicating tacit knowledge to others come from the philosopher Michael Polanyi (1958). He argues that human beings have a kind of tacit knowledge that language cannot capture; or in other words "we can know more than we can tell" (Polanyi, 1966, 4). Hence, knowledge management is a matter of sharing knowledge with others and not just keeping it for own use and power (Brown & Duguid, 2000; Wenger & Snyder, 2000). It is the answer to 'know how' as opposed to 'know why' and 'know what', which are common practices of Information Management (Polanyi 1958, 1966). Moreover, the generation of somebody's own way of thinking could lead to gaining new knowledge and expertise. "Providing evidence to illustrate your arguments" (Cottrel, 2005, p. 9) and having non-biased views are some prerequisites for knowledge management and critical thinking.

But how do we know what we need to know? And more importantly, how can we reduce the risks of making the wrong decision when using '*imperfect information*'?

Modica and Rustichini (1994, p. 108) provided an introduction to the concept of awareness and unawareness in models of information. "A subject is certain of something when he knows whether that thing is true or false; he is uncertain about it when he does not know its truth value, but he knows he does not – 'conscious' uncertainty. […] On the other hand, a subject is unaware of

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something when he does not know its truth value, and he does not know that he does not know – and actually so on ad infinitum: he does not perceive, does not have in mind, the possible object of knowledge".

According to Plato's *Apology* (21d), the Classical Greek philosopher and leading figure in the areas of epistemology and ethics, Socrates once said: *This man, on one hand, believes that he knows something, while not knowing [anything]. On the other hand, I - equally ignorant - do not believe [that I know anything].* (Plato *Apology*, 21d)

The above quotes support the researchers' personal point of view that Knowledge Management could better be seen as '*Ignorance Management*' due to the fact that it is impossible for someone to comprehend and understand everything in a complete way. The only real wisdom is in recognising the limits and extent of your knowledge and therefore, KM is essentially a matter of sharing the extent of our ignorance with other people and thus learning together. This process of accumulating knowledge will develop a tacit understanding and will improve both short-term opportunistic value capture and longer term business sustainability.

This paper explores the power of understanding the unknown while arguing that there is no perfect knowledge to enhance and facilitate knowledge management processes. Hence, after re-visiting examples of current KM strategies within multinational corporations, this paper defines the concept of Ignorance Management highlighting the necessity to re-examine managerial strategies and improve innovative capacity in multinational organisations.

Theoretical foundations

The concept of managing ignorance in multinational organisations was highly influenced by Nonaka's work regarding the creation of a 'knowledge sharing' company as well as that of other critical thinkers who discussed knowledge and organisational learning, from Socrates, Plato and Aristotle in Ancient Greece to Polanyi, Takeuchi, Senge and others in the modern age. However, in order to apply this concept to large and multinational environments, it is important to understand how individuals acquire new knowledge in organisations. As Bhatt (2001, p. 75) noted "knowledge management is a comprehensive process of knowledge creation, knowledge validation, knowledge presentation, knowledge distribution, and knowledge application". Therefore, it can be

deduced that managing knowledge within an organisation is a reflective and complex practice and is characterised by collective thinking and the creation of a shared frame of reference (Sarker, Kirkeby & Chakraborty, 2011).

Multinational organisations, even in today's uncertain economic climate, have made notable changes to their KM strategies shifting to a human-centred and more social-like perspective. This movement has occurred because companies are starting to admit the importance of human factors within their organisations. They can see that by taking into account the knowledge of their employees, the overall value of their businesses rises, becoming at the same time more profitable and successful. Hence, knowledge management strategies are tailored to meet specific business needs while aiming to produce more effective knowledge exchange mechanisms and foster innovation. Notably, Porac, Thomas and Baden Fuller, (1989) had seen an increase in interest in the interpretive side of organisations in the early 1980s (Barley, 1983, 1986; Bartunek, 1984; Kiesler & Sproull, 1982), which was later incorporated into questions of strategic management (Dutton & Jackson, 1987).

However, despite the observation of Porac et al. (1989), it is evident that "in most companies the ultimate test for measuring the value of new knowledge is economic" (Nonaka, 1991, p. 103). People often follow rules, prefer stability and maintain the status quo. Also, it is a psychological concept that individuals are often afraid to make extreme and radical changes, and embrace new ideas and thoughts (Aldag & Stearns, 1991; Griffin, 1993). Hence, despite individuals being significant sources, conduits and generators of knowledge, the body of organisational knowledge should be seen as the aggregate of each individual employee's ignorance. Also, knowledge creation within an organisation should centre on the crucial presumption that human knowledge is created and enlarged by means of understanding the unknowns. This statement is also supported by Pynchon (1984, pp. 15-16), who sees ignorance as a potential component for future success and achievement: "Ignorance is not just a blank space on a person's mental map. It has contours and coherence, and for all I know rules of operation as well. So as a corollary to [the advice of] writing about what we know, maybe we should add getting familiar with our ignorance, and the possibilities therein for writing a good story".

Based on the above analysis, one can explain why managing ignorance is important and essential for maintaining a strategic knowledge sharing culture within multinational organisations; however this concept remains still widely unexplored in today's organisational milieu.

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The Ignorance Management Theory

In order to further develop the concept of Ignorance Management we have developed a framework that highlights different assumptions about the nature of knowledge and ignorance. Principally, we have made the distinction between knowns and unknowns as well as between awareness and unawareness, i.e. ignorance. In the context of strategic knowledge management analysis this key theory will be referred to as '*Ignorance Management*', a term adopted by the authors in their attempt to marry the words 'Ignorance' and 'Knowledge Management', especially in regards to the way multinational organisations should acknowledge the power of the unknown (Figure 1).

More specifically, the outcome of our work has proposed two axes that set up the four different paradigms (approaches) which can be identified in this theory: I know that I know (high level of knowledge and low level of ignorance), I don't know that I know (high level of knowledge and ignorance), I know that I don't know (low level of knowledge and ignorance) and I don't know that I don't know (low level of knowledge and high level of ignorance).

The visualisation produced allows us to better understand the scope of this paper as well as its limitations in the context of multinational organisations while investigating the two sides of the graph. It also allows us to look at and predict the trajectories of an organisation within that diagram.

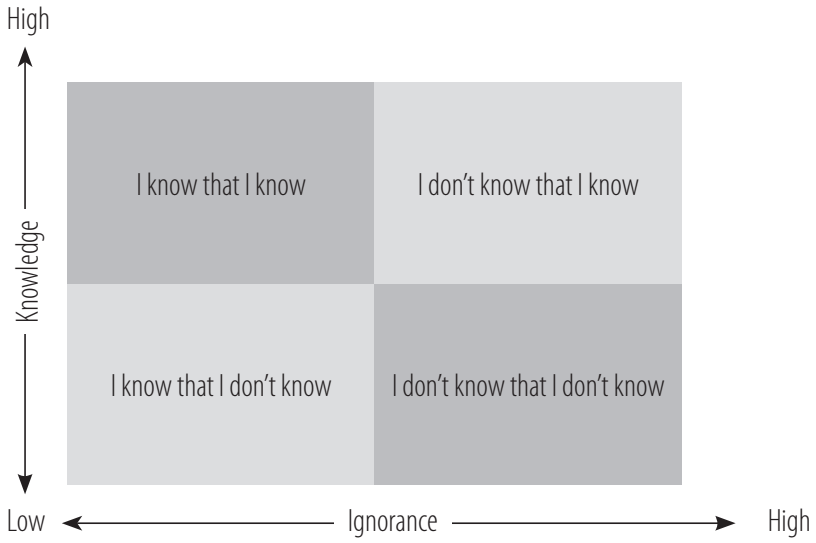

Figure 1. Overview of the Ignorance Management theory from the viewpoint of four paradigms

Regarding the knowledge dimension, it can be deduced that reality exists externally to humans; knowledge can be discovered using scientific approaches and people's reactions can be predicted. In contrast, this paper examines the importance of the ignorance dimension highlighting that being on the awareness side, people have 'free will' and can act capriciously; reality is perceived by individuals and created from perception and interpretation. Therefore, it is inferred that employees who demonstrate higher levels of ignorance may be characterised as ill-informed, whilst employees who demonstrate low levels of ignorance may be characterised as more competent and productive. Also, in particular within collaborative groups, communities could create the social fabric of learning; foster interactions and relationships based on mutual respect and trust and encourage a willingness to share ideas, expose one's ignorance, ask difficult questions and listen carefully (Wenger, McDermott & Snyder, 2002, p. 28). Hence, the emphasis of multinational KM organisational strategies should be given in providing the incentives to explore such new avenues while investigating any unknowns through new knowledge capture mechanisms. This will allow them to foster and innovate as well as gain competitive advantage through more effective knowledge management strategies.

