The Impact of Organisational Climate on Information Communication Technology Support for Knowledge Management: An Exploratory Case Study

By

Ibrahim Dawoud

Thesis submitted in fulfilment of the requirements for PhD in Management

City University, London

Faculty of Management

Cass Business School

May 2010

THE FOLLOWING HAVE BEEN REDACTED AT THE REQUEST OF THE UNIVERSITY

PAGE 12 FIGURES 2.1 AND 2.2

PAGE 13 FIGURE 2.3

QUESTIONNAIRE ON PAGES 237-243

بسم الله الرحمن الرحيم

قال الله تعالى

"يَا أَيُّهَا النَّاسُ إِنَّا خَلَقْنَاكُمْ مِنْ ذَكَرٍ وَأُنْثَى وَجَعَلْنَاكُمْ شُعُوبًا وَقَبَائِلَ لِتَعَارَفُوا إِنَّ أَكْرَمَكُمْ عِنْدَ اللَّهِ أَتْقَاكُمْ إِنَّ اللَّهَ عَلِيمٌ خَبِيرٌ " (سورة الحجرات , آية : 13)

O mankind! Indeed We have created you from male and female, and made you peoples and tribes, that you may know one another. Indeed, the most noble of you in the sight of Allah is the most righteous of you. Indeed, Allah is Knowing and Acquainted. *(Quran, 49, 13)*

List of tables

List of figures

Acknowledgements

This and every other stage in the course of my development through life would not have been possible without the help, blessing and mercy of ALLAH, the most beneficent, the most merciful; all success is from Him and all praise is due to Him.

Boundless appreciation to my lovely and caring mum who has always prayed for my success; to my late father who was always extremely kind, always encouraged me to set as good an example as possible, and wished me the very best all my life. May ALLAH rest him in eternal peace in heaven.

My special gratitude to my wife for her patience, understanding and encouragement. And to my children for their patience and moral support, especially during the times I have had to be far from home. I am also eternally grateful to my brothers, sisters, relatives and friends for their concern and good wishes.

Over the course of my PhD, there have been a number of people who have contributed significantly to this research. First and foremost my genuine and sincere appreciation goes to my supervisor Professor Clive Holtham for being a boundless ocean of inspiration and motivation, and also to my second supervisor Dr Martin Rich for his productive feedback and support throughout the course of this study. Furthermore, everyone who has contributed to the study either by reviewing or giving feedback is always appreciated.

I thankfully acknowledge the help of the members of the viva panel who kindly took the time out of their busy schedules and agreed to be involved in the panel, and I am also grateful to the school for funding the SOQ measurement which was used solely for the purpose of this research project. My thanks extend to their representative in the UK, Mr Andy Wilkins, who offered his help and time with the SOQ analysis. I also appreciate the support given by the British Library in offering better access to a wide range of information and in providing assistance to me as a regular reader. My special thanks to the participants of the study for their time, efforts and valuable information which helped in completing this study. I hope this work might be of use to them.

Finally, I am forever indebted and thankful to my country, Saudi Arabia, for sponsoring and taking care of me. I sincerely hope to fulfil all her expectations.

Declaration of authorship

To the best of my belief and knowledge, I hereby state that this piece of work has not been submitted for any degree in any institution or university anywhere. Where sources of information have been presented in this study, they have been acknowledged in the thesis itself.

Signed .....

Date .....

Abstract

Knowledge management (KM) has emerged as a vital concept for improving organizational performance through better use of knowledge and for minimizing the loss of valuable knowledge when employees leave. Information communication technology (ICT) is often seen as a key enabler of KM. However, ICT alone cannot make organizations more 'knowledgeable'; nor can it create the necessary trust and interpersonal environment necessary to achieve an optimally effective network. Thus, KM 'solutions' may fail to meet their expectations. Much of the literature in this field addresses the question of why the relationship between ICT and KM is so problematic. Many authors identify 'culture' as the most significant barrier to effective KM implementation. Only a few authors identify the right organizational 'climate' as the key to persuade people to create, reveal, share and use knowledge. However, too little attention has been paid to the impact of climate on technological support for KM; hence, the objective of this study is to explore the relationships between organizational climate, ICT support and KM.

This study utilizes a mixed method that would capture an 'overall picture' of knowledge management in the case of one Saudi Arabian organization. While chiefly a qualitative study, quantitative data were used to assist in answering the research question that concerned the diagnosis of organizational climate. Because our understanding of the development of knowledge management is incomplete, particularly in the context of Saudi Arabia, the research reported here is exploratory in nature.

At the heart of this thesis is a detailed analysis of the overarching aim of this study: to examine the impact of the organizational climate on information communication technology support for knowledge management. This issue is of considerable importance for the contemporary business environment and practice. The empirical investigation focuses upon the extent and utility of knowledge management activities and information communication technologies in an R&D centre located in Saudi Arabia. This investigation was supported by a survey that asks respondents to reflect

on their current work climate, and to elaborate on their perceptions of the climate regarding knowledge management activities. Of 150 people who were invited to take part, 77 participants completed the questionnaire in 2007. Alongside this, 34 interviewees took part in the qualitative semi-structured investigation; the interviews were carried out to explore the research question above in more depth. In 2008, an additional 17 semi-structured qualitative interviews were undertaken with the aim of understanding in further depth the impact of organizational climate on information communication technology support for knowledge management. This brought the total number of interview participants to 51.

The empirical findings of this study indicate that organizational climate plays an important role in affecting the dynamics and ease of access of knowledge management initiatives through the use of ICT support. This can be done by shaping employees' attitudes, behaviour and feelings, which characterize life in the organization. Results also identify the methods through which ICT supports knowledge management. Based on the findings, the results of this study further suggest some improvements for knowledge management practices. This study provides a better understanding of the relationship between organizational climate, information communication technology and knowledge management practices.

Chapter 1

Introduction

Introduction

This chapter will introduce the background to the study and consider the problem under investigation. It then provides an overview of the research questions, followed by the study objectives, rationale and methodology employed for the study. It also demonstrates the significance of this study. Towards the end an outline of the research is given.

1.1 Background to the research problem

While the modern world often appears increasingly impersonal, in those areas where knowledge really counts, people count more than ever. (Brown and Duguid, 2002, p.121)

In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge. (Nonaka, 1998, p. 96)

The complexity and speed of work which takes place in business environments is often described as turbulent, chaotic and rapidly changing. US President Kennedy once said, 'In a time of turbulence and change, it is truer than ever that knowledge is power' (Daniels, 1994, p.110). Knowledge is seen as critical to an organization's high performance since it offers the basis for sustaining a competitive advantage (Drucker, 1993; Von Krogh et al., 1996; Oldham, 2003; Hunter et al., 2005) and might be the ' only source of advantage for business organisations in the future given that , unlike all other sources , knowledge is endogenous to the company and cannot be copied' Magalaes, (1998, p.87)

Interest in knowledge as the source of a firm's competitive advantage has a long history in several disciplines (Ichijo and Nonaka, 2007). For example, in the field of management, Peter Drucker was the first person to use the term 'knowledge worker',

back in 1959, in his book *The Landmarks of Tomorrow*. Knowledge workers include those in the informational technology field (Ichijo and Nonaka, 2007). Drucker further believed that 'knowledge is *the* primary resource for individuals and for the economy overall' (Drucker, 1992).

The early years of knowledge management (KM) spanned the period from approximately 1992 until 1998 (Prusak and Weiss, 2007, p.32). Since then, knowledge management has become a burning issue among academics, public policy makers, consultants and business people (Hislop, 2009; Ichijo and Nonaka, 2007). Numerous conferences and articles in scholarly and business journals have focused on this subject (Davenport and Prusak, 2000). Knowledge management has emerged as one of the most influential organizational practices of performance improvement (Benbya, 2008).

Within organizations, there is a growing conviction that knowledge is critical not just to business success but also possibly to business survival (Davenport and Prusak, 2000, p. xviii), which in turn has encouraged many organizations to invest in information and communication technology (ICT) specifically to support knowledge management (Davenport et al., 1998; Ruggles, 1998; Alavi and Leidner, 2001; Brown and Duguid, 2000; Brown et al., 2005).

There exists a great deal of literature discussing the exploitation of knowledge and how it can be effectively facilitated through the use of technological tools (e.g. O'Dell, 1997; Alavi and Leidner, 1999; Zack 1999; Skyrme and Amidon, 1999; Swan et al., 1999; Davenport and Prusak 2000; Bhat, 2001; Hendriks, 2001; Nongkran, 2004; Freck, 2005; Song, 2006; Ichijo and Nonaka, 2007; Butler and Murphy, 2007; Loos et al , 2008; Goh and Hooper, 2009; Hislop, 2009).

Information and communication technologies (ICTs) are increasingly powerful, pervasive and globally spread and can offer a great opportunity to support knowledge (Walsham, 2002). However, many tools designed to support KM appear not to have gained permanent acceptance within organizations, which suggests that the leveraging of knowledge through ICTs is hard to achieve (McDermott, 1999; Walsham, 2002; Huysman and Wulf, 2006). Such ICTs can offer effective support for human

knowledgeability (Walsham, 2002), but experience of these tools' design may lead to negative perceptions and may be the consequence of taking a managerial, individual or technology-oriented perspective only (e.g. Davenport and Prusak, 1998; Huysman and de Wit, 2002; Malhotra, 2004; Butler and Murphy, 2007).

Davenport (2005) argues that it is well known that 'spending on new technologies, and overall productivity, have both risen'. Despite this, little is known about how knowledge workers use these technologies and what the specific needs of those people are (Davenport, 2005, p. 85). Knowledge management is inherently people-based (APQC, 1997), and ignoring this fact can lead to resistance to the use of these technological tools (Hickins, 2000; Huysman and Wulf, 2006). Furthermore, technology alone cannot make organizations more 'knowledgeable'; nor can it create the trust and interpersonal environment necessary to achieve an optimally effective network (Davenport and Prusak, 1998; Hasanali et al., 2002). Knowledge, as Ruggles (1997b, p.14) suggests, 'is very personal, while technology can be very cold and, by its very nature, calculating'. This discussion suggests that linking ICT to knowledge management is anything but an easy task (Hendriks, 2001). That might be because '[t]he complexity of human factors to be managed was much greater than for most data or information management projects. And unlike data, knowledge is created invisibly in the human brain' (Davenport, Long and Beers, 1999, p.105).

While much of the literature in this field addresses the question of why the relationship between ICT and knowledge management is so problematic, many authors (e.g. DeLong and Fahey, 2000; Sveiby and Simons, 2002; Kayworth and Leidner, 2003; Alavi et al., 2005) have identified culture as the most significant barrier to effective KM implementation This is true. Yet Arab culture, on which this research has been focused, is different from the cultures of Western nations (Hofstede, 1997; Glisby and Holden, 2003). For example, Nonaka and Tkeuchi's SECI model (socialization, externalization combination and internalization) doesn't *necessarily* translate into the Arab world, according to Hutchings and Weir (2006), and nor should it be assumed to be irrelevant to the literature and practice of knowledge management cross-culturally. Certainly knowledge management works differently in the Arab world, as a result of cultural differences (Hutchings and Weir, 2006).