The main ideas that have inevitably evolved from this theory, namely knowing what is needed to be known and also acknowledging the existence of unknowns that could transform knowledge strategies if successfully explored, have consequently led to the creation of new terms including that of Ignorance Management. Hence, as no previous definition has been given to support this key term, we have provided our own based on our research and professional practice.

Ignorance Management is a process of discovering, exploring, realising, recognising and managing ignorance outside and inside the organisation through an appropriate management process to meet current and future demands, design better policy and modify actions in order to achieve organisational objectives and sustain competitive advantage.

Hence, this study argues that managing ignorance and adaptation in multinational organisations is not just a theoretical foundation, but also a pragmatic undertaking that has become increasingly important in multinational environments. Thus, the critical question is not just managing what is known but also trying to find ways to manage the unknown. Furthermore, according to the above definition, this viewpoint of acknowledging ignorance should be

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clearly defined in business documents with a strong connection to corporate strategy. We believe that if successfully incorporated within a company's KM policy, this form of knowledge will have a more permanent dimension and the organisation may build on it a sustainable competitive advantage.

Research methodology

Participatory action research was undertaken to explore this theory within the scope of a multinational organisation. Kurt Lewin, often recognised as the founder of social psychology and one of the first to study group dynamics and organisation development, "is credited with coining the term 'action research' to describe work that did not separate investigation from the action needed to solve the problem" (McFarland & Stansell, 1993, 14). In his paper *Action Research and Minority Problems* (Lewin, 1946, 35-38), "action research" is described as "a comparative research on the conditions and effects of various forms of social action and research leading to social action [that uses] a spiral of steps, each of which is composed of a circle of planning, action, and fact-finding about the result of the action". An illustration of the first, second and third steps are shown in Figure 2.

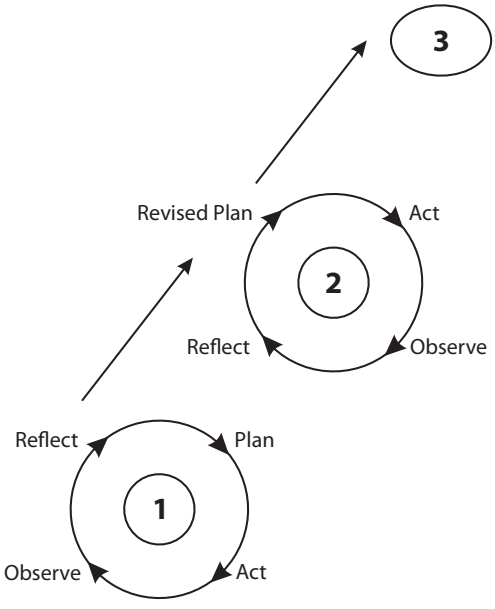

Figure 2. The spiral af action research cycle as illustrated by Altrichter (2002, p. 130)

Participatory action research is a reflective process of solving problems and creating solutions while working with others in teams to improve strategies, knowledge and processes of the environments within which they practice.

According to Reason and Bradbury (2006, p. 2), "the primary purpose of action research is to produce practical knowledge that is useful to people in the everyday conduct of their lives". Hence, all of the members are involved in the research process (Hopkins, 2002). Riel (2010) highlighted the importance of action research in developing a deep understanding of the ways in which a variety of social and environmental forces interact to create complex patterns. Specifically, it is noted that "action research is a way of learning from and through one's practice by working through a series of reflective stages that facilitate the development of a form of 'adaptive' expertise" (Riel, 2010). Ferrance (2000, p. 15) noted that "within all the definitions of action research, there are four basic themes: empowerment of participants, collaboration through participation, acquisition of knowledge, and social change". Thus, action research was used as it is most appropriate in situations that involve the development of knowledge and ignorance as well as innovation.

In addition, the focus of this research is given in particular to multinational organisations where innovation and new knowledge is essential to both short-term opportunistic value capture and longer term business sustainability. Therefore, the theoretical findings have been applied to technology intensive and innovative environments. In particular, this research is focussed on one of the largest military contractors in the world, which employs over 100,000 people across the globe. The company is ranked within the top 10 of the entire major global aerospace and defence indexes including the Defence News, Forbes2000 and Stockholm International Peace Research Institute (SIPRI) top 100. The company's employees are highly skilled within their respective field and the organisation has attempted to create an environment specifically suited to knowledge exchange, transfer and sharing.

Although case study research is mainly based on survey or micro data, Benoliel (1996) made a plea for observational data to be reincorporated as a standard data collection strategy. Moreover, Jorgensen (1989, p. 22) commented that "participant observers commonly gather data through casual conversations, in-depth, informal, and unstructured interviews, as well as formally structured interviews and questionnaires". Hence, this research adopts a primarily interpretative philosophy, using the style of qualitative research and is mainly based on the observations and questionnaire conducted. Specifically, the participants observed were actively engaged in several different knowledge sharing activities including sharing good practice, connecting people to people, supporting growth, stimulating innovation, auditing current systems and enhancing services. The questionnaire was designed to identify the

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knowledge management environment in the organisation and how it could be enhanced. It was kept as concise as possible in order to maximise the number of responses; however it included four open-ended questions which were used to solicit personal comments regarding the participants' view on managing ignorance and the unknown. The questionnaire was circulated to 364 respondents (316 males and 48 females) in twenty-seven different departments of the organisation and across nine different locations around the world, including the United States, Sweden, Australia, Saudi Arabia, India and the United Kingdom.

There are critics of this interpretive approach, objecting to the researcher's subjectivity in the observations and their analysis of the observed processes. But the justification for this approach is in the feedback and understanding that originates via the participants (Walsham, 1995). However, as with any empirical study, caution was exercised so that field observations do not mislead the development of theory; therefore, care was taken to ensure that observations are common enough to be generalised and not aberrant exceptions resulting from inefficient industry practice.

Findings

From the research conducted, it was found that the most commonly used KM approaches were based on enhancing the Information Technology (IT) infrastructure either by creating collaborative decision-support tools (i.e. portals, just-in-time KM systems, content management) or by developing knowledge-exchange applications that enable knowledge sharing and provide access to explicit organisational knowledge (i.e. newly developed intranet and extranet, people finder systems, central KM managers). Specifically, in the case study examined, it was noted that efforts have been made to adopt a new knowledge management strategy within the organisation while investing in collaborative and knowledge sharing technologies. According to participants, examples include workspaces, wikis, the intranet as well as collaborative team spaces. All these technologies have been generally accepted by a large number of employees and could be seen as knowledge facilitators in the digital era.

However, there was little emphasis on cultivating communities of practice or other social structures such as collaborative networks. Specifically, almost forty two per cent of the participants in the study noted that they are not

given sufficient opportunity to meet and identify colleagues that have the knowledge they seek and forty seven per cent highlighted that there are not enough formal opportunities (e.g. within meetings) to share, generate and reflect on new knowledge. The majority of the sample however acknowledged the importance of sharing knowledge via a structured network (such as a community of practice) recognising that networking and other personal mentorship programmes could not only facilitate their day-to-day work but also help them learn something unknown.

Also it was noted that organisational changes occurring due to the recession have had direct implications for collaboration and knowledge sharing in multinational environments. More specifically, more than half of the sample noted that there are not enough informal places (e.g., coffee rooms) to exchange new knowledge. In addition, important knowledge exchange and networking events such as training and mentoring schemes, welcome gifts and other de-briefing sessions that were taking place in the past were found to have ceased or been eliminated due to the financial crisis in 2008 and emphasis was given to pure project targets and goal deliveries.

Another important issue revealed through this study was a lack of acknowledging and understanding the unknowns as well as what we need to know. This was illustrated by the comments of several employees who remarked that without the correct degree of focus, it could be very time consuming with little return on investment.

"You don't know what you should know or what you're missing from the knowledge transfer".
"Is the knowledge correct or are you getting bad data? Hard to find the right data at the right time (too much or not enough)".
"If the context is wrong it could leave people with knowledge which does not add value but that position is defended because it is perceived as being a lesson learned and thus one to act on".
"There is a danger of getting or transmitting half the story and thinking you know more than you do".

Based on the above results, the study suggests two additional key concepts that are presented in detail in the following section. First of all, it examines the importance of managing the unknown and secondly it suggests how managers can make the transition to the complete state of high level of knowledge and low level of ignorance more gradual and successful.

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Discussion

As shown above, employees within multinational environments were found to be within the different classifications of our theory. Specifically, several highly skilled employees were recorded into the categories of low level of knowledge. This gave us a better understanding of Ignorance Management and allowed us to explore how organisations should not just manage what is known but also trying to find ways to manage the unknown.

Hence, employees within the state of low level of knowledge and high level of ignorance (i.e., I don't know that I don't know) should first realise their state of ignorance to fall into the intermediate state of low level of knowledge and ignorance (i.e., I know that I don't know). Becoming more aware of the organisation's operations and KM mechanisms and given the right incentives by management, employees should then be able to produce new knowledge and foster innovation (i.e., I know that I know). Additionally, employees within the state of high level knowledge and ignorance (i.e., I don't know that I know) who already have the necessary power to produce new knowledge should be aware this strength and make the most of every opportunity for the benefits of the business (Figure 3).

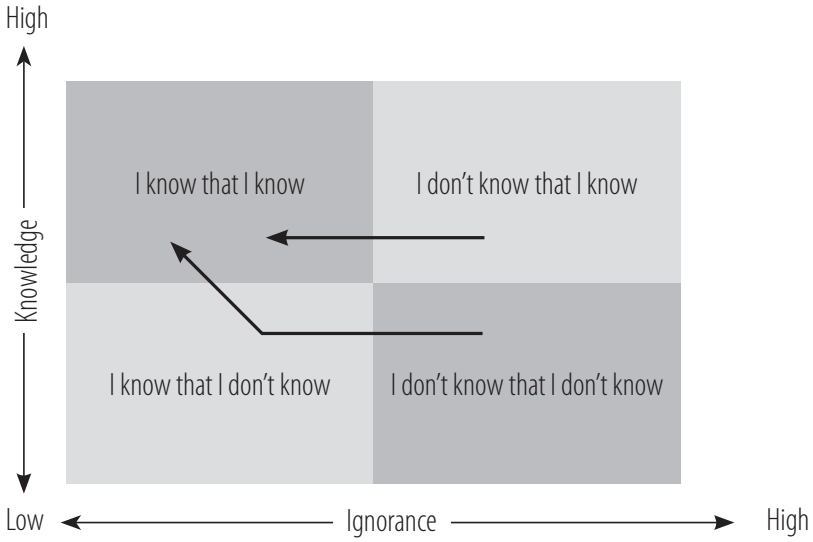

Figure 3. Exploring the transformation from the unknown to the known

The transformation from the unknown to the known is not an easy process and requires time, resources and financial support. Hence, the question is whether managers are willing to re-examine their managerial strategies by

acknowledging and understanding the existence of unknowns, which could transform the current inefficient knowledge practices in multinational organisations. These interpretations are also supported by Dunning and Kruger who demonstrated that humans find it intrinsically difficult to get a sense of what we don't know and argued that incompetence deprives people of the ability to recognise their own incompetence – also known as the Dunning-Kruger effect (Kruger & Dunning, 1999).

The Ignorance Management theory could help explore and manage the unknown. However, the important aspect is for managers (in particular middle managers) to accept people's ignorance. In most cases, they do not see the different levels of awareness within their organisational structures or even if they do they happen to ignore them. Without taking the appropriate actions to manage ignorance, improvements to operations and processes with the company may ultimately fail, which can be costly and time consuming. Due to the novel nature of this theory, the literature was found not to have any relative connections to these concepts. Thus, further research is essential to explore the final effect of acknowledging ignorance as well as the changes it will bring to existing organisational KM processes.

To sum up, the critical question is not just managing what is known but also trying to find ways to manage the unknown. This viewpoint of acknowledging ignorance, if successfully incorporated within a company's KM strategy, will not only facilitate and enhance knowledge management processes but will also foster innovation and increase the levels of new knowledge in multinational organisations.

Conclusion

This paper identifies an alternative perspective on Knowledge Management by definition of the concept of Ignorance Management in multinational organisations. It discusses the difficulties employees face in understanding and comprehending what they need to know to do their jobs, and what implications this can have within global technology intensive environments. Also, after highlighting why managing ignorance is important for maintaining a strategic knowledge sharing culture within multinational organisations, this paper develops a novel theory on the nature of knowledge and ignorance while making the distinction between knowns and unknowns as well as between awareness and unawareness, i.e. ignorance. Very little of this discussion is

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captured by the current KM literature and no definition has been given to support this theory. Hence, in an attempt to address the existing gap, this paper argues that managing ignorance and adaptation in multinational organisations is not just a theoretical foundation but also a pragmatic exercise that has become increasingly important in multinational environments.

Specifically, the key conclusion drawn from the study is to re-examine managerial strategies in multinational organisations by acknowledging and understanding the existence of unknowns which could transform the current inefficient knowledge practices. Hence, the critical question is not just managing what is known but also trying to find ways to manage the unknown. This viewpoint of acknowledging ignorance, if successfully incorporated within a company's KM strategy, will not only facilitate and enhance knowledge storage and transmission processes but will also undoubtedly play a vital role when referring to a company's efficiency, productivity and overall performance. Furthermore, another point noted is to explore and predict the trajectories of an organisation based on the Ignorance Management theory. For example, it was apparent from the research that employees classified within the domain of high level ignorance could produce new knowledge and foster innovation within the business. Finally, this paper suggests new ways to alleviate knowledge-related problems and makes a significant contribution to the current KM literature by introducing an alternative perspective on Knowledge Management and defining the novel theoretical concept of Ignorance Management in multinational organisations.

The study reflects the experience of large multinational organisations and much remains to be done in analysing small and agile corporate environments. Also, as with any new theory, caution is recommended when testing and applying it within technology intensive environments. In addition, further work on analysing the characteristics that make an organisation innovative and how that is correlated with an employee's ignorance would be beneficial and is highly recommended. Finally, the complimentary nature of this theory merits further study to make Ignorance Management usable in more general contexts.

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Facilitating knowledge sharing through ignorance management:

The moderating role of knowledge processors

Abstract

Knowledge sharing is one of the most efficient management processes in supporting organizational effectiveness. Extant literature notes a number of behavioural factors with an impact on knowledge sharing. In this paper we introduce the behavioural factor of ignorance to empirically examine its direct effect on organizational knowledge sharing. Conducting a qualitative study within an organizational context we argue that knowledge sharing effectiveness could be greatly improved, by managing employees' ignorance i.e. knowing what needs to be known and also acknowledging the existence of unknowns. Moreover, based on the findings we identify the moderating role of Knowledge Processors in the linkage between ignorance and knowledge sharing in their capacity as both source and recipient of knowledge. Suggestions are further made regarding new roles in knowledge management whilst limitations and future research implications are also discussed.

Keywords: ignorance management, knowledge processors, knowledge sharing, aerospace and defense industry, multinational organizations.

INTRODUCTION

In the era of the knowledge economy, organizations which are innovative performers are in great need of effectively managing either the knowledge stock that is already stored in various organizational repositories, or the new amounts of knowledge that are externally derived (Jantunen, 2005). Thus, organizations which perform this capability, i.e., to manage the organizational knowledge by capturing, storing, sharing and utilizing it within their boundaries (Davenport and Prusak, 1998), habitually, maximize their performance by improving productivity and overall efficiency of operations (Nonaka and Takeuchi, 1995). Extant literature on knowledge management defines, among others, human capital as a vital factor in knowledge exchange activities that take place either internally (e.g. within teams, units and/or departments) or externally (e.g. between partners and third-party organizations). Additionally, employees' involvement in various face to face or virtual Communities of Practice (CoP), has become one of the most well-known strategies for managing their knowledge. Specifically, examples to support the above statement include but are not limited to Chevron, Ford, Xerox, Raytheon, IBM (Ellis, 2001), Dow Chemical, Shell, Schlumberger, Cap Gemini Ernst & Young and Best Buy (Vestal, 2002), as well as Caterpillar (Ardichvili *et al*., 2003). In recent times, the expansion of social media (such us Facebook, LinkedIn and Twitter) as well as other information technology tools (such as blogs, wikis and collaboration platforms) allow users to join groups, to participate in virtual discussion, to post their own views and to chat exchanging information which, in some cases, may contribute to the organizational knowledge stock. Apart from the contextual forces and the organizational environment which both influence organizational knowledge sharing, the current literature also recognizes a set of behavioural factors which moderate (i.e., enabling or disabling) the sharing of knowledge within organizations (Yoo and Torrey, 2002). As such, trust (e.g. Nahapiet and Ghoshal, 1998), anticipated reciprocal relationships (e.g. Bock *et al*., 2005;

Chiu *et al*., 2006; Wasko and Faraj, 2005), identification (e.g. Kankanhalli *et al*., 2005), image (e.g. Wasko and Faraj, 2005), organizational rewards (e.g. Bock *et al*., 2005), knowledge self-efficacy (e.g. Bock *et al*., 2005; Jarvenpaa and Staples, 2000), and loss of knowledge power (e.g. Davenport and Prusak, 1998) have all been identified as behavioural factors which affect the process of knowledge sharing within organizations.