However, while culture is usually long-term and strategic and is very difficult to change, climate, on the other hand, is often transitory, tactical and manageable over the relatively short term, as Schwartz and Davis (1981. p.33) suggest. Denison (1996), who echoes Schwartz and Davis's view, argues that climate denotes those aspects of organizational environments which are rooted in each organization's value system and may be considered as relatively temporary. Akkermans et al., 2008; Isaksen and Ekvall, 2007, usefully summarised that while culture constitutes what the organization values, climate is what organization members experience (this is discussed further in section 3.4) Section 3.4 below goes into fully referenced details about the culture/ climate distinctions. In order to aid understanding for the earlier pages of this document here is a very brief unreferenced summary of 3.4

'Whatever culture is, it is not climate ' 'One way to understand culture is to understand what it is not' 'Cultural researchers are more concerned with the evolution of social systems over time. Climate researchers are more concerned with the impact that organizational systems have on groups and individuals.' 'Talking about culture is talking about beliefs and values, and these go to the very soul of the organization and its people. It is therefore much easier to change the climate and language of the business.'

In recent years there has been increasing general consensus among researchers that a climate encouraging creativity is an important factor contributing to the innovation and creativity of an organization, and increasing interest in the organizational climate (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar; 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007). Recent developments in climate studies have highlighted the need to explore the impact of organizational climate on ICT support for KM, as this area has been less well researched. Not only that, but also because 'the right organizational climate can persuade people to create, reveal, share, and use knowledge' (Davenport, Long and Beers, 1999, p.105).

Thus, it is becoming increasingly difficult to ignore the effect of organizational climate. Hence, this thesis will address this problem by exploring the impact of organizational climate on information and communication technology support for knowledge management. More precisely, the researcher seeks to address the aspects

that operate either to help or hinder the use of ICT to support knowledge management. The research questions are listed in the following section.

1.3 Research questions and purposes

This study aims to understand the impact of organizational climate on information communication technology support for knowledge management. The brief related literature review in section 1.2 above reveals that organizational climate can have either a positive or negative impact on the practices of knowledge management. Therefore, the study will examine what impact organizational climate might have on knowledge management. At the same time, it will explore what kinds of information communication technological tools are applied to support information that fuels knowledge within a Saudi research and development organization. Simultaneously, this study investigates what needs to be done to improve knowledge management practices from the participant's perspective. It aims to explore the overarching question, *what is the impact of organizational climate on information and communication technology support for knowledge management?* More specifically, this research question includes three sets of sub-questions, specified as follows:

RQ1 How is information communication technology support for knowledge management influenced by organizational climate? This question has a subsidiary question: what does the organizational climate look like?

The first research question is explorative in nature. It will study what effects organizational climate has on information communication technology tools as applied to R&D operations involving knowledge. At first, a diagnosis of the organizational climate can help provide an overview of this climate. This in turn can help capture the daily activities of the employees with regard to knowledge management within a certain organizational climate.

RQ2 How is information communication technology used or not used within knowledge management?

The second research question is also explorative. Although the study is not concerned about particular tools, it will explore what methods are currently used or not used to manage knowledge. This will help identify the tools that are applied to manage knowledge, since information communication technologies must be coupled to an existing climate to work effectively and provide user satisfaction. It will also look at what methods would be considered desirable.

RQ3 How can knowledge management be developed and improved?

This third and final research question is again exploratory in nature. It will explore how knowledge management can be developed, and what barriers to the implementation of knowledge management exist. Based on this insight the researcher will seek ways to improve knowledge management as it is perceived by participants.

1.4 Research objectives

The overall objective of this research is to better understand the role of organizational climate in ICT for knowledge management. A better understanding of this role will help facilitate the usage of ICT in knowledge management activities. In seeking to gain an insight into the questions defined above, this research employs a case study to examine the situation of knowledge management in R&D. The researcher employed a mixed method of data collection to gather the data needed to meet the three objectives stated below:

A- to gain a better understanding of how information and communication technology support for knowledge management is influenced by organizational climate;

B- to identify how information communication technology is used or not used within knowledge management;

C- to ascertain ways in which knowledge management can be developed and improved from the participants' perspective.

1.5 Research rationale

This research utilizes a Situational Outlook Questionnaire (SOQ) to examine the organizational climate in which information communication technologies are operated to manage knowledge. The SOQ measure has been used by over a hundred organizations, many of which are Fortune 500 companies. The SOQ provides a snapshot of the R&D centre's knowledge management climate. Research (as discussed in the earlier section, 1.2, and discussed further in sections 3.4 and 3.4.1) shows organizations with a healthier working climate achieve higher levels of interaction and flexibility. This in turn can help ICT users to support the knowledge management process. Furthermore, the SOQ will assist a better understanding of the role of ICT in knowledge management activities within the organizational climate.

The organizational climate with its nine dimensions (introduced in Chapter 4) will help provide a better understanding of the climate factors that either help or hinder the management of knowledge. The research will have implications for the practical application of ICT in knowledge management within the R&D centre. The exploration of the role of the organizational climate in the utilization of ICT in knowledge management will provide support for organizations seeking better use of ICT to support knowledge management. The review of current usage of ICT to support knowledge management will identify the applicability of the tools that are used and suggest ways to improve knowledge management practices in the context of ongoing organizational climate.

1.6 Research methodology

In order to achieve the research objectives as stated above and to get a better understanding of current knowledge management practices within R&D, this research employs a case study method (discussed in Chapter 4). This case study relies on a mixed-method technique to gain insight into the use of ICT to support knowledge management within the climate context. In this research a mixed method was used as follows:

1) The SOQ survey was conducted as described below:

Out of 150 employees, 77 participants completed the questionnaire. The SOQ has two parts; the first part composed of 53 statements that ask respondents to reflect on their current work climate, selecting from a four-point scale. The second part contains three short-answer questions; these questions provide participants with an opportunity to elaborate on their perceptions of the climate as regards knowledge management activities.

2) The qualitative method involved interviewing 51 participants as follows:

In 2007, 34 interviewees took part in the qualitative semi-structured investigation; the interviews were carried out to explore in more depth two questions: (a) 'How does information communication technology participate in knowledge management activities?' and (b) 'How can knowledge management be improved?'

In 2008, an additional 17, semi-structured qualitative interviews were undertaken with the aim of understanding in greater depth the impact of organizational climate on information communication technology support for knowledge management.

A thorough discussion of the methodology used is given in Chapter 4.

1.7 Significance of the study

This study will provide a contribution to the growing knowledge pool on knowledge management. It is crucial to promote the practices of information communication technology to aid knowledge management within the context of organizational climate, which in recent years has increasingly been seen as a factor contributing to the innovation and creativity of an organization (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar; 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007).

Linking ICT to KM is acknowleged as 'anything but an easy task' (McDermott, 1999; Hendriks, 2001; Walsham, 2002; Huysman and Wulf, 2006), and only the appropriate organizational climate can help ease this difficulty (Davenport et al., 1999, p.105).

Yet there is little known about this important factor. Thus the significance of this research lies in the investigation of how knowledge management activities are carried out, and how ICT is used (or not used) within knowledge management activities within the context of organizational climate.

Furthermore, the data from this study can be of benefit to academics and practitioners alike, since it provides an insightful look into the role of organizational climate and its impact on ICT support for KM. It will provide a valuable guide to effective use of knowledge management supported by ICT. For example, this will help in identifying those factors that are likely to be crucial to the success of knowledge management.

The discussion so far has provided an introduction to what the thesis is about, followed by the research questions, objectives, rationale and methodology. It has also outlined the significance of the study. There now follows an outline of the research.

1.8 Overview of the thesis

This thesis contains seven chapters, as shown in Figure 1.1. Chapter 1 offers an overview of the research and of the organization of the thesis. It commences with an introduction to what the thesis is about followed by the research questions, objectives, rationale and methodology. It also outlines the significance of the study.

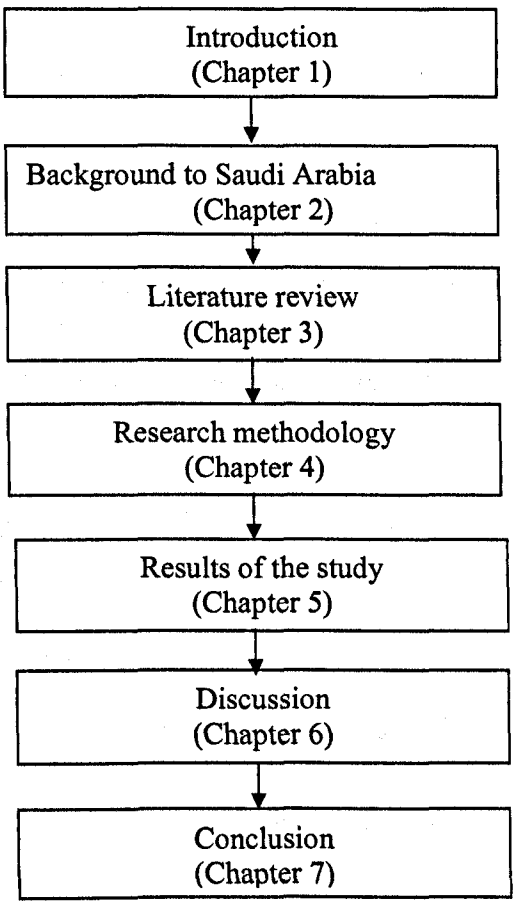
Chapter 2 examines the background to the research setting (Saudi Arabia). It starts with a profile of Saudi Arabia, then touches on Islamic culture and knowledge. After this there is a focus on Saudi culture, ICT and knowledge. Towards the end, the development of the study is discussed.

Chapter 3 provides a review of the existing literature related to knowledge management, and the use of information and communication technologies in the context of organizational climate.

Chapter 4 specifies the research methodology, methods for data collection and analysis procedures used in the study. In this chapter, a statement of purpose is drawn up, followed by the research design, which involves an examination of the

philosophical assumptions, the strategy of inquiry and the specific methods used in this study. The approach to data analysis is also explained in detail and the integrity of the data is discussed. Chapter 5 amounts to a report of the results of the case study. It commences with the SOQ result followed by the qualitative outcome. In this chapter an outline of the results of this study are presented in themes that either emerged through the literature of Ekvall (e.g. challenge and involvement, freedom, etc.), or through the data collected.

Figure 1.1: The structure of the thesis



Chapter 6 is a discussion of the themes that emerged with regard to the existing literature. Implications of the results and conclusion are demonstrated.

Chapter 7 provides a conclusion containing a summary of the main findings, contributions, and main implications. Limitations and recommendations, strengths and weaknesses, and a final note are also included.

Chapter 2

Background to Saudi Arabia

2.1 Introduction

The research took place in Saudi Arabia, the home of Islam's most holy shrines, a country that is always believed to be 'ultraconservative' and which is often represented in Western media by means of negative stereotypes. Therefore it is of great importance to provide the reader with some information that might help cultivate an understanding and appreciation of its different culture.

There follows some brief background information on the research setting. This commences with a profile of Saudi Arabia, then touches on Islamic culture and knowledge. After this there is a focus on Saudi culture, ICT and knowledge. Towards the end the development of the study will be described. This section discusses identification of the topic of research, the motives and ethics of the study, and the completion of the fieldwork.

2.2 Saudi Arabia: Profile

Saudi Arabia is 'the land of the two holiest places in Islam: Masjid Al-Haram and Masjid Al-Nabawi, in Makkah Al-Mukaramah and Al-Madinah Al-Munawarah respectively, shown in Figures 2.1 and 2.2. Geographically speaking, Saudi Arabia is a large but sparsely populated country, which comprises almost four-fifths of the Arabian Peninsula, an area approximately one-third the size of the United States. Geographically, it is situated in the south-western part of Asia (Royal Saudi Embassy, London, 2007), as illustrated in Figure 2.3. 'Saudi Arabia is the 13th biggest nation [by area] in the world. Most of the territory is desert or semi-desert plateaux. The two largest cities in the country are Riyadh, the capital, and Jeddah, the main port and commercial centre' (*Telegraph*, 2006).