In this study we initiate the behavioural variable of ignorance, namely not knowing what needs to be known, to examine the effect of employees' ignorance on knowledge sharing. In so doing, we classify employees' ignorance between: (i) ignorance of subject matter experts, i.e., experts who possess extensive and unique knowledge skills, (ii) ignorance of Knowledge Management Systems implemented by organizations, i.e., existing technology and/or specific tool-sets (e.g. databases) and (iii) ignorance of the corporate knowledge itself, i.e., the content of the existing knowledge in the organization (e.g. current practices, processes and rules). Additionally, we argue that employees' ignorance, which render employees unaware of prevailing corporate issues, could be transformed in effective corporate knowledge, if successfully managed.

In the context of organizations which operate in knowledge intensive environments, ignorance plays a significant role towards knowledge sharing, by preventing employees from exchanging knowledge and ideas with their work teams in which they daily interact and perform various routine tasks and activities. Specifically, employees' unwillingness or tendency not to share the personal knowledge they possess is likely to be affected by the recipient's lack of appropriate cognitive background. Additionally, based on their unknowns, employees may underestimate the value of new knowledge which they could acquire in the course of knowledge exchange processes, thus may justifiably feel that their participation in knowledge sharing activities is a futile process of learning. However, such difficulties are effectively managed when both recipients and sources of knowledge, recognise the limits and

extent of their knowledge while exchanging knowledge and ideas. In other words, they perceive the extent of their ignorance, by exploring unknowns; therefore, managing the knowledge they possess more effectively and learning together.

Our empirical research aims to broaden the discussion on knowledge sharing behaviours, by analysing the effect of ignorance on knowledge sharing within the context of a multinational organization. Additionally, besides the use of social networking tools and other information technology applications which facilitate the aforementioned relationship, the need for interpersonal communication is also required. To address this need we initiate the role of Knowledge Processors (KPs), in their capacity to function as both sources and recipients of new knowledge, who may moderate the linkage between ignorance and knowledge sharing while managing employees' ignorance by transforming the unknown to the known.

Hence, the key objectives of our paper are to: (i) empirically identify the linkage between ignorance and knowledge sharing and (ii) conceptually propose the moderating role of KP in reaching the complete state of high level of knowledge and low level of ignorance.

The next section of the paper offers a literature overview of the behavioural factors that affect knowledge sharing to help identify the ignorance effect on knowledge sharing. In regards to the remaining structure of this paper, the third section outlines the methodology and provides the results of the empirical study, and the fourth section discusses the empirical results by providing the role of KPs while outlining implications for practitioners and discussing areas for future research. The concluding remarks of our study summarize the study's contribution.

THEORY AND RESEARCH PROPOSITIONS

Knowledge sharing within organizations

The sharing of knowledge is one of the most significant organizational process aiding organizations to maximise learning (Bock and Kim, 2002; Davenport and Prusak, 1998;

Nonaka and Toyama, 2003; Tsai, 2001) and predicts a variety of desirable organizational outcomes including increased productivity, decreased task completion time, increased organizational learning, innovativeness (e.g., Argote *et al*., 2003; Cummings, 2004; Hansen, 2002) and sustained competitive advantage (Gold *et al*., 2001). Brown and Duguid (2000) note that knowledge management is a matter of sharing knowledge with others and not just keeping it for own use and power. Nonaka and Takeuchi (1995) argue that the creation of knowledge can be seen as a process of knowledge sharing through articulating and internalising knowledge processes. In addition, Jarvenpaa and Staples (2000) state that the sharing of ideas among employees is a key process underlying collective knowledge within an organisation without which a company may not be able to leverage its most valuable asset. Thus, the competitive and dynamic business environment increasingly requires employees to share knowledge with others (Davenport and Prusak, 1998; Drucker, 1985; Chow *et al*., 2008) either through formal or informal processes which take place within an organization (Cummings, 2004).

The sharing of knowledge within organizations has received considerable attention from both researchers and practitioners throughout the world, also leading to the identification of a number of behavioural factors that affect it in either a positive or negative way. Apart from the behavioural factors which are discussed in details later on this paper, the extant literature identifies significant variables with an impact on knowledge sharing. The most commonly cited factors include the nature of knowledge to be shared i.e., tacit versus explicit (Polanyi, 1966) or codified versus personal (Hansen *et al*., 1999; Nonaka and Takeuchi, 1995; Zander and Kogut, 1995), the organizational context, structure or systems in which the sharing of knowledge takes place (Argote and Ingram, 2000; Dushnitsky and Lenox, 2005; Gupta and Govindarajan, 2000) as well as the type of relationships (either formal or informal)

formed between those who share knowledge, among others (Ancona and Caldwell, 1992; Gupta and Govindarajan, 2000; Levin and Cross, 2004).

Focusing on behavioural factors with an impact on knowledge sharing we used the EBSCO and Emerald databases with the key words 'behavioural factors' and 'knowledge sharing' to identify studies that demonstrate a direct relationship between the linkage of behavioural factors and knowledge sharing. Our work led us to thirty-six (36) studies which have been published between 1994 and 2012, and are summarized in Table 1.

{Place Table 1 about here}

In general terms, the aforementioned studies demonstrate a direct link (either positive or negative) between several behavioural factors (e.g. trust, commitment, reputation enhancement, expected rewards, etc.) and the variable of knowledge sharing which has been viewed from different perspectives. Namely, scholars approach knowledge sharing either as an individual behavior to share knowledge (i.e. send or receive), the individuals' tendency or intention to share knowledge, the quality and quantity of the knowledge to be shared, or as employees' attitudes towards knowledge sharing (which has been used either as dependent or independent variable) and the subjective norms that dominate knowledge sharing. No matter how the sharing of knowledge has been approached, scholars come to a consensus with regard to the benefits that individuals receive from their participation in knowledge sharing activities in their organizational daily life. As such, Gupta *et al.* (2012b, p. 10) mention, among other individual benefits, the obligation of others to reciprocate, the level of self-esteem and the increased personal identification.

More specifically, with reference to Table 1, most researchers pay particular attention to variables, which may pre-determine employees' knowledge sharing behaviour (e.g. trust, subjective norms, organizational commitment, etc), especially when such activities have been established by organizations to foster employees to share knowledge and are not found to be

employees' initiatives. However, other scholars highlight individual motivators which may, equally, determine employees' behavior to share knowledge. Employees habitually share the knowledge they possess, mainly, when they are intrinsically motivated (self-motivated) or when they anticipate specific personal benefits in return, such as enhanced reputation, perceived usefulness of the acquired knowledge, self-development, association, reciprocal relationships (e.g., Bock *et al*., 2005; Foss *et al*., 2009; He *et al*., 2009; Kankanhalli *et al*., 2005; Kwok and Gao, 2004; Lin, 2007). Likewise, employees share knowledge when they are driven by behavioural control (e.g. Ryua *et al*., 2003), enjoyment in helping others (e.g. Kim and Lee, 2011; Kumar and Rose, 2012) or in some cases when they choose to be socially engaged in knowledge exchange activities even if the structures or rules of the organizations in which they are employed do not support the appropriate culture (Obembe, 2010).

Considering, particularly, the impact of the expected rewards on individuals' knowledge sharing behaviours, the existing literature does not recognise a definitive relationship between these two variables since the findings are inconsistent and opposing. For instance, Burgess (2005) argues that expected rewards positively influence the knowledge sharing behaviour of employees. Liao (2008) also sees a direct and positive relationship between the power of rewards and the knowledge sharing behaviour of employees in Research and Development (R&D) departments of Information and Computer Companies in Taiwan. Similarly, He *et al.* (2009) support that rewards along with training and management facilitation could positively affect knowledge sharing, exploring various antecedents of employees' behaviour who use Knowledge Management Systems (KMS) to share knowledge. Moreover, Kumar and Rose (2012) confirm the positive relationship between organizational rewards and knowledge sharing by studying the knowledge sharing behaviour of Administrative and Diplomatic Service Officers in Malaysia.

Contrary to this, the empirical studies of Bock and Kim (2002) and Bock *et al*. (2005), note that expected rewards do not affect knowledge sharing behaviours; whilst Lin (2007) argues that expected organizational rewards neither affect employee attitudes towards knowledge sharing nor their knowledge sharing intentions. In addition, Gupta *et al.* (2012b) verify that there is no relationship between these two variables (i.e. expected rewards and knowledge sharing) when they analyzed the impact of employees' perception towards the perceived knowledge sharing benefits and costs on their knowledge sharing behaviour in their study of 228 employees of two major Information Technology organizations in India.