Figure 2.1: Masjid Al-Haram in Makkah (Mecca)

Figure 2.2: Masjid Al-Nabawi in Al-Madinah Al-Munawarah (Medina)

The development of the oil industry and the wealth it brought changed Saudi life dramatically. The government used oil profits to improve housing and provide

electricity and other modern conveniences for the people. The BBC (2007) has described Saudi Arabia as having 'emerged from being an underdeveloped desert kingdom to become one of the wealthiest nations in the region'.

Figure 2.3 Saudi Arabia: location

(Source: worldatlas.com; Information Office of the Royal Embassy of Saudi Arabia in Washington, DC, 2010)

According to the Saudi Arabian General Investment Authority (Sagia, 2007), a report issued by Milken International Corporation in February 2007 classified Saudi Arabia in the first rank worldwide with respect to the 'total economic environment' (e.g. the environment's capacity for project management and financing). The Milken report focuses on the low and stable interest rates, low inflation and low taxes, compared with international standards. Saudi Arabia is also a member of G20 of the world's most powerful countries (BBC, 2009). Table 2.1 below summarizes some important aspects of life in Saudi Arabia.

Table 2.1: Saudi Arabia: Basic facts

Country	• Official name: Al-Mamlaka Al-Arabiyya Al-Saudiyya (Kingdom of Saudi Arabia) • Capital: Riyadh • Terrain: Mostly uninhabited, sandy desert • Area: (2,250,000 km^2) • Climate: Harsh, dry desert with great extremes of temperature
People	• Estimated 2006 population: 26,292,000 • Population density: 32 persons per sq. mi. (12 per km^2) • Population distribution: 86% urban, 14% rural • Life expectancy (yrs): Male = 71, Female = 73 • Doctors per 1,000 people: 1.4 • Percentage of age-appropriate population enrolled in the following educational levels: Primary = 67, Secondary = 67, Further = 25 • Ratio of girls to boys in primary and secondary education: 101:100 (2005) • Literacy rate, adult total (% of people aged 15 and above): 79.4 (2006) • Language spoken: Arabic (official) • Religion: Islam
Economy	• Currency: Saudi riyal • Gross domestic product (GDP) in 2004: US$310.2 billion • Real annual growth rate (2003–04): 5% • GDP per capita (2004): US$12,000 • Goods exported: Petroleum and petroleum products • Goods imported: Machinery and equipment, foodstuffs, chemicals, motor vehicles, textiles • Trading partners: United States, Japan, South Korea, Germany, UK
Technology	• Radios per 1,000 people: 326 • Televisions per 1,000 people: 265 • Computers per 1,000 people: 130.2 • Mobile services per 1,000 people: 810

(Adapted from World Bank and UN sources, 2007; Saudi Ministry of Foreign Affairs, 2010)

2.2.1 Culture and knowledge

When you need to transfer knowledge, the method must always suit the culture. (Davenport, 1998)

The world we live in is becoming increasingly globalized, but globalization does not imply homogeneity of culture (Walsham, 2001). 'Implementing an information system developed in one national culture for use in another national culture may present its own set of unique problems' (Shore and Venkatachalam, 1996). In working

in the contemporary world, there is a need to make extra efforts to tackle cross-cultural issues. This should lead not only to more effective business practices in areas such as information and communication technologies outsourcing but also to a world of increased cultural understanding (Walsham, 2001; Sahay and Walsham, 2004), as knowledge management requires a culture that values and fosters knowledge development (Prusak, 1992). Hence, there is a need to understand the cultural context in which knowledge management programmes are taking place.

Hutchings and Weir (2005) highlight the importance of cultural differences and argue that, for example, in the Arab world the sharing of knowledge cannot be taken for granted outside the context of a culture where trust plays a major role. Similarly, Al-Alawi et al. (2007) investigate the role of certain factors in organizational culture – such as interpersonal trust, communication between staff, information systems, rewards and organizational structure – that also play important roles in knowledge sharing. As religion plays the central part in determining the cultural conditions for knowledge in Saudi Arabia, it is therefore very difficult to separate religion and culture, as they are closely interconnected (Foucault and Carette, 1999). We thus need to touch briefly on the influence of Islam in the Islamic world and beyond.

The Islamic world has for centuries influenced its neighbours. Following the collapse of the Roman, and then the Byzantine empires, Islamic science, medicine and commerce flourished. Knowledge and trade routes intertwined, with knowledge passing via Muslim scholars to Europe and beyond. Great cities like Baghdad and Alexandria flourished as great centres of learning, along with the colonies in Spain and Portugal, where the Arabic legacy in architecture is still in evidence (PBS, 2001). Modern science owes a great deal to the early efforts of the great Muslim scientists and thinkers (Schulte and Al-Fehaid, 2004).

Islam is said to be the world's fastest-growing religion, according to a report of the Pew Forum on Religion and Public Life in October 2009. The global Muslim population stands at 1.57 billion (MSNBC, 8 October 2009) and the Islamic community is itself growing in economic and political influence, which is likely to have a global impact. Haq and Smithson (2003), for example, point out that there were more than 250 Sharia-compliant mutual funds managing an estimated $300

were more than 250 Sharia-compliant mutual funds managing an estimated $300 billion. This was an increase from some $800 million in 1996 (Visser, 2009). The *Financial Times* reported that according to measurements by HSBCI, Islamic banking assets had risen by 28.6 per cent in 2009, to $822 billion, compared to just 6.8 per cent at conventional banks. Islamic finance is thought to be one of the fastest-growing sectors of the global financial system (Wigglesworth, 2009).

Islam plays a pivotal role in the Saudi culture in which this research was conducted. It is therefore important to establish what Islam means. The religion of Islam is the acceptance of and obedience to the teaching of God, which He revealed to his Prophet and messenger Muhammad. Islam is a religion of mercy. The holy Qur'an states: 'And We have sent you (O Muhammad): not but as a mercy for *'Âlamîn* (all that exists)'. 'Islam is a religion of submission to God's will. It is meant to be the latest and the most complete of the monotheistic religions, after Judaism and Christianity. A Muslim is simply a person who testifies that there is no God but God (ALLAH), and Muhammad is His Messenger and fulfils the ritualistic duties of prayer, fasting, pilgrimage (once in a life if possible) and Zakat (the due incumbent upon Muslims to the poor) (Brown, 1989, p.606)' (Haynes, 1999).

However, the practice of Islam is sometimes manipulated by its own followers, who do not read Islam ultimately as a peaceful way of life and deliberately destroy its image as 'a peaceful religion'. For example, I was sickened to learn that a British couple were kidnapped by pirates in Somalia and threatened with death if they did not pay the ransom: the pirates, unfortunately, were described as being an 'Islamist group' (BBC, 21 November 2009). These pirates, in 2008, also hijacked a giant Saudi tanker, the *Sirius Star* (*Guardian*, 27 November 2008), which was meant to be owned by a Muslim country – a factor that proved no obstacle to their conduct.

There is no dispute concerning the notorious and heinous crimes that killed innocent people in the USA on 11 September 2001, nor concerning those that killed innocent people in the UK on 7 July 2005. Evidence to the contrary of what the extremists espouse is found in the form of terrorist attacks on numerous predominantly Muslim countries. In Saudi Arabia in 1979, a similar type of massacre took place in the holy

mosque in Makkah in which hundreds of innocent Muslims were killed. This was repeated in 1987, 1999, 2003, 2004, 2005, 2006, 2007, 2008 and 2009.

Under no circumstances can these inhumane crimes be justified, given that killing innocent people is one of the major sins. While Islam is absolutely unconnected with such acts, Harding (2005) suggests that 'the West's image of Islam has been hijacked by extremists. Things are being done in the name of religion, but it's not good enough for the media to describe them simply as Islamic'. Armstrong (2005) argues that 'We rarely, if ever, called the Irish Republican Army (IRA) bombings "catholic" terrorism because we knew enough to realise that this was not essentially a religious campaign' (Armstrong, 2005).

'To cultivate an inaccurate prejudice damages the tolerance, liberality, and compassion that are supposed to characterise Western culture' (Armstrong, 2006, 18). This abbreviated understanding of Islam highlights the need to approach this culture in a balanced way. One cannot afford to confuse acts of terrorism with Islamic culture any longer because such crimes have nothing to do with religious observance. Rather, they constitute the tools for which a movement rooted in political ambition 'accomplishes' its aims. In the holy Qur'an, (the first sacred source in Islam) ALLAH says: 'if anyone killed a person not in retaliation of murder, or (and) to spread mischief in the land – it would be as if he killed all mankind, and if anyone saved a life, it would be as if he saved the life of all mankind' (Qur'an 5: 32).

In the authentic *hadeth* (Prophet's saying) in relation to killing innocent people or those who deal with Muslims, the Prophet said 'whoever has killed a person having a treaty with the Muslims shall not smell the fragrance of paradise, though its fragrance is found for a span of forty years'. He listed murder as a major sin. Muslims are also encouraged to be kind to animals; the Prophet once said: 'A woman was punished because she imprisoned a cat until it died. On account of this she was doomed to Hell. While she imprisoned it, she did not give the cat food or drink, nor did she free it to eat the insects of the earth.' When the Prophet was asked: 'Messenger of God, are we rewarded for kindness towards animals?' he said, 'There is reward for kindness to all living animals or humans' (see www.islam-guide.com). This is what Islam says about killing innocent people. 'The true Islamic values are peace, reconciliation, and

forgiveness; it also states firmly that there must be no coercion in religious matters' (Armstrong, 2005).

'Because it is recognized that the terrorists in no way represent mainstream Islam, some prefer to call them Jihadists, but this is not satisfactory. Extremists and unscrupulous politicians have purloined the word for their own purposes, but the real meaning of Jihad is not 'holy war' but 'struggle' or 'effort'. Muslims are commanded to make massive efforts on all fronts – social, economic, intellectual, ethical and spiritual – to put the will of God into practice. An oft-quoted tradition has the Prophet Muhammad saying after a military victory 'we are coming back from lesser jihad (ie the battle) to a greater jihad, the far more important, difficult and momentous struggle to reform our own society and our own hearts' (Armstrong, 2005). Nor do terrorists represent what is called Wahabism.

A professor of political science at the University of Vermont warns about the dangerous trend of linking Wahabism with terrorism, explaining that this phenomenon is not Saudi or Wahabi in any exclusive sense. He goes on to say it is part of the Zeitgeist of the whole Muslim world right now (Leupp, 2003; Oliver, 2002). Wahabism's founder Muhammad ibn 'Abd-al-Wahab (1691–1787) was not the godfather of contemporary terrorist movements; rather he was a voice of reform reflecting mainstream eighteenth-century Islamic thought. His vision of Islamic society was based upon a monotheism in which Muslims, Christian and Jews were to enjoy peaceful co-existence and cooperative commercial and treaty relations (DeLong-Bas, 2004).

On the other hand, Islam attaches great importance to knowledge as well as wisdom. For more than 1400 years in the holy Qur'an, wisdom has been regarded as one of the greatest gifts humankind can enjoy. This can be seen in a number of verses such as: 'He gives wisdom unto whom He will, and he unto whom wisdom is given, he truly has received abundant good. But none remember except men of understanding' (Qur'an 2: 269). And Surah ('Chapter') 31 is named 'Luqman' after a wise man on whom God had bestowed wisdom. The man is held up as an example in contrast to other kinds of people who are mentioned at the beginning of the Surah, who speak without knowledge and mislead people through corrupted discourse.