Based on the review of the current knowledge management literature, it appears that the behavioural factor of ignorance is not sufficiently explored. There are several signs to suggest that recognising the role and significance of ignorance could further improve such knowledge management efforts within technology intensive organisations (Israilidis *et al*., 2012). Also, several attempts have been made to explore the value of managing organisational ignorance in order to enhance knowledge creation, sharing and transmission processes (Wolchover, 2012). Hence, to take the extant literature one step further, we introduce the behavioural factor of ignorance and argue that the effectiveness of knowledge sharing could be greatly improved, if successfully knowing what is needed to be known and also acknowledging the existence of unknowns.

Linking ignorance to knowledge sharing

In a recent study conducted by Dunning and Kruger (Wolchover, 2012), it was noted that humans find it intrinsically difficult to get a sense of what they don't know and the authors argue that incompetence deprives people of the ability to recognise their own incompetence – also known as the Dunning-Kruger effect (Kruger and Dunning, 1999). Furthermore, Zack (1999) highlights that managing organisational ignorance can yield impressive benefits, if successfully incorporated within a company's KM strategy.

Additionally, Pynchon (1984, p.15-16) argues that ignorance could be seen as a potential component for future success and achievement: *"Ignorance is not just a blank space on a person's mental map. It has contours and coherence, and for all I know rules of operation as well. So as a corollary to [the advice of] writing about what we know, maybe we should add getting familiar with our ignorance, and the possibilities therein for writing a good story".* It can therefore be deduced that ignorance could play a vital role in reducing the risks of making the wrong decision when using 'imperfect information'.

The above observations are also supported by the theory of Ignorance Management as presented by Israilidis *et al.* (2012). In this theory, four paradigms were identified and visually illustrated in a four quadrant diagram based on different assumptions about the nature (e.g. high and low volume) of knowledge and ignorance. Employees who demonstrate higher levels of ignorance may be characterised as ill-informed, whilst employees who demonstrate low levels of ignorance may be characterised as more competent and productive.

It is therefore apparent that employees classified within the category of low level knowledge and high level ignorance are characterised by poor knowledge sharing and collaboration skills, due to the fact that they are more likely to give out wrong information and hence place the company in a high-risk position, both financially and knowledge-wise. Additionally, highly ignorant employees may be prevented from participating in knowledge sharing activities since they are lacking prior knowledge and experience which in itself reduces (or in some cases may eliminate) their ability to absorb new knowledge. According to the seminal work of Cohen and Levinthal (1990, p. 128) on absorptive capacity, "*one's ability to recognize the value of new information, assimilate it and apply it to commercial ends is largely a function of the level of prior related knowledge*". Moreover, ignorance can also be seen as an obstacle to knowledge sharing in terms of employees' unawareness of the information they possess. Unaware employees cannot estimate the real value of information

which can often be transformed into significant organizational knowledge increasing efficiency and productivity, if shared effectively. It is also worth noting that lack of knowledge regarding the existence or utilization of new technologies and tool-sets, such as current Knowledge Management Systems available to employees, could also restrict knowledge flows in various organizational team discussions.

Thus, in this paper, influenced by the theory of Ignorance Management, we argue that managing ignorance, i.e., exploring the transformation from the unknown to the known, may facilitate the sharing of knowledge within organizations since employees will have reached the complete state of 'I know that I know', that is high level of knowledge and low level of ignorance. Also, based on the above argumentation we postulate that managing employees' unknowns will also augment the sharing of knowledge within organizations.

Research Proposition: *Employees' ignorance may negatively affect their knowledge sharing behaviour.*

CONTEXT AND METHODOLOGY OF THE STUDY

The organization

The focus of this research is given in particular to multinational organisations where knowledge sharing is essential to both short-term opportunistic value capture and longer term business sustainability. Hence, this study has been applied to technology intensive environments and was conducted within a specific organisational context at DefenseCo[1], which employs more than 60,000 employees across the globe and operates within the Aerospace, Defense and Information Security industry with worldwide interests. The company's employees are highly skilled within their respective field and the organisation has attempted to create an environment specifically suited to knowledge exchange, transfer and

[1] DefenseCo is a pseudonym that has been adopted to protect company anonymity.

sharing. As Jafari *et al.* (2007) note, one of the most important industries which should be managed completely from the knowledge point of view is the aerospace industry as the design and construction of aerospace systems has raised specific KM concerns, such as dealing with complexity, traceability, maturity of knowledge, interaction between experts, awareness of the status of information, and trust in knowledge. Therefore, in the light of these observations, facilitating knowledge sharing is increasingly critical due to the increased pressure to boost efficiency and explore organisational knowledge for new aerospace and defense systems effectively.

The study design

The philosophy of this study is based on an interpretative approach; thus, qualitative methods were implemented using as units of the analysis various departments in DefenseCo to gain a better understanding of the relationship between employees' ignorance and knowledge sharing. Ten different departments (i.e., business units) were explored, including land, maritime, air and space, among others. A number of factors affected the selection process, such as organisational issues and cost limitations imposed by the organisation. However, the selection was sufficiently representative since analysing different organisational departments resulted in looking into multiple knowledge exchange mechanisms which gave both breadth and depth to the research findings.

The personnel within DefenseCo were highly involved in knowledge sharing activities and other knowledge intensive processes, such as dealing with complex information and managing multiple projects simultaneously. As such, all participants were actively engaged in several different knowledge sharing activities including sharing good practice, connecting people to people, supporting growth, stimulating innovation, auditing current systems and enhancing services. This allowed us to better understand whether employees' unknowns have

an impact on the sharing of knowledge that takes place in their daily routine, tasks and activities and then to identify whether ignorance plays a critical role in knowledge sharing.

The data presented in this paper were collected as part of a larger research project, which used both quantitative and qualitative methods. For the purposes of this study, a series of nine semi-structured interviews were conducted, supporting van der Heijden's (2007, p.181) view, who notes that "it seldom proves necessary to interview more than fifteen or so people […] but after say ten interviews a lot has already surfaced and interviews become repetitive". On average, the semi-structured interviews lasted approximately 45 to 50 minutes; however, there was no predetermined length for the interviews and participants were free to continue talking for as long as they wished, providing both breadth and depth results about the organisation's structure and knowledge sharing processes. In order to overcome logistical difficulties, all interviews were conducted by telephone and were recorded using a digital voice recorder as the interview was being conducted.

The interviewees were mainly senior managers and had an extensive experience in the organisation. They were also involved in KM-related activities and were eager to promote knowledge sharing within their area of responsibility.

Data Analysis

The interview data were transcribed in note form for further analysis, once the interview had been finished. Each interviewee was assigned with a unique reference code, which was used to identify the relevant documents; hence, by maintaining the anonymity of the interviewees, open and frank answers were encouraged.

Furthermore, the analysis was conducted using the Atlas.ti computer assisted qualitative data analysis software due to the wide selection of built-in features and functionalities which fully supported the qualitative research process, including text

interpretation and content analysis. Coding was performed manually and patterns were identified and classified automatically via the use of the software programme.

The data analysis uncovered patterns, themes, and categories important to both academia and business. However, because qualitative research is fundamentally interpretive, the researchers made every effort to achieve a balance between description and interpretation, supporting Patton's view who argued that an interesting and readable article "provides sufficient description to allow the reader to understand the basis for an interpretation, and sufficient interpretation to allow the reader to understand the description" (Patton 2002, p.503-504).

The following section presents the findings of the research, the implications of which will be discussed in a later section of this paper.

Findings

The interviews suggested that there is a relationship between employees' ignorance and knowledge sharing and that managing unknowns may yield effective knowledge sharing within organizations. More specifically, the majority of the interviewees (seven participants) identified a strong connection between ignorance and knowledge sharing, illustrating further, the benefits of interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively. It was also found that within the organisation, several employees were not familiar with the term 'knowledge sharing' as they had never come across anything similar before. In relation to organisational KM methods and practices that would enhance sharing opportunities, the interviewees noted the importance of involving the management at a variety of levels to resolve deficiencies or compliance issues. Finally, despite the fact that in recent years a lot of effort has been placed on enabling accurate and personalised results by improving ontologies, artificial intelligence

and heuristics, it was found that the majority of tools were lacking effective search mechanisms and the ability to filter down results based on the user's preferences.

To present clearly key elements of the findings discussed above, representative quotes from the interviewees have been grouped into four categories, namely: (i) ignorance of subject matter experts with specialist knowledge within the organization; (ii) ignorance of Knowledge Management Systems implemented by the organization; (iii) ignorance of the corporate knowledge itself, and finally (iv) the need for interpersonal communications as opposed to the use of applications and other computer-related software programmes in managing knowledge effectively. The output of this classification is portrayed in Table 2.