In many verses in the Qur'an, many Prophets are described as wise or are given wisdom as a grace from God. For example, in Surah 3 'Aal-Imran' (the Family of Imran), it is mentioned that Christ Jesus the son of Mary will be taught the Book and the Wisdom and the Torah and the Gospel (verse 48). On the other hand, the word knowledge ('*ilm*' (learning) and its derivatives) is mentioned 811 times, according to Arfaa and Sadeq (2007 cited in Kaleem, 2009). The author did a search for the incidences of the word 'knowledge' *per se* and the total number was 443 (quranexplorer.com: 19 November 2009, 12:29). Kaleem (2009) notes that the Qur'an considers the quest for new knowledge to be equal to faith in any Muslim and quotes this verse: 'My Lord! Increase me in knowledge' (Qur'an 20: 114).

It has been further ordained that those who know and those who do not know cannot be equal. In Islam, the responsibilities of a person who knows and can observe and think for himself have been laid down as greater than those of someone who does not know and cannot contemplate. Therefore, the responsibilities of the scholar or scientist, who is trained to be knowledgeable, as well as observant and rational, are far greater than the ordinary citizen in preserving peace and harmony in this world (Kazi, 1988).

Thus, knowledge is learned and mastered by the individual, shared with the community, and applied. This is the genuine manifestation of Islam when practised according to the principles of the Qur'an and the supplementary teachings of the Prophet Muhammad (*Sunnah*). Knowledge in all its forms is an obligation on all Muslims. It is a personal obligation, a civic duty, and brings glory to God (Schulte and Al-Fehaid, 2004). An example of a method used for teaching by the Prophet is that he would repeat a word three times in order to be understood (Sahih Bukhari, 846). This repetition was found recently to 'give the listener a chance to hear, question and interpret appropriate content, and give the storyteller a chance to fine-tune' (Holtham et al., 2001).

The importance and centrality of trust in Islam cannot be exaggerated. It ties in with the concept of God being an all-seeing, all-knowing deity, putting it beyond human capacity to deceive God: 'then if one of you entrust the other, let the one who is entrusted discharge his trust (faithfully), and let him be afraid of Allâh, his Lord'

(Qur'an 2: 283). Trust in knowledge management is likewise indisputably important. A climate of trust was found to be critical to knowledge management (Bertels and Savage, 1998; Huemer et al., 1998; Davenport and Prusak, 2000; Nonaka and Nishiguchi, 2001).

This section has highlighted the Islamic culture in which the case study was undertaken. The next section examines Saudi culture and how it influences knowledge management activities.

2.2.2 Saudi custom

It is said that the hallmarks of Saudi customs are respect and hospitality for guests and reverence for and deference towards one's elders. Making guests feel welcome creates an atmosphere of trust, and respecting elders signifies that wisdom has supreme value, and that the older generation has much to teach the young. Thus, we can infer from this that the rules of social conduct are to show modesty and practise courtesy and to be willing to learn from both one's elders and one's peers (Al-Sweel, Bianchi and Evans, 1993; Schulte and Al-Fehaid, 2004). Given this abundant deference to guests and elders, it is likewise expected that when foreigners visit Saudi Arabia, they will become familiar with this, and, where possible, speak in Arabic, which would suggest an effort on the part of the foreigner to understand and know the people and culture. These signals indicate to native Saudis that the foreigner, or guest, is someone who is worthy of their respect (Schulte and Al-Fehaid, 2004).

Saudi society embraces deference to elders. This can be deployed as a way for younger workers to learn skills from their elders, who can act in a positive mentoring role, providing both knowledge and moral guidance, and boosting the confidence of younger employees. The willingness of elders to teach and of younger generations to learn and respect is already rooted in Saudi culture, and this can be leveraged to help create a more robust knowledge-based economy (Schulte and Al-Fehaid, 2004; Calabrese, 2004).

As indicated in the opening of section 2.2.1, Davenport (1998) argues, 'when you need to transfer knowledge, the method must always suit the culture'. Thus, Saudi organizations attempt to tailor their knowledge management skills to match their particular culture and the strengths of that culture, rather than relying on imported models from other cultures, a process which somewhat , does not appear to be an obstacle to the widespread dissemination of these new knowledge-based techniques (Schulte and Al-Fehaid, 2004).

Given this cultural and religious foundation, joining up knowledge management and learning in Saudi Arabia is a worthy undertaking. Both public and private organizations realize the importance of this both to the economy and to society in general: that knowledge acquisition in fact creates cohesion in society. While the unit (the individual) must learn, likewise the individual shares knowledge and so develops society in general. People work best when they learn and work together (Schulte and Al-Fehaid, 2004: Davenport, 1998).

2.2.3 Information communication technology and knowledge management in Saudi Arabia

Because of the growing role of information and communication technologies in national economies, the Saudi government has given it top priority. During the past forty years, the ICT sector has witnessed major changes. When computers were used in significant numbers for the first time in the 1960s, they were limited to very few applications in the civil government sector, such as the Public Statistics Department. By the early 1970s, ICT had begun to be used on a large scale by many government bodies. A new computer centre was established and supplied with the necessary equipment. This stage was characterized by the use of very large and expensive computers. However, it began to draw the attention of the private sector, and a number of specialized institutions and companies began to focus on selling computers, providing maintenance for them and developing systems and programming.

ICT applications spread rapidly to cover many sectors for the purpose of improving productivity and enhancing performance in the fields of finance, industry, commerce,

education, government and health care. By 2004 the e-Government Programme, *Yesser* (an Arabic word meaning to ease or to simplify), was established as one of many initiatives and projects adopted by the government to achieve sustained growth and development in all aspects of life. These initiatives include enabling one million Saudi families to obtain PCs through an easy process and to pay for them by following an affordable instalment plan; this plan, due to run for the next five years, aims to achieve an 'information society' (CICT, 2007). Saudi Arabia has the capacity to absorb new technologies in its growing industrial sector, according to a study by Ankari (2004). Furthermore, a recent report shows that Saudi Arabia has the biggest IT market in the Gulf region, with spending of US$3.4bn in 2008 expected to rise to US$5.6bn by 2013. The Saudi Arabia Information Technology Report Q1 (2009) suggests that the IT market should continue to grow, driven by a robust economy and infrastructure investments in major verticals such as oil and gas, power, financial and telecoms (TMC News, 2009).

On the other hand, the concept of a 'knowledge society' was one of the initiatives and projects adopted by the government. Business Week (2006) described this development thus: 'Saudi Arabia's money is mostly finding its way into knowledge clusters and industrial parks. King of Saudi Arabia Abdullah wants to make his country one of the 10 most competitive economies in the world by 2010 and purpose-built sites for large-scale industry are seen as the most efficient way to harness comparative advantages. The number of areas designated as industrial parks has therefore grown from 14 to 24. In addition, to keep up with the impressive strides of other emerging markets Saudi officials are increasingly placing their bets on IT, with all its refined products. Bill Gates delivered the keynote address at the First Global Competitiveness Forum in Riyadh on November 8 2006. The Microsoft chairman focused his lecture on IT as an enabler. By investing in knowledge, Saudi Arabia can make itself future-proof.'

However, organizations in Saudi Arabia are still at an early stage of the process in applying knowledge management principles at every level – Saudi organizations and enterprises know that they must compete in a world market, and that knowledge is the key factor that provides long-term competitive advantage. The dissemination of this

changes attitudes over time, and the younger generation will be more comfortable with constant innovation. Therefore, Saudi culture can arguably be said to not be an obstacle to the widespread adoption of these new knowledge-based techniques (Schulte and Al-Fehaid, 2004),

Alavi and Leidner (1999) studied the practices and outcomes of knowledge management systems (KMS) in fifty organizations, including some in Saudi Arabia. Their findings suggest that interest in KMS across a variety of industries is very high, that the technological foundations are varied and that major concerns revolve around achieving the correct amount and type of accurate knowledge and garnering support for contributing to KMS. The study also suggests that much has been made of technology–structure alignment, but the success of KMS may be related more to organizational culture than to organizational structure, as evidenced by the concerns of respondents about getting knowledge sharing accepted in their organizations.

Nonetheless, it is again the culture which makes it somewhat difficult to manage knowledge, and as mentioned above, one has to explore other routes to make the facilitation of knowledge management as effective as possible: hence the study at hand is examining the organisational climate impact instead - thoroughly described in 3.4 - which hopes to shed light on 'the long tunnel' or at least to pave the way for future research.

2.3 Development of the study

2.3.1 Motives for the study

My interest in developing this study came about naturally, as I had been reading quite a lot about knowledge, about what has been described as know-how (this term was stressed by one of my tutors during my Master's degree in Public Administration), but I never thought of it as a PhD project or anything similar. I came to the school in October 2006, to study the impact of information technology on organizations. Looking into the impact of IT, it is maybe better to say that one particular perspective on the impact of IT is obsolete (the question of whether we need IT or not is no longer there), but that the expansion of knowledge management is a perspective where there

is opportunity for new work. I was then overwhelmed by a huge volume of publications regarding the value of IT, which were very interesting, but I wanted to study the impact of organizational culture on IT.

Previously, my interest had been in the impact of IT on organizations: now it was the other way around. Next I developed this study in relation to knowledge management, as this was my former interest. I discussed the topic with my supervisor, who kindly did not impose any specific topic to study. I then spent a great deal of time on the issue of organizational culture and its impact on IT to support KM. I found that most of the publications to date (January 2007) had encountered a major barrier in the form of culture (e.g. DeLong and Fahey, 2000; Sveiby and Simons, 2002; Kayworth and Leidner, 2003; Alavi et al., 2005).

My supervisor and I discussed the topic in quite some detail. I clearly remember when he drew a picture of a big mountain and asked: 'You have this big mountain: either you blow it up or you navigate round it. What do you choose?' I replied 'navigate it', since I know that culture (e.g. Schwartz and Davis, 1981; Denison, 1996) is very difficult to change, particularly in an Arab country like Saudi Arabia (Hutchings and Weir, 2005; Al-Alawi et al., 2007), as described in sections 1.2 , 2.2.1 and 2.2.3 . My supervisor then said 'Find a way to navigate it'. I spent some time wondering how I was going to navigate this issue.

After a while, he advised me to look into the work of Isaksen and Ekvall (2007), but this was about climate, so I asked myself why this work seemed appropriate to my supervisor. I called for an urgent meeting to discuss the issue: at first I did not like his advice to think about a possible way to navigate the 'big mountain', since it would involve a major shift in the study from a more qualitative (culture) to a more quantitative (climate) approach.

Most of the research conducted in relation to climate had been done in relation to innovation and creativity or safety and security (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar, 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007). In one sense this made matters harder, but it also offered a useful

opportunity to make the study distinctive. There appeared to be nothing that was in any way similar to my topic (climate, IT and KM, specifically in the Arab world). I felt somewhat comfortable with studying the three components of my topic: climate, IT and KM. But who could inform us on this issue?

2.3.2 Who can inform us?

As Benbasat et al. (1987) suggest, 'prior to searching for sites, the researcher should determine the unit of analysis most appropriate for the project. Will the study focus on individuals, groups or an entire organization?' The decision was made to study individuals. The next step was to learn who could inform us on this issue. We now knew that individuals would be studied, but which ones and at which location, organization and so on? I decided to conduct the research in my home country, Saudi Arabia.

Searching for an appropriate location and company in a conference held back in 2006, I met a key person in Company A with whom I discussed the issue of the study. He welcomed the idea but negotiation to access the site was not 'a piece of cake'. I then secured access through my previous tutor during my Master's degree at King Saud University who kindly wrote a glowing recommendation to the CEO of Company A. The latter appointed a coordinator who is in charge of KM at the R&D centre to aid the conduct of the study. The description of Company A given below is partly from the induction by the coordinator and partly from their website.

2.3.2.1The research context

The context for the study was a Research and Development (R&D) centre at Company A located in Saudi Arabia. This centre inhabits an advanced R&D complex inaugurated in early 2001 to accommodate 400 employees (at the time) and provide state-of-the-art facilities for cutting-edge Saudi technology research. Scientists and engineers are recruited worldwide to provide research expertise and to help develop

the company workforce. The centre's current research workforce numbers more than 250, including PhD and MSc degree holders as well as university graduates.

The R&D centre has established partnerships with the company's customers. This strategy promotes teamwork and cooperation between the centre's scientists and their customers. Additionally, Company A is actively involved in the Joint Industry Program (JIP), which is a collaborative partnership with distinguished academic institutions and industrial laboratories. The R&D reflects the company's continuing and expanding commitment to the future of petroleum research, to development in Saudi Arabia, and to achievement in research. The R&D facility enables scientists and engineers to effect a shift in focus from service orientation to a blend of specialized services and applied research.

2.3.2.2 R&D focus and capabilities

The focus of R&D is to provide timely and cost-effective applied research in support of its industrial and environmental objectives. The centre is a corporate facility with a mandate to provide the following services:

- Fulfilment of corporate company objectives of research, focused primarily on upstream research (reservoir-production), downstream research, material sciences and environmental research. Technical support and troubleshooting are also provided for.
- Sophisticated laboratory facilities that give advanced analytical support for exploration, production, manufacturing, engineering and operations services.
- Research and programme coordination is provided by the company to academic institutions both in-Saudi and out-of-Saudi.
- Intellectual Asset Management is a group formed by the company for the protection and development of its intellectual property. This team, within the R&D centre, manages patents and markets newly discovered technologies and inventions.

- Research Capabilities: the new, state-of-the-art facilities have made R&D committed to expanding applied R&D. This is done by developing innovative research techniques and acquiring advanced technologies.

2.3.2.3 Knowledge management at the R&D centre

The centre has been implementing KM for almost five years; it was first utilized back in 2003. According to an initial meeting held at the outset of the current study, in 2007 the centre showed that a majority of employees believe that sharing knowledge is an important tool to accomplish the mission and vision of the centre. They feel that KM should play a more vital role, and show a high degree of interest in the capturing of relevant knowledge. More than two-thirds of the employees stated that they could not get the right knowledge at the right time from the current KM system. The report identified the following reasons:

- knowledge was not relevant or not current;
- cultural barriers were identified as the maker or breaker of any knowledge management improvement efforts;
- lack of knowledge management support;
- lack of training and awareness;
- knowledge management technology tools were scattered (knowledge management sharing tools were not easy to use) thus so was the knowledge;
- lack of clear written procedures;
- lack of trust;
- lack of acceptance of honest mistakes;
- lack of recognition of knowledge sharing.

It is worth noting that these barriers were listed in a report completed internally by R&D (2007), which I, during my second phase in 2008, was afforded the opportunity to peruse. I conducted the study not on account of these difficulties of theirs but on account of my own research questions, which guided the study. Although, for ethical reasons, I will be unable to reproduce the exact documentation, the report's findings I believe will enhance my own interpretation and conclusions on the topic.

Nonetheless, finding the site at which to conduct my research was only the beginning: the pivotal thing now was to identify which method would be optimal to look into the subject. The following section presents a discussion of the research design.

2.3.3 What method can be used?

In the transfer document, I detailed a wide range of methods. These include grounded theory, action research, ethnographic study, survey, case study and so forth. Each method was put forward to assess its appropriateness. Needless to say, each has its pros and cons; in fact, we as humans also have pros and cons, so it is inevitable that this will be the case with the methods we devise. For example action research would be of use, but the people in Saudi Arabia were not interested, due to sensitive issues they might have had. Ethnographic study was also discussed, but again being in the field for quite a long time was not possible due to the limitations I faced. This section is a highly simplified summary of the method- full details are provided in chapter 4.

Throughout the course of my PhD study, many alternative designs were thoroughly discussed with my supervisor as well as with other peers and colleagues. Refinement to the research approach was undertaken to ensure the method I used was of assistance in allowing the people concerned to speak their minds about the issues being investigated. One of the refinements was the agreement to make use of the proprietary SOQ method identified by Ekvall and Isaksen (2007) to examine the climate within the organization and make alterations to the narrative questions attached to the questionnaire concerning innovation and creativity, to link them to KM.

The story of the research was not finished, as there were two other components: IT and KM. So I trawled through the literature to find a way forward. I found a study conducted in Australia by Freck (2006) relating IT to KM, but there was nothing on organizational climate. I adapted some of her interview questions, which to some extent fitted in with my research questions. I also looked into a study conducted in the USA by Nongkran (2004) relating organizational culture to knowledge sharing, and I adapted some of my own questions as well. I also looked into a study by Charles W.

Prather titled 'How's Your Climate for Innovation?' (1996) and modified some of his questions, which originally concerned climate for innovation, to address the issue of climate for ICTs to support knowledge management (phase II). In essence, my study was a combination of the following continents: Europe (Ekvall and Isaksen, 2007), Australia (Freck, 2006), America (Nongkran, 2004, and Prather, 1996) and finally Asia (Saudi Arabia). That is to say, in a sense we share the planet and we have become a global village.

I also decided to go for a single case study. Though I thought about multiple cases, it appeared that one suitable place (to my knowledge) in Saudi Arabia where it would be possible to conduct the study was Company A, which has been implementing KM since 2003, and it was high time to examine this case (see the justification of case and single case studies in section 4.3.4.1). I also gave priority to qualitative study over quantitative research (see section 4.3.3.4). I thought about the different types of study (e.g. exploration, description and explanation), and finally opted for the exploration method (see the justification of this kind of study in section 4.3.4.1).

2.3.4 Originality and motives

My current research does not claim to be unique; as my supervisor advised, 'you never know: it might be there but we do not know for sure'. With this in mind, I checked the originality of the topic by searching a website claiming to offer a comprehensive listing of theses with abstracts accepted for higher degrees by universities in Great Britain and Ireland since 1716. The site (www.theses.com, accessed 25 July 2007) claims to have 504,387 theses in its collection and was last updated on 4 July 2007. This was in line with a double-check I was offered by a kind staff member at the British Library whom I asked to verify the originality of said topic. I explained to her on the 26 July of the same year that I was going to research this topic and she kindly spent about half an hour scouring the Library's database. It was not found to match with anything similar. I also checked a location in Saudi Arabia, the King Fahad National Library, believed to have a listing of theses accepted for higher degrees by universities and written by Saudi students locally or abroad, as they are required to store a copy of their dissertations in this location. This source

(http://www.kfnl.gov.sa) was checked on 27 July 2007. Finally, a so-called EBSCO research database was checked on 27 July 2007 for the same purpose; again, no evidence was found to indicate that the current topic had been researched.

To the best of my knowledge, this is the only study of its kind that has been conducted in the company concerned according to the coordinator appointed for this study. It can help us understand the story of KM in Saudi Arabia, particularly given the scarcity of similar studies in developing countries in general and in Saudi Arabia in particular, as organizational context is always a key issue in Saudi organizations. Nonetheless, my hopes and fears are reflected in the realization that conducting such research has never been an easy task, but I am still optimistic that the research can , even if only indirectly, contribute positively to the Saudi business sector. It can also contribute to the body of case studies available in the field of knowledge management, as well as to the stock of human knowledge itself.

2.3.5 The fieldwork

First and foremost, ethical issues were addressed to the best of my ability, as follows. First, I ensured that I, as the researcher, acted as professionally and objectively as possible whilst conducting the study (the research as an instrument is discussed thoroughly in Chapter 3). Permission for access was sought from the department concerned at the site. Securing access to the site was one of the difficulties I encountered during my PhD journey. Sites range from open, requiring no permission to enter, to closed, requiring permission to enter. There are also sites where one can gain access to a setting that might be restricted in terms of observation and interaction as a result of one's status or characteristics.

The site on which I carried out my project was restricted to those who had the company's ID, and was also very sensitive and secretive, due to its nature as an R&D centre. The required ID was secured through the coordinator who facilitated my entry. I also had another problem; it was to study the participants and to become familiar with them so that I could gain their trust (we know that trust is a pivotal issue in the Arab world: Hutchings and Weir, 2005; Al-Alawi et al., 2007). I also wanted to share

their experience so as to give credibility to my study. However, it was essential to bear in mind that participation in the study was voluntary and free from coercion.

The coordinator did his best to solve this difficulty by inviting me for lunch with five informants who were already working on the KM system, which was championed by the coordinator himself. In this initial gathering, some questions pertaining to both general and personal matters were asked by the informants (e.g. 'Where do you come from?', 'Why is this project important?', 'What will I gain from it?' and so on and so forth). After I provided satisfactory answers, we all felt that we had become familiar with each other, and laughter and jokes were exchanged. In my opinion, this meeting was a valuable experience, as it facilitated my movement around the site (only outside offices). Employees greeted me every time they saw me – sometimes they greeted me first, at other times I did it first. In studying them, I was able to describe their opinions, thoughts and details concerning their daily activities and relationships given the fact that I myself am Saudi and know my people well, even though I was not doing ethnographic research as such but a single case study.

Having said that, it did not mean that they were available to work on my time: they were not always there when I wanted them to be. I made sure that the ethical issues were taken into consideration. For the first 34 interviews I conducted, the mixed method was used: in parallel with the interviews, I asked the participants first to complete the questionnaire in front of me, which on average took 30 to 50 minutes, followed by the interviews, which lasted 35 minutes to an hour and a half. In total, the process took about an hour and a half to two hours to go through. Though this was a hard job for me to do, I managed to conceal the identities of the participants. I noticed that the interviewees did not want to put their names on the questionnaires, as they did not want to reveal their identities. I made sure not to question them about personal information and assured them that they would remain anonymous. The site selected was also anonymous, as desired, and labelled simply Company A throughout the study. In addition, the structured interviews did not contain any questions that could reveal any sensitive intelligence material; the focus was solely on origin.

During my stay in the eastern province of Saudi Arabia (where the research was conducted), my mother accompanied me on both visits to the site, in 2007 (when I

interviewed 34 people), and 2008 (17 persons): as I spent most of the year in the UK and a shorter period in Saudi Arabia, my mother used to join me on my trips, then when I came home to Riyadh, the capital (roughly about 400 km from the eastern province), I spent the whole time on-site and interviews were scheduled from 7.30am to 3.00pm, the site's closing time. During breaks, I went to a café located on the ground floor, and at times one or two personnel would pop in for a chat. These relationships gave me a solid understanding of what knowledge management was like in the R&D centre and subsequently enhanced my conclusions.

Every time I faced a problem, I used a hotline that was connected to my supervisor, which enabled me to consult him over issues and topics. I remember emailing him four or five times in one night concerning modifications to some questions. Flexibility seems to be a characteristic of qualitative research, as Bryman (2008, p.389) suggests: 'qualitative research tends to be a strategy that tries not to delimit areas of enquiry too much and to ask fairly general rather than specific research questions'.

After I had conducted the first 34 interviews, I asked the coordinator whether I would be able to survey the whole R&D workforce (250 people), but he advised that 150 questionnaires was enough. He continued by informing me that a study conducted by his team the previous year (2007), which had also been supported by the top management, had a response rate of 30 percent. In my research, however, I distributed 34 face-to-face surveys out of 150, and the remainder were disseminated through the coordinator, as I was not allowed to march through corridors and offices due to the sensitivity of the work. A total of 77 participants were able to complete the questionnaire, which means that the response rate was 50 percent, including the questionnaires completed during the interview sessions. This response rate is deemed to be high; however, this mode of surveying tends to be high in response but does not assure anonymity or even confidentiality and may also be affected by bias (O'Leary, 2004, p.154).