{Place Table 2 about here}

DISCUSSION

The main finding in our study is the impact of ignorance on knowledge sharing activities that take place within our case organization of DefenseCo. The results revealed an interesting linkage between the aforementioned entities, viz., ignorance and knowledge sharing, which has not been previously discussed in the KM literature. Specifically, the negative effect of ignorance on employees' knowledge sharing behavior demonstrates the importance of acknowledging the existence of unknowns when sharing knowledge and recognizes the potential value of managing ignorance in the workplace. Also, employees who are found to be ignorant about corporate knowledge, subject matter experts or existing KMS in their organization, may inevitably transmit wrong information, if knowledge sharing occurs.

It is therefore inferred that employees' ignorance may result in significant performance consequences to organizations. For instance, in terms of managing external knowledge, employees who are unaware of new technologies, modifications of already existing products or services, and cost-efficient ways of managing operations within the

business may not be able to implement innovation, i.e., make the appropriate decisions to adopt innovation (Klein and Sorra, 1996). Similarly, in terms of managing internal corporate knowledge, ignorant employees are likely to increase organizational costs by spending additional time and resources while searching for knowledge in various external knowledge repositories. Employees ignorance could also lead to poor decision-making and communication, which may inevitably affect the performance of operations while limiting the ability to repel external threats or manage future crisis situations.

Building on these observations and given the linkage between ignorance and knowledge sharing, the necessity to re-examine KM strategies and improve the efficiency and effectiveness of existing knowledge sharing processes has become common place. Managers should find ways of managing ignorance, similar to how they would manage knowledge, while fostering knowledge sharing which will undoubtedly help them overcome problems that might arise within their industry.

It is therefore argued that beside the use of social networking tools and other information technology applications (such as wikis, collaborative workspace platforms and dynamic share drives), the role of Knowledge Processors (KP) could positively moderate the aforementioned relationship by helping employees to reach the complete state of highest knowledge and lowest ignorance. Siachou and Ioannidis (2008) have already discussed several benefits of KPs in the context of facilitating knowledge sharing within action teams by extracting net-based knowledge from various Internet repositories. However, given the focus of this paper, KPs are examined as moderators in managing ignorance effectively through improving knowledge searching and acquisition processes across organizational business units. KPs are also viewed as moderators in reliably transmitting new knowledge and problem-solving skills within work teams in order to successfully deliver products or services within limited time constraints. Further analysis on the characteristics of the role of KPs as

well as various implications for KM practitioners are extensively presented in the following section of this paper.

Implications for practitioners: The moderating role of Knowledge Processors

The results of our study indicate that beside the various knowledge management systems (KMS), mainly supported by new technologies and advanced tool-sets, the transformation from the state of employees' unknowns to the knowns requires interpersonal communication among those who possess and those who seek knowledge. Reviewing the relevant literature, several factors (e.g. personnel movement and replicating routines) which facilitate the interpersonal communication in the context of knowledge sharing were found to be isolated (Alavi and Leidner, 2001; Gupta and Govindarajan, 2000). To address this issue, we argue that team leaders should consider the role of KPs functioning as both sources and recipients of knowledge (Siachou and Ioannidis, 2006) in order to facilitate employees with their transition from the unknown to the known. This, in itself, will enable team leaders to actively participate in knowledge sharing activities providing effective knowledge sharing mechanisms as well as minimizing search and sharing knowledge costs affecting the organization. For instance, knowledge intensive organizations often render knowledge obsolete and are in great need of constantly acquiring new amounts (both sources and updates) of knowledge. If this is the case, KPs could absorb new knowledge from outside the organization as knowledge recipients, whilst effectively sharing the newly acquired knowledge within the various organizational units accurately and on time as knowledge sources. In parallel however, KPs could identify the level of employees' ignorance while transforming them into more knowledgeable employees. To achieve this, KPs should accurately inform employees about the content and value of existing corporate knowledge as well as how to utilize it wisely for the benefits of the organization. Furthermore, KPs could sculpt the appropriate culture between and within parts of the organization which foster

employees' initiatives to share the knowledge they possess. Activities to achieve this may include, but are not limited to, annual executives' conferences, formal and informal departmental meetings, ad-hoc situational committees, training sessions and speak-up groups (Alavi and Leidner, 2001; Reagans and McEvily, 2003).

It must be noted that Knowledge Management literature has already identified specific roles in leadership positions within multinational organizations, including Chief Knowledge Officers (e.g., Earl and Scott, 1999) and Knowledge Champions (e.g., Jones *et al*., 2003) among others. However, the role of KPs differs from existing paradigms in its responsibility to manage employees' ignorance in identifying their unknowns, thus rendering them knowledgeable employees. Simultaneously, KPs get actively involved in knowledge sharing activities by distributing the appropriate knowledge to various organizational units accurately and on time while facilitating employees' knowledge sharing behavior. This not only exceeds the management of corporate knowledge and acquisition of new knowledge that is externally derived, but also provides additional support to business action teams, the members of which should effectively deal with unpredictable situations within various time constraints (Edmondson, 2003). Hence, in their capacity as leaders of these teams, KPs could help identify the different types of ignorance of each team member while providing the necessary support to effectively perform their tasks. In doing so, it is proposed that KPs should first locate and absorb knowledge that is externally derived before appropriately sharing it within the action teams, based on its value and usefulness for the organization.

Furthermore, KPs include a set of skills and abilities which are relevant to the context of this work, including their ability not only to effectively absorb new knowledge but equally to retain it, i.e., to institutionalize the utilization of the incoming knowledge (Szulanski, 1996). Finally, KPs should be seen as self-motivated roles with the intention to share important amounts of knowledge with other organizational parties, devote time and personal

resources in order to support the sharing of knowledge as well as promote on-going learning by exploring the transition from the unknown to known.

Limitations and Future Research

This research experienced some limitations in regards to the feedback of the proposed solutions, mainly due to internal organizational rules and regulations. In terms of the findings, our study supports a direct link between ignorance and knowledge sharing when other factors are not taken into account. Therefore, it is not clear whether these results support a bidirectional relationship between the aforementioned entities. Additionally, since our study is based on qualitative analysis, we propose that the use of quantitative analysis could also be explored to support data generalizability as well as to confirm presence of a bidirectional relationship. Equally, additional studies need to be conducted to examine the linkage between ignorance and knowledge sharing by also considering the moderating (or mediating) effect of other variables than the KPs which we propose. Also, the role of KPs should be further tested empirically in future work. Finally, the study was conducted for an Aerospace and Defense organisation; hence it may not reflect other corporate environments where agile and less hierarchical structures are established.

In terms of the literature review, our study is based on a number of articles accessed through specific databases while using pre-selected key words, as noted in the body of this paper. Consequently, this may have increased the likelihood of not taking into consideration journal articles and published research work in other electronic databases or print sources.

CONCLUDING REMARKS

This paper identifies a direct link between ignorance and knowledge sharing and argues that managing ignorance could facilitate employees' knowledge sharing behavior. Very little of this discussion is captured by the current KM literature and no relationship has been identified

between ignorance and knowledge sharing. Hence, in an attempt to address the existing gap, this paper argues that the effectiveness of knowledge sharing could be greatly improved, if successfully knowing what is needed to be known and also by acknowledging the existence of unknowns. Moreover, this paper conceptually proposes the moderating role of KP to enable the smooth transition from the unknown to the known in reaching the complete state of high level of knowledge and low level of ignorance.

The study reflects large multinational organisations and much remains to be done in analysing small and agile corporate environments. Also, the exact nature of the aforementioned relationship merits further study, to make Knowledge Processors usable in more general contexts.

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Table 1: **Key Studies that demonstrate the impact of behavioral factors on knowledge sharing**

	Author(s) in alphabetic order & Publication Year	**Type of Study**	**Behavioral Factors**	**Approach to Knowledge Sharing (KS)**	**Impact on Knowledge Sharing[2]**
(1)	Abzari and Abbasi (2011)	Empirical Quantitative Study	Attitude towards KS Subjective Norms Perceived Behavioral Control	KS Intention	**+** **+** **+**
(2)	Aliei *et al* (2011)	Empirical Quantitative Study	Helping Behavior Sportsmanship Organizational Loyalty Organizational Compliance Individual Initiative Civic Virtue Self-Development	KS Behavior	+ + + + + + +
(3)	Appel-Meulenbroek (2010)	Case Study Quantitative Study	Connectivity Co-presence	KS Behavior	+ Not Significant
(4)	Bock and Kim (2002)	Empirical Quantitative Study	Expected Rewards Expected Associations Expected Contribution Attitudes towards KS KS Intention Level of IT usage	Attitudes towards KS Attitudes towards KS Attitudes towards KS KS Intention KS Behavior KS Behavior	Not Significant **+** **+** **+** **+** Not Significant
(5)	Bock *et al*	Empirical	Attitudes toward KS	KS Intension	**+**

[2] + indicates a positive impact of the proposed behavioral factors on knowledge sharing.
- indicates a negative impact of the proposed behavioral factors on knowledge sharing.

	(2005)	Quantitative Study	Anticipated Extrinsic Rewards	Attitudes toward KS	-
			Anticipated Reciprocal Relationships	Attitudes toward KS	Not Significant
			Self-Worth through KS Behavior	Attitudes toward KS	+
			Self-Worth through KS Behavior	Subjective Norms to KS	+
				KS Intention	
			Subjective Norm to KS	Attitudes toward KS	+
			Subjective Norm to KS	Subjective Norms to KS	+
			Organizational Climate	KS Intention	+
			Organizational Climate		+
(6)	Chiu *et al.* (2006)	Empirical Quantitative Study	Community Related Expectations	KS Quantity and Quality	Not Significant on quantity and quality
			Personal Outcome Expectations		+ (Quantity and Quality)
			Social Interaction		+ Quantity, Not Significant Quality
			Trust		Not Significant Quantity, + Quality
			Norm of Reciprocity		+ Quantity, Not Significant quality
			Identification		+Quantity, Not Significant quality
			Shared Knowledge		-quantity, +quality
			Shared Vision		-Quantity, +Quality
(7)	Chow and Chan, (2008)	Empirical Quantitative Study	Extensive Social Networking	Attitudes towards KS	+
			Extensive Social Networking	Subjective Norm towards KS	-
			Social Trust	Attitudes towards KS	Not Significant
			Social Trust	Subjective Norm towards KS	Not Significant
			Shared Goals	Attitudes towards KS	+

			Shared Goals Attitudes towards KS	Subjective Norm towards KS Intension to KS	+ + +
(8)	Constant *et al* (1994)	Experiments	Self Interest Reciprocity Work Experience Work Teams Self Expression Self Consistency Self Interest Reciprocity Work Experience Work Theory	Knowledge Sharing (information) Product/Expertise	- (as product) -(as product) No Direct Relationship (as product) No Direct Relationship (as product) + (as expertise) + (as expertise) - (as expertise) - (as expertise) No Direct Relationship (as product) No Direct Relationship (as product)
(9)	Foss *et al* (2009)	Empirical Quantitative Study	Employees Intrinsically Motivated Employees Motivated by Introjection Employees Externally Motivation Job Autonomous Employees Task Identified Employees Receiving Feedback	Receive and Send Knowledge	+ Not significant to receive and negatively to send) - + + +
(10)	Gupta *et al*[a] (2012)	Empirical Quantitative Study	Organizational Commitment Psychological Contract Fulfillment	Knowledge Sharing	Nor significant +

			Psychological Contract Breach		-
(11)	Gupta *et al*[b] (2012)	Empirical Quantitative Study	Expected Rewards Expected Association Expected Contribution Perceived Cost	Knowledge Sharing	Not supported + + -
(12)	He *et al* (2009)	Case Study Qualitative Study	Perceived Usefulness of KMS Trusting Relationships Cooperative Norms Strong Ties Rewards, Training and Management Facilitation	Knowledge Sharing	+ + + + +
(13)	Hsu and Lin (2008)	On-Line Field Study	Perceived Usefulness Perceived Ease of Use Perceived Enjoyment Employee Attitudes Altruism Expected Reciprocal Benefit Reputation Trust Expected Relationships Social Norm Community Identification	Attitude towards KS Attitude towards KS Attitude towards KS Intention to KS Attitude towards KS Attitude towards KS Attitude towards KS Attitude towards KS Attitude towards KS Intention to KS Intention to KS	Not Direct + + + + Not Direct + Not Direct Not Direct Not Direct **+**
(14)	Iqbal *et al* (2010)	Conceptual Paper	HR Practices (i.e. Hiring Practices, Collaboration, Team Assignments, Reward Systems) Trust	Knowledge Sharing	**+** **+**
(15)	Jones *et al* (2006)	Empirical Qualitative Study	Basis of Truth and Rationality Motivation Orientation to Change	Knowledge Sharing (through ERP implementation)	+ +

			Orientation to Work Orientation to Collaboration Control, Coordination and Responsibility Orientation and Focus		Not Significant + + + +
(16)	Joy and Haynes (2011)	Case Study Analysis	Team Based Working Environments Mentoring	Knowledge Sharing	**+** **+**
(17)	Kim and Lee (2011)	Empirical Quantitative Study	Facilitating Conditions Social factors Affect Enjoyment in Helping Others Knowledge Self-Efficacy Anticipated Usefulness Anticipated Reciprocal Relationships	Knowledge Sharing	+ + Not supported + + + +
(18)	Kumar and Rose (2012)	Empirical Quantitative Study	Enjoyment in Helping Others Reciprocity Self efficacy Trust Pro-Sharing Norms Self-Image Organizational Reward	Knowledge Sharing	+ Not significant + + + Not significant Not significant
(19)	Kwok and Gao (2004)	Case Study Analysis	Rewards Personal Needs Altruism Reputation Linking Affiliation	Knowledge Sharing	+ + + + + +

(20)	Liao (2006)	Empirical Quantitative Study	Organization's Commitment to Learning Organization's Open-Mindedness Organization's Shared Vision Communication Trust	Knowledge Sharing	Not significant + + + Not significant
(21)	Liao (2008)	Empirical Quantitative Study	Reward Power Coercive Power Legitimate Power Reference Power Expert Power Trust	Knowledge Sharing	+ Not significant Not significant Not signifiant + +
(22)	Lin and Lee (2004)	Empirical Quantitative Study	Senior Managers' KS Intention Senior Managers' Attitudes towards KS Senior Managers' Subjective Norms Senior Managers' Perceptions of Behavioural Control	Knowledge Sharing (Corporate)	+ + + +
(23)	Lin (2007)	Empirical Quantitative Study	Employee Attitudes toward KS Expected Organizational Rewards Expected Organizational Rewards Reciprocal Benefits Reciprocal Benefits Knowledge Self-Efficacy. .Knowledge Self-Efficacy Enjoyment in Helping Others Enjoyment in Helping Others	KS Intensions Attitudes towards KS KS Intensions Attitudes towards KS KS Intensions Attitudes toward KS KS Intentions Attitudes toward KS KS Intentions .	+ Not significant Not significant + + + + + +
(24)	Lin and Joe (2012)	Empirical Quantitative Study	Flow Experience Interemployee Helping	Knowledge Sharing	+ +
(25)	Marks et al	Laboratory Experiment	Managerial Prompts	Knowledge Sharing	+

	(2008)		Group Identification Social Value Orientation		Not significant +
(26)	Michailova and Minbaeva (2012)	Case Study Empirical Quantitative Analysis	Organizational Values: Espousement Enactment Internalization of The Core Value of Dialogue	Knowledge Sharing	 + + +
(27)	Obembe (2012)	Case Study Empirical Qualitative Analysis	Personal Perceptions Considerations of Past Experience Prospective Engagements in Practice	Knowledge Sharing	**+** **+** **+**
(28)	Panteli and Sockalingam (2005)	Conceptual Paper	Trust Conflict		**+** **-**
(29)	Ryua et al (2003)	Empirical Quantitative Study	Attitude toward KS Subjective Norms Behavioral Control	KS Intention	**+** **+** **+**
(30)	Shin *et al* (2007)	Empirical Quantitative Study	Attitude toward Quanxi Collectivism Confucian Dynamism	Attitudes toward KS (Information)	+ + +
(31)	Teh and Sun (2012)	Empirical Quantitative Study	Job Involvement Job Satisfaction Organizational Commitment Organizational Citizenship Behavior	KS Behavior	+ + – +
(32)	Wang (2004)	Empirical Quantitative Study	Ethical Concerns Self-Interest Concerns	KS Intention	+ Not significant
(33)	Wang *et al* (2009)	Conceptual Paper	Personal Benefit from Contributions Lowering the Cost for KS	Knowledge Sharing	**+** **+**
(34)	Wasko and Faraj (2000)	Empirical Quantitative Study	Enhanced Reputation Enjoy Helping	KS Contribution	**+** Not Significant

			Centrality Self-Rated Expertise Field Tenurship Commitment Reciprocity		+ Not Significant Not Significant - -
(35)	Yanga and Farn (2009)	Empirical Quantitative Study	Affect-Based Trust Shared Value Internal Control Internal Control	Tacit KS Intention Tacit KS Intention Tacit KS Intention Tacit KS Behavior	+ - + Not significant
(36)	Zhang and Ng (2012)	Empirical Quantitative Study	Intention to KS Perceived Behavioral Control Attitude towards KS Subjective Norms Perceived Behavioral Control Over Knowledge	KS Behavior Knowledge Sharing Knowledge Sharing KS Intention KS Intention	+ Not significant + Not significant +