The completion of the survey took place during late 2007, due to the time available to the personnel on site, who seemed to be very busy doing their own tasks and jobs. One told me that I was lucky to gain access and to conduct the study. I asked him what made him say that, and he said that they were busy doing their main jobs but

hinted that emails had been sent to the entire population of the R&D centre recommending that they take the issue being studied seriously, as this would help them to manage knowledge effectively and efficiently. This furnished the study with confidence and promised that it would produce valuable information for the people interested, practitioners and academics alike.

Chapter 3

Literature Review

3.1 Introduction

A considerable amount of research has been published on knowledge (Drucker, 1994; O'Dell, 1997; Takeuchi Nonaka, 1998; Ruggles, 1998; Teece ,1998; Drucker, 1999; McDermott, 1999; Alavi and Leidner, 1999; Zack 1999; Skyrme and Amidon, 1999; Swan et al., 1999; Davenport and Prusak 2000; Hickins, 2000; Bhat, 2001; Walsham, 2002; Brown and Duguid, 2002; Malhotra, 2004; Nongkran, 2004; Holtham, 2005; Freck, 2005; Huysman and Wulf, 2006; Davenport, 2007; Butler and Murphy, 2007; Song, 2007; Ichijo and Nonaka, 2007; Benbya, 2008; Loos et al , 2008; Goh and Hooper, 2009; Hislop, 2009). However, the effective utilization of information and communication technologies to support knowledge management is hard to achieve (McDermott, 1999; Hendriks, 2001; Walsham, 2002). In this chapter, the researcher attempts to shed light on the existing literature related to knowledge management, and the use of information and communication technologies in the context of organizational climate.

This literature was the basis for the development of the research questions. It examines key definitions and concepts in related areas, such as knowledge management and information and communication technologies, and organizational culture vs. climate. It commences by reviewing the distinctions made by various authors between data, information and knowledge, before examining knowledge management, information and communication technologies for knowledge management, and organizational climate.

3.2 What do we talk about when we talk about knowledge?

The above heading appeared in Davenport and Prusak (2001). In their book, they state that knowledge is neither data not information, though it is related to both, and the differences between theses terms are often a matter of degree (Davenport and Prusak, 2001, p.1). There is, however, much disagreement about the status and definition of

data, information and knowledge. Stenmark (2002) argues that despite efforts to define them, many researchers use the terms very casually, as is evident from Table 3.1 below.

Data are seen as isolated (Tuomi, 1999): a set of discrete, raw numbers and objective facts about events (Davenport and Prusak, 2001; Raisnighani, 2000; Alavi and Leinder, 2001) occurring in the physical environment before they have been organized and arranged into a form that people can understand and use (Benbya, 20087). Since 'data by itself has little relevance or purpose ... information is therefore data endowed with relevance and purpose' (Drucker, cited in Davenport and Prusak, 1998). Information is seen as data placed in a meaningful context that is useful to individuals (Zack, 1999; Wu, 2000; Benbya, 2008).

Information is also perceived as a flow of messages or meanings which might add to, restructure or change knowledge (Machlup, 1983, in Nonaka, 1994). 'Information is also passive, received from external resources: for example, if you switch on the TV, lots of information comes out of it, whereas knowledge is active, generated by commitment and belief. People realise these gut feeling are very important for knowledge creation' (Nonaka, 1999, p.87).

Although the terms 'information' and 'knowledge' are often used interchangeably, there is a clear distinction between them: Nonaka (1994) quotes Dretske's (1981, p.44) definition of information as 'that commodity capable of yielding knowledge, and what information a signal carries is what we can learn from it. Knowledge is identified with information – produced (or sustained) by belief, but the information a person receives is relative to what he or she already knows about the possibilities at the source.' Therefore, knowledge is social interaction; it is humanistic and rooted in individuals and organizations (Nonaka, 2001).

Tuomi (1999) argues that the traditional hierarchy of data, information and knowledge, as propounded by Wu (2000), does not solve the problem, and that the relationship between data, information and knowledge needs to be reconsidered if we want to develop information system support for KM. He argues that the meaning structure that underlies knowledge for an individual needs to be articulated through

cognitive effort to become focal and structured. When knowledge is articulated and stored in computer memory, the information must be represented; information then has to be split into 'atoms' that have no meaning, to allow automatic processing (Tuomi, 1999). ICT then can offer effective support for human knowledgeability (Walsham 2002): therefore, humans must usually help with categorizing, calculation and considering (Davenport and Prusak, 2001).

Table 3.1 Definitions of data, information and knowledge

Authors	Data	Information	Knowledge
Wiig		Facts organized to describe a situation or condition	Truths and beliefs, perspectives and concepts, judgements and expectations, methodologies and know-how
Nonaka and Takeuchi		A flow of meaningful messages	Commitments and beliefs created from these messages
Spek and Spijkervet	Symbols not yet interpreted	Data with meaning	The ability to assign meaning
Davenport	Simple observations	Data with relevance and purpose	Valuable information from the human mind
Davenport and Prusak	A set of discrete facts	A message meant to change the receiver's perceptions	Experiences, values, insights and contextual information
Choo et al.	Facts and messages	Data vested with meaning	Justified, true beliefs
Quigley and Debons	Text that does not answer questions or solve problems	Text that answers the questions who, when, what, or where	Text that answers the questions why and how

(Source: Stenmark, 2002, p.2)

3.2.1 Knowledge

'Most people have an intuitive sense that knowledge is broader, deeper and richer than data or information' (Davenport and Prusak, 2000). Other authors have defined knowledge as 'valuable information in action' and argued that the value of knowledge is determined through the eyes of the recipient (APQC, 1997, 13), and that, information becomes knowledge once it is processed in the mind of an individual (Alavi et al, 1999). Arguably, knowledge is humanistic and social interaction

embedded in people and organizations (Nonaka, 2001). McDermott (McDermott, 1999, p.105) argues that there are six features that distinguish knowledge from information:

- Knowing is a human act
- Knowledge is the residue of thinking
- Knowledge is created in the present moment
- Knowledge belongs to communities
- Knowledge circulates through communities in many ways
- New knowledge is created at the boundaries of old.

Nonetheless, for a long time, scholars have debated the issue of knowledge to try to exclude subjectivity from management in order to build an objective theory that can be applied universally to any situation that managers face (Nonaka and Toyama, 2008, p.7). Viewing knowledge as objective implies that it can be captured, stored, transferred and managed (Zack, 1998a; Alavi and Lidner, 2001). This objective view contributed to the idea that 'ICT management systems' could be used to support knowledge management (Walsham, 2005). Within this objectivist perspective, knowledge can exist in a number of forms, including documents, diagrams or computer systems, or can be embedded in physical artefacts such as machinery or tools (Hislop, 2009, 19).

Knowledge is created by people in their interaction, and therefore to understand knowledge one must understand people, as they have different subjective viewpoints and these differences are necessary to the creation of knowledge (Nonaka and Toyama, 2008, p.8). This view of knowledge as a state of mind posited that humans expand their personal knowledge through inputs received from their environment (Bebya, 2008, p.8): this, however, suggests that knowledge depends on people's ability to interpret and use the information available to them.

In analysing how individuals perceive the world, Polanyi (1966) introduced the notion of tacit power, which produces the deep tacit knowledge that we have of the world. This again is different in each individual, due to different initial dispositions and

experiences (Polanyi, 1966; Walsham, 2002). Spender (1996) defines tacit knowledge as 'not yet explicated'. Therefore, it cannot be articulated and it is hard to formalize (Nonaka, 2001), and 'it may even be subconscious' (Hislop, 2009, p.23).

It can be argued that real knowledge is shaped by means of interactions between tacit and explicit knowledge, rather than by either type alone (Nonaka, 2001). One consequence of this is that there is no such thing as fully explicit knowledge, as all knowledge will have tacit dimensions. Hislop illustrates this using the example of Clark (2000), who uses the term 'explicit' to linguistically symbolize their inseparability. For example, text, which is often referred to as a form of codified knowledge, has tacit components without which no reader could make sense of it (Hislop, 2009, p.36). Similarly Brown and Duguid (2001) argue that the perspectives of tacit and explicit knowledge are inseparable and thus there is no such thing as pure tacit knowledge or pure explicit knowledge – all knowledge has both tacit and explicit components.

3.3. Can knowledge be managed and, if so, why?

The mainstream of the literature on knowledge suggests the most primary assumption underlying the issue of knowledge management is that knowledge is a resource that is amenable to control and management (Hislop, 2009, p.53). The words 'management' and 'knowledge', at first sight, appear to be uneasy bedfellows. Knowledge is largely cognitive and highly personal, while management involves organizational processes. Many knowledge workers do not like to be managed in the traditional sense. However, knowledge is increasingly recognized as a crucial organizational resource giving market leverage. Its management is therefore too important to be left to chance. Managers should take steps to leverage the knowledge in their organizations (Skyrme, 1997).

Nonetheless, some scholars would suggest that knowledge is hard to manage (e.g. Fuller, 2002; McAdam and McCreedy, 2000). A related argument in the literature on ICT-based knowledge management is that knowledge management is difficult to accomplish (McDermott, 1999; Hendriks, 2001; Walsham, 2002; Huysman and Wulf, 2006). For example, McDermott (1999) argues that people are not reluctant to use

ICT: rather, failings have come about because they often need to share knowledge that is neither obvious nor easy to document – knowledge which requires a human relationship to think about, to understand, share and apply appropriately.

However, McKinlays (2002, cited in Hislop, 2009) argues that reluctance to participate in knowledge initiatives occurs because conflicts exist between the benefits an organization may derive from a knowledge management initiative and its consequences for employees, which were found in McKinlays's study to be a result of concerns about potential negative effects these initiatives might have. As one employee in McKinlays's study said, 'I'm being asked to give myself away.' Therefore, 'knowledge can only be surrendered voluntarily, many organisations stress the significance of viewing knowledge management in human brains' (APQC, 1997, p.71) and thus it is an inevitable aspect of knowledge management processes (Hislop, 2009, 55).

Although the term 'management' generated some confusion from the beginning, it is evident that one cannot manage knowledge. What one can do is to manage an environment that hones knowledge, that encourages information sharing, knowledge creation, an environment that enables supportive interaction between people; that stores, codes, and makes available information in a way that adds value to the individual's work and benefits the organization (Liebowitz, 1999).

On the other hand, by managing knowledge, 'organisations, for example, can achieve their mission. Among these factors influencing the increasing proliferation of knowledge management are market forces such as:

- the need for speed and cycle time reduction so no re-inventing the wheel;
- revenue growth;
- competition for customer relationships;
- lost knowledge from turnover, hiring, downsizing and restructuring;
- the fact that knowledge has a higher margin than product; and
- globalisation' (APQC, pp.2–5)

- Acquisition of knowledge is a way to reduce or to manage risk (Milton, 2005, p.142).

Other reasons for managing knowledge have to do with infrastructure capabilities such as:

- the rise of powerful network communication database and collaborative technologies;
- the understanding of tacit and explicit knowledge; and
- changes in management and process skills.

By exploring the 'why' factor, what matters most for managing knowledge is ensuring that the right people have the right knowledge at the right time (O'Dell et al., 2000, pp.3–5).

3.3.1 What is management?

Management is defined in the *Oxford English Dictionary* (2000) as a noun meaning 'the act of running and controlling a business or similar organisation' or 'the people who run or control a business or similar organisation' or 'the act or skill of dealing with people or situations in a successful way'. However, Alvesson and Karreman (2001, cited in Hislop, 2009) argue that the mainstream knowledge management literature is weak at defining the term 'management', making any debate or definition of it appear unnecessary, and they suggest that when defining the term 'knowledge management', it is as important to talk about management as it is knowledge. This would suggest, in other words, that management is rather an ill-defined term: there are lots of alternative definitions around, but in terms of what it means within 'knowledge management' it is hard to be specific.