Table 2: **Ignorance classification – Detailed Findings**

No	Quote from employees	Classification*
(1)	*"I suppose I'm more of a people person […] I'm not really someone that interfaces with the screen. I do and in fact I'm looking at one now but it is a tool for me to pass information, not necessarily to learn from"*	<4>
(2)	*"In an organisation like ours, we tend to think that it's got lots of information and data stored on computers and we need to access that. I think, actually, what you need to do is maximise the use of knowledge, and the knowledge bit is actually stored in the people. So you need to know who to go to and have access to them"*	<1>
(3)	*"I think you have to go back to the human being to make it really work. Problem being is there are savings, you drop of all the people involved to try to make the system work and say you're actually going to be physically doing it rather than working on that digital cloud, you're actually going to be speaking with other people passing this information down, so human being; the human element"*	<1>
(4)	*"Try not to get rid of the human element, keep the human element in and it will work"*	<4>
(5)	*"Well it seems to me that it's one of those subjects that's almost going on in a dark room in the background, so at least raise the profile of it - what is it that we're trying to achieve, how are we going about achieving it, what will be the benefits, how can I contribute, how can I take from it. At the moment it's just KM, I'm not quite sure that people understand what that is. Is it just retention of documents? How do we start to retain people's experiences as well which may have a bearing on the piece of work that we're about to undertake? Do we have a robust knowledge/register of qualified people? It's all about people - it's knowing who to go and talk to"*	<1>
(6)	*"It needs to be more integrated with daily management. So maybe we could set some kind of objective around making sure that knowledge is not only captions stored but it's shared between the team"*	<2>
(7)	*"More up and down feedback just in general communications would help"*	<2>
(8)	*"When we have team meetings, there should be a part at the end of that where suggestions can be made and then they should be communicated back at the next one"*	<4>
(9)	*"I struggle a bit with this, because Knowledge Sharing across the company, I don't think it's done very well. We all go on to the main website and we can read the handbooks and the guidebooks and the templates and everything, but there isn't any database of perhaps Learning from Experience, things that tell people what's gone right, what's gone wrong. There isn't*	<3>

	anywhere that pulls our knowledge together"	
(10)	*"I'm not aware of any knowledge sharing tools […] The only tools that I really use are my own eyeballs looking down the list of assets"*	<3>
(11)	*"Because we are very busy at times, the opportunity for face-to-face networking within the business is not as active as it was. I personally think that its better when people have the opportunity to work and to share ideas through working through a common tread"*	<4>
(12)	*"I think lot of us struggled with that question around Knowledge Sharing and what those tools were, because we're not aware of any specific Knowledge Sharing tools"*	<3>
(13)	*"You would do a search, for example Knowledge Capture, and within our database it came up with 7640 results. And then I thought well, what's the point in Knowledge Capture process"*	<2>
(14)	*"If I want to find out what's going on in other business areas for sharing best practice, the searching methodology doesn't work on our main corporate site. If you saw that number of results there was no way you would have the time to scroll through the results"*	<2>

***** (1): ignorance of: subject matter experts;
(2): ignorance of KMS;
(3): ignorance of the corporate knowledge itself;
(4): need for interpersonal communications

B. Survey questions

Section 1: Basic details

1. Gender

   Male; Female

2. How old are you?

   Under 25; 25-30; 31-40; 41-50; Over 51

3. How long have you been affiliated with [the organisation]?

   Less than a year; 1 year; 2-4 years; 5-10 years; More than 10 years

4. What best describes your job role?

   Line Leader; Functional Director, or other Direct Report to the Chief Executive; Project Management Authority (PMA); Engineering Authority (EA); Capture Manager / Project Manager; Commercial Manager; Review Chairperson; [MD] Performance Excellence (PE); Business Leadership Team; Customer; Assessor; Project Technical Authority (PTA); Project Engineering Manager (PEM); Other (please specify) ...

5. In which area do you work?

   Please tick all that apply

   Military Air and Information (MAI); Naval; Land; Business winning; Security; Other (please specify) ...

6. What is your current location?

   Australia; India; Saudi Arabia; United Kingdom; United States; Other (please specify) ...

Section 2: Personal KM

1. In general, how frequently do you use the [corporate] LCM Intranet home page?

Daily; Weekly; Monthly; Quarterly; Yearly; Never

2. What LCM materials do you use?

   Guides; Handbooks; Templates; Training material; Other (please specify) . . . ; None

3. How often do you make use of the LCM materials?

   Daily; Weekly; Monthly; Quarterly; Yearly; Never

4. I tend to use the LCM materials when

   Setting up projects; Organising, chairing or performing phase reviews; Acting as assessors; Other (please specify) . . .

   Please rate your level of agreement with the following statements

5. LCM is applied well within [the organisation].

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

6. LCM is effective when applied.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

Section 3: Technology

1. When you are given a new piece of technology do you...

   Please tick all that apply

   Look forward to using it; Use it only when required; Become apprehensive about using it; Other (please specify) . . .

2. In general, do you feel the quality of the training you have received for using the LCM materials is?

   Excellent; Very Good; Average; Poor; Very poor

   Please rate your level of agreement with the following statements

3. Sufficient training or general information is provided about the LCM materials.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

4. I feel the benefits of new software/technology over the old are clearly explained.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

5. I believe that current [corporate] tools meet my working needs.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

6. I am given sufficient opportunity to give feedback on the suitability of the LCM materials that are provided.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

7. I am given sufficient technical support for the systems I use.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

8. Please state which knowledge sharing tool you think is the most effective.

   . . .

9. Please state which knowledge sharing tool you think is the least effective.

   . . .

10. Newly implemented systems live up to my expectations.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

11. In general, it is difficult to find the knowledge required to do my job.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

Section 4: Organisational Factors

1. In general, I feel I receive sufficient credit when sharing knowledge.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

2. I am given enough time to share knowledge.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

3. There are currently sufficient knowledge capture tools available within [the organisation].

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

4. I am given sufficient opportunity to meet and identify colleagues that have the knowledge I seek.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

5. I am given enough opportunity to meet and identify colleagues with a need for my knowledge.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

6. Which methods do you use to identify people with appropriate knowledge?

E.g. asking people/personal network, phone directory, Google, wiki, [corporate] portal, email, discussion forums, etc

...

7. I have benefited through sharing knowledge with others (including receiving knowledge from others).

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

8. In your opinion what are the downsides of knowledge sharing?

   ...

9. I share knowledge outside my immediate area of expertise.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

10. [The organisation] has made its knowledge sharing goals clear.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

11. I am encouraged to share knowledge by management?

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

12. Sharing knowledge outside my projects is part of my work process.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

13. I find it easy to share knowledge.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

14. There are enough formal opportunities (e.g. within meetings) to share, generate and reflect on new knowledge.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

15. There are enough informal places (e.g. coffee rooms) to share, generate and reflect on new knowledge.

    Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

Section 5: Rewards/Recognition

1. Do you know of any reward schemes to encourage the sharing of knowledge within [the organisation]?

   Yes; No; Not sure; If yes, please specify ...

2. The Operational Framework at [the organisation] supports Knowledge Sharing.

Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

3. If Knowledge Management was included within a yearly review process, I would spend more time developing my skills in 'Knowledge Sharing'.

   Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree

Section 6: Comments and Feedback

Thank you for completing this survey. Please provide your e-mail address below if you would be willing to be contacted for an interview or if you would like us to contact you regarding this survey.

Email: . . .

C. Interview questions

Section A: Knowledge Management dynamics

1. What is your understanding of the purpose of [KM] LCM? Does the information available support this view?
2. Can you give any examples where you felt that the information you received on LCM was inaccurate or incomplete in the last 6 months?
3. Is there something you want to know but still don't know [regarding your [KM] LCM experience]? Give examples... In your attempt to get information out of the LCM materials, are you getting the information you need from other sources, colleagues, line managers, etc.?
4. Can you name the 3 most important areas of interest for you using the LCM website?
5. Does [KM] LCM add value? (How or Why not?)

Section B: Tools and systems

1. Could you propose any improvements on the tools <based on the answers provided in the survey>?
2. What suggestions do you have for improving your training (related to quality)?
3. Would you like to see an application where you could input cost-saving ideas for [the organisation]?
4. Could you suggest any new methods/practices/tools that would provide sharing opportunities?

Section C: Knowledge and lifecycle management strategies

1. What suggestions do you have to communicate more effectively our capabilities/benefits?
2. Knowledge sharing goals: What would you like to see in the KM agenda/portfolio for the following years (a) for your department (b) for the organization as a whole.

3. The survey findings suggest that employees think that KM should be included within a yearly review process. Why do you think this might be?
4. Have you got any suggestions on how the implementation of Knowledge Management could be improved within [the organisation]?