The term 'knowledge management' is also difficult to grasp. There are many ways to think about KM (Mclnerney and LeFevre, 2000). Liebowitz and Beckman (1998) define KM as 'the formalization of and access to experience, knowledge and expertise that create new capabilities, enable superior performance, encourage innovation, and enhance customer value'. Others consider knowledge as an enhancement of a firm's

effectiveness: 'KM is the systematic, explicit and deliberate renewal and application of knowledge to maximize an enterprise's knowledge-related effectiveness and returns from its knowledge assets' (Wiig, 1993). Some define KM as 'the capability of a company as a whole to create new knowledge, disseminate it throughout the organization and embody it in products, services, and systems' (Nonaka and Takeuchi, 1995), while von Krogh (1998) sees it as identifying and leveraging the collective knowledge in an organization to help the organization compete.

Hedlund (1994, cited by Schultze, 1998) suggests that KM 'addresses the generation, representation, storage, transfer, transformation, application, embedding and protection of organizational knowledge'. It is also concerned with establishing an environment and culture in which knowledge can evolve (Davenport and Prusak, 1998). Alavi's definition is concerned with the concept of KM as 'an IT-based system developed to support and enhance the primary organization knowledge management processes of knowledge generation, knowledge codification and knowledge transfer' (Alavi, 1999).

Hoffmann et al. (2002) offer a definition of a KM system as providing support to the organizational processes of the development, preservation, distribution and recombination of knowledge. In a similar way to Hedlund (1994), the authors include factors that may affect KM within the organization. They define a company's KM system as combining 'continuous organizational design, development of human resources, and innovation of technology. Success can only be ensured by simultaneous development of all parts of the KMS and their mutual adaptation.'

Dimattia and Oder (in Mclnerney and LeFevre, 2000) offer this definition: 'KM involves blending a company's internal and external information and turning it into actionable knowledge via a technology platform.' Freck (2005) defines KM 'as a systematic effort to share and use organisational knowledge within the organisational context so as to increase organisational performance.' She derives her definition of KM from the above group (Alavi, Hedlund, Hoffmann, Dimattia and Oder) which has the benefit of recognizing KM as a multifaceted concept that involves not only activities but also influences from the organizational environment, supported by ICTs.

It should now be obvious that there is no agreement between researchers on the definition of knowledge management. However, Freck's (2005) definition is somewhat similar to the recent definition offered by Hislop (2009), who defines knowledge management as 'an umbrella term which refers to any deliberate effort to manage the knowledge of an organisation's workforce, which can be achieved via a wide range of methods including directly, through the use of particular types of ICT, or more indirectly, through the use of social processes, the structuring of organisations in particular ways or via the use of particular culture and people management practices' (2009, p.59).

Since this research focuses on both knowledge processes and their contexts through the use of particular climates, a combination of the definitions offered by this group of authors has been derived: *KM is a systematic attempt to share and use organizational knowledge within its context through the use of particular organizational climates which can be achieved through a wide range of methods, including the use of ICT in order to enhance organizational performance.*

The research has so far discussed the debate about knowledge and whether it can be managed. The following section will discuss the linkage between information and communication technologies and knowledge management. It commences by discussing the impact of IT on organizations.

3.3.2 Information and communication technologies and knowledge management

3.3.2.1 Information technology's impact on organizations

Rodrigo Magalhaes (1998, p.88) questions the view of IT (Huber, 1990; Walsh and Ungason, 1991; Stein and Zwass, 1995) that argues that the more information technology is implemented, the more information processing and storage capacity an organization will possess. He asks whether it is really that straightforward, and whether we have really learned about the impact of information technology on the organization in general. He cites a number of authors (Robey, 1977; Attewell and Rule, 1984; Markus and Robey, 1988; Orlikowdki and Robey, 1991, 1992, 1995) to

indicate that we have not. This raises the concern of what impact IT has on an organization.

Given the revolution that information technology has brought to our lives, it would be very helpful to clarify the meaning of the term 'information technology'. Daft (1997, p.84) defines IT as 'the hardware, software, telecommunications, database management, and other information-processing technologies used to store, process, and deliver information'. For Carter (1991, p.8), information technology is: 'The use of modern technology to aid the capture, processing, storage, retrieval, and communication of information, whether in the form of numerical data, text, sound, or image.'

As organizations grow and change, they depend more and more on IT for their survival (Feeny and Willcocks, 1998). Companies nowadays use IT to find solutions to business problems, in order to improve organizational performance. As Carr (2004, p.3) puts it, 'Today, few would dispute that information technology has become the backbone of commerce in the developed world'. Similarly, Daft (2001) asserts that highly successful organizations today are typically those that most effectively collect store, distribute and use information. This reiterates the significance of IT, which Porter and Millar (1985, p.160) highlighted more than two decades ago when they stated that the importance of the information revolution was 'not in dispute'. Furthermore, for Porter and Millar (ibid.), the question was not

whether information technology will have a significant impact on a company's competitive position; rather the question is when and how this impact will strike. Companies that anticipate the power of information technology will be in control of events. Companies that do not respond will be forced to accept changes that others initiate and will find themselves at a severe competitive disadvantage.

It has since been recognized that IT has a wide range of effects on an organization, many of which present significant benefits (Lucas, 1994). IT can increase the power and motivation of employees by giving them the complete information they need to do their jobs well. It may be assumed that increasingly sophisticated information technology will continue to have a significant impact at the organizational level.

In a nutshell, ICT has revolutionized the way in which organizations operate, and no serious firm can afford to ignore the fact that ICT, which radically reduces the time needed to create and /or communicate knowledge, has to be in accordance particularly with human needs (Nonaka and Nishiguchi, 2001, p.287). Daft (2001) asserts that the primary goals of ICT today are to support KM efforts and to leverage organizational knowledge; having greater access to information is useless unless that information is put to use to further the goals and success of the organization.

However, the impact of ICTs on societies is varied, and according to the BBC news (2001) 'Nine out of ten computers connected to the internet are located in English-speaking countries and more than 80% of all home pages on the web are written in English'. Mitchell Rice (2003) further comments in his paper 'Information and Communication Technologies and the Global Digital Divide' that this language is understood by only about 10% of the world's population and the application of ITCs is exacerbated by this percentage, as mentioned in the BBC report (Rice, 2003). The language barrier is due to the conflicting native languages of employees that are found to affect knowledge sharing (Ojha, 2005). This is an important issue since the present study is carried out in a non-English speaking country, Saudi Arabia; in a company whose employees originate from all corners of the globe and as such cannot maximize the potential of the internet as a research tool.

A case study carried out in Saudi Arabia by Al shoaibi (1998) examined the impact of IT on organizations and found a positive impact on business organizations, but specified several technical and behavioural problems that could affect the use of IT in Saudi Arabia organizations, concluding that top management support was essential to the success of IT usage.

Moreover, the use of ICT to support knowledge management activities is not without difficulty; it requires training on how to use the ICT. Training has influence on the use of ICT (Davenport and Prusak, 1998; Scott 1998) and is deemed essential (Earl, 1998), as, without proper training on how to use ICT, a low-grade use of the system may result (Igabaria et al., 1997, cited in Al-Gharbi and Naqvi, 2008). Equally important is the need for reskilling, motivation and the time to gain skills (Scott, 1998). These are some among the various factors that affect the use of ICT to support

KM that will be covered in section 3.4.1. Nevertheless, this observation leads us to discuss the relationship between IT and KM.

3.3.2.2 Linking information communication technology to knowledge management

The mid to late 1990s witnessed an enormous advance in the capability of ICTs, which was seen as a driver for organizations wanting to organize, store, search, retrieve and manipulate huge amounts of data and information (Jennex, 2007) that fuel and support organizational knowledge. ICT can be defined as 'technologies which allow/facilitate the management and/or sharing of knowledge and information. Thus the term covers an enormous diversity of heterogeneous technologies, including computers, telephones, e-mail, databases, data mining systems, search engine, the internet and video conferencing equipment' (Hislop, 2009, p.220).

The aim of ICT is to take knowledge that exists in human heads and paper documents, and make it widely available throughout an organization (Davenport and Prusak, 1998). ICT-based knowledge management ranges from fairly simple best practice databases to elaborate systems that include customized reports, interconnected expert knowledge flows and communication webs of great sophistication (McInerney and LeFevre, 2000).

Across the spectrum of knowledge management literature, a critical role is accorded to information and communication technologies (e.g. O'Dell, 1997; Alavi and Leidner, 1999; Zack 1999; Skyrme and Amidon, 1999; Swan et al., 1999; Davenport and Prusak, 2000; Bhat, 2001; Hendriks, 2001; Nongkran, 2004; Freck, 2005; Song, 2006; Ichijo and Nonaka, 2007; Butler and Murphy, 2007; Loos et al , 2008; Goh and Hooper, 2009; Hislop, 2009).

Virtually all large firms that create KM use ICT to organize store and codify knowledge and make it accessible to members (McInerney and LeFevre, 2000). Once knowledge is saved in a system, it becomes explicit, codified knowledge (Zack, 1999). Knowledge that has a large tacit dimension usually appears to be difficult to store in a system. In the case of implicit knowledge, the human being is both the

knowledge carrier and the vehicle through which the knowledge is passed on (Huysman and Wulf, 2006).

Alavi and Leidner (2001) suggest that knowledge management may be viewed from different viewpoints, as ICT can play a specific role in each perspective: (1) a state of mind, (2) an object, (3) a process, (4) a condition of having access to information, or (5) a capability. Table 3.2 below summarizes the various views of knowledge perspectives and their implications.

It can also be seen that different ICTs might have dissimilar communication features, as Hislop (2009, p.230) argues: he summarizes these characteristics as shown in Table 3.2, referring to the information richness theory (where 'communication richness is an invariant, objective property of communication media': Ngwenyama and Lee, 1997, p.147). While such theory provokes a growing level of criticism, as it has 'fixed and objective information richness characteristics' (Hislop, 2009, p.231), others suggest that the leanness or richness of any communication is something that emerges from the 'interaction between the people and the organizational context' (Hislop, 2009, p.231).

Table 3.2: Knowledge perspectives and their implications

Perspectives		Implications for knowledge management	Implications for KM systems (the role of ICT)
Knowledge vis-à-vis data and information	Data is facts, raw numbers. Information is processed/interpreted data. Knowledge is personalized information.	KM focuses on exposing individuals to potentially useful information and facilitating assimilation of information.	KMS will not appear radically different from existing IS, but will be extended toward helping in user assimilation of information.
State of mind	Knowledge is the state of knowing and understanding.	KM involves enhancing Individuals' learning and understanding through the provision of information.	Role of ICT is to give access to sources of knowledge, rather than knowledge itself.
Object	Knowledge is an object to be stored and manipulated.	Key KM issue is building and managing knowledge stocks.	Role of ICT involves gathering, storing and transferring knowledge.
Process	Knowledge is a process of applying expertise.	KM focus is on knowledge flows and the process of creating, sharing and distributing knowledge.	Role of ICT is to provide links among sources of knowledge to create greater breadth and depth of knowledge flows.
Access to information	Knowledge is a condition of access to information.	KM focus is organized access to and retrieval of content.	Role of ICT is to provide effective search and retrieval mechanisms for locating relevant information.
Capability	Knowledge is the potential to influence action.	KM is about building core competencies and understanding strategic know-how.	Role of ICT is to enhance intellectual capital by supporting development of individual and organizational competencies.

(Adapted from: Alavi and Leidner, 2001, p.111)

While the common assumption about ICTs is that they can offer help to facilitate knowledge (Walsham, 2002), this assumption has been widely criticized (McDermott, 1999; Hendriks, 2001). At one extreme of the spectrum of views, some see technology as key to KM, while others see ICT as at best a minor issue compared with the fundamental problems of KM (Carter, 2000; Hull, 2000; Scarbrough and Swan, 2001, in Edwards and Shaw, 2004).

The greatest criticism of KM systems is their purported inability to actually manage knowledge (Hendriks, 2001; Knight, 2003), or at least the fact that this is hard to achieve (McDermott, 1999). Hendriks's (2001, p.57) study, based on an analysis of 400 journal articles during the period 1993–98, showed that much of the KM literature was biased towards a technological agenda and away from the wider organizational context.

Furthermore, much of the literature related to design requirements for KMS concentrates largely on formal modelling and analysis of formal knowledge requirements (e.g. Holsapple, 2003 in Huysman and Wulf, 2006), but as Allen and Henn (2007) point out, when designing ICT, it is of great importance that it enables possibilities for communication of all three types – for coordination (to coordinate work), information (to keep up to date with the rate at which knowledge is changing in any given technology and involved in transferring and transforming existing knowledge) and inspiration (which is active in creating knowledge).

Allen and Henn argue that most managers will probably acknowledge the critical role played by the first two types and ignore the centrality of communication for inspiration, which has implications for successfully creating knowledge that has a tremendous influence on how and where communication takes place and hence on all interactions between people within an organization (Allen and Henn, 2007, p.28).

It is not the ICT itself but the way in which people use it that determines the role of ICT in supporting knowledge sharing and KM (Huysman and Wulf, 2006). Zack and McKenny (1995, p.418) believe that

strategic advantages associated with these technologies will not derive from having the technical skills to evaluate and implement these technologies, or even from being the first mover (especially if the social climate for appropriation is not favourable), but rather will come from having the appropriate social context, norms, politics, reward systems, and leadership to take advantage of electronic communications technologies for enabling new organizational forms. As organizations attempt to adopt new forms, especially those which cross functions, departments, and traditional

organizational boundaries, social context will become even more important and influential.

Similarly, Brazelton and Gorry (2003, p.23) argue that '[t]echnology may support a knowledge-sharing environment, but getting users to participate in effective ways is key'. That is because knowledge is a human act, and best practice can come from focusing more on people and less on IT (APQC, 1997, p.71) because, unlike information, knowledge sharing needs a different set of concepts and tools, and leveraging it involves a combination of human and information systems (IS) (McDermott, 1999, p.105).

Table 3.3: Communication characteristics

Medium	Communication characteristics
Face-to-face interaction	• Information-rich (social cues such as facial expression, voice, visible gestures. Plus, synchronous communication , potential for rapid high-quality feedback/interaction • Most relevant for sharing tacit knowledge • Spontaneous/informal interactions possible when people are geographically proximate • Conditions amenable to development of trust (other factors excluded) • Expensive when people are geographically dispersed
Video conferencing	• Information-rich (social cues, and virtually real-time, synchronous medium) • Expensive to set up • Set-up time inhibits spontaneity
Telephone	• Intermediate information-richness (tone of voice conveys some social cues, but gestures and expressions invisible). • Also synchronous, facilitating detailed, immediate feedback • Cost variable • Spontaneous/informal interactions possible irrespective of geographic proximity • Can facilitate development of trust where face-to-face interaction difficult
Email	• Suitable for sharing of highly codified knowledge • Relatively low information richness (all social cues lost) • Inexpensive (cost unrelated to geographic proximity) • Asynchronous, with variable feedback speed • Spontaneous/informal interaction possible irrespective of geographic proximity • Permanent record of interaction exists • Development of trust based on mail alone difficult

(Source: Hislop, 2009, p.230)

Moreover, what is most important in technological support for KM is, as Davenport and Prusak (1998, p.143) point out,

to get a few toes into the water. You may not even know how willing people are to share knowledge through systems until you build a system and see how the organization responds. It will be difficult to determine which types of application provide the best fit with an organization until you experiment. Right now, there is no right technology for knowledge management.

This view on ICT support for knowledge management is usefully summarized by Walsham (2001, p.599), who states that: 'computer based systems can be of benefit in knowledge based activities ... to support the development and communication of human meaning'. Thus, ignoring people's motivation, ability and opportunity to share knowledge is one of the key causes of resistance to the use of knowledge-sharing and knowledge-managing tools.

In order to improve knowledge sharing and KM supported by ICT, tools need to be embedded in the social networks of which they are part (Huysman and Wulf, 2006). We tend to believe that because knowledge is an essentially human factor, which only people can possess, technology alone is not enough to create the atmosphere needed to share and manage it. Organizations need to do more in order to prepare a proper environment for this knowledge to be shared and managed, as the system cannot operate in isolation.

The greatest challenge to knowledge management found by Ruggles (1998) was 'changing people'. The complexity of the people sharing and managing knowledge is emphasized in the statement by Davenport, Long and Beers (1999, p.105) that

the complexity of human factors to be managed was much greater than for most data or information management projects. Unlike data, knowledge is created invisibly in the human brain, and only the right organizational climate can persuade people to create, reveal, share, and use it.

From the above arguments, it seems that linking ICT to knowledge management is anything but easy. This illustrates the importance of the interaction between staff dealing with ICT and the ICT itself. In other words, 'leveraging knowledge involves a unique combination of human and ICT'. Moreover, the use of ICT support will be

determined through people's behaviour and the context in which they operate. Therefore the question posed by this study is:

How are information communication technologies used, or not used, within knowledge management activities?

Understanding the participation of ICT to support KM will help identify various ways in which methods and practices of ICT can affect the flow of information that fuels knowledge within its context.

This leads us to discuss in the next section an important element in the knowledge management processes, namely the context of climate. This factor was accentuated by Davenport et al. (1999) and yet little is known about its impact. Since the study is approaching these knowledge management practices in terms of climate, not culture, it is therefore of importance to discuss the difference between culture and climate and how the researcher decided to focus on climate. Consequently, it is very helpful to assess the organizational climate in which a knowledge management system is operated to see whether this climate helps or hinders KM activities.

3.4 Organizational culture vs. climate

Since the early 1980s, when the cultural perspective began to become important in organizational studies, the distinction between culture and climate was quite clear. (Denison, 1996)

Schwartz and Davis put it most simply when they say that whatever culture is, it is not climate: 'one way to understand culture is to understand what it is not' (1981: p.32, in Denison, 1996). The climate perspective has followed a very different pattern. The climate concept has its roots in Lewin's studies of experimentally created social climates (Lewin, 1951; Lewin, Lippit and White, 1939, cited by Denison, 1996).

Cultural researchers, on the other hand, are more concerned with the evolution of social systems over time (Mirvis and Sales, 1990; Mohr, 1982; Pettigrew, 1979; Rohlen, 1974; Schein, 1985, 1990; Van Maanen, 1979, cited in Denison, 1996), whereas climate researchers are generally less concerned with evolution but more

concerned with the impact that organizational systems have on groups and individuals (Ekvall, 1987; Joyce and Slocum, 1984; Koyes and DeCotiis, 1991, cited in Denison, 1996). Table 3.4 below presents a summary of this widely accepted view of these two literatures, by pointing out contrasts in the epistemology, point of view, methodology, level of analysis, temporal orientation, theoretical foundations and disciplinary basis of the culture and climate perspectives.

Table 3.4: Contrasting the organizational culture and organizational climate research perspectives

Differences	Culture literature	Climate literature
Epistemology	Contextualized and idiographic	Comparative and nomothetic
Point of view	Native point of view	Researcher's viewpoint
Methodology	Qualitative field observation	Quantitative survey data
Level of analysis	Underlying values and assumptions	Surface-level manifestations
Temporal orientation	Historical evolution	Ahistorical snapshot
Theoretical foundations	Social construction; critical theory	Lewin's field theory
Discipline	Sociology and anthropology	Psychology

(Source: Adapted from Denison, 1996, p.625)

However, Schwartz and Davis (1981, p.33) point out that 'while climate is often transitory, tactical, and manageable over the relatively short term, culture is usually long-term and strategic. It is very difficult to change'. Or as Thomson (1998, p.240) states, 'Changing the culture of an organization by tackling it head on as a single facet of organizational life is really, really tough. To go deep into cultural change you have to be talking about beliefs and values, and these go to the very soul of the organization and its people. It is much easier to change the climate and language of the business.' Isaksen and Ekvall (2007) arrived at a similar conclusion and advised to focus on climate as the level for change. Table 3.5, below, adapted from Akkermans et al. (2008), usefully summarizes these dissimilarities.

Table 3.5: Organizational culture and climate

Culture	Climate
The values, beliefs, history, traditions, etc., reflecting the deeper foundations of the organization.	Recurring patterns of behaviour, attitudes, and feelings that characterize life in the organization.
What the organization values	*What organization members experience*

(Source: Akkermans et al., 2008; Isaksen and Ekvall, 2007)

Furthermore, studying climate arguably requires quantitative methods to gauge the unique views, thoughts, feelings and behaviours people have (Denison, 1996). Hence, the study at hand employed a quantitative method known as the Situational Outlook Questionnaire (SOQ) to assess the climate in which knowledge management programmes are taking place (this is discussed in the methodology chapter).

However, despite the fact that most of the literature is based on organizational culture (e.g. Hofstede, 1998; Janz and Prasarnphanich, 2003; Kayworth and Leindner, 2003; Knapp and Yu, 1999) and that in the mainstream of knowledge management literature, the role of culture in knowledge management is acknowledged to be important (e.g. APQC, 1997; DeLong and Fahey, 2000; Sveiby and Simons, 2002; Kayworth and Leidner, 2003; Alavi et al., 2005), culture was amongst the highest-ranked barriers to KM implementation (e.g. Cloete and Snyman, 2003; Singh et al., 2006; Alavi et al., 2006; Mariano and Casey, 2007).

In recent years, there has been an increasing interest in the organizational climate (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar; 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekval, 2007). These studies have shown a positive relationship between a conducive organizational climate and innovation and creativity. Yet there has been very little research on the impact of organizational climate on knowledge *per se* except for the study of Seveiby and Simons (2002) and Bock et al. (2005).

In Seveiby and Simons' study of *Collaborative Climate and Effectiveness of Knowledge* (2002), they defined *collaborative climate* by behaviours that people can observe: 'what people do around here'. Based on data from 8277 respondents in a wide variety of public and private sector organizations, they suggest that a collaborative climate is one of the major factors influencing the effectiveness of knowledge work. Again, in their study, executives cited the internal 'culture' of resistance to sharing as the hardest barrier to overcome in the implementation of KMS. Although the difference between culture and climate is manifested, researchers and researched are still using the words 'culture' and 'climate' interchangeably, as shown in the study of Seveiby and Simons. Although their study employed a large

database of 8277 participants, which made the findings statistically robust, as they describe it, and despite the fact that the instrument they used to gather the data had a range of important items, the current study utilizes a different instrument (the SOQ) for reasons that will be discussed later. What is more, the sample differs from Seveiby and Simons', which was focused largely on Australian respondents (n=5,613) American/Canadian respondents and those classed 'Rest of the World' (largely Asia Pacific and Scandinavian countries.

For Bock et al.'s 2005 study titled 'Behavioral intention formation in knowledge sharing: examining the rules of extrinsic motivators, social-psychological forces, and organizational climate', they conducted a field survey of 154 managers from 27 Korean organizations and, regarding individuals' intentions to share knowledge, found that attitudes were affected by organizational climate. Again in this study, climate factors were looked into: fairness (a trusting climate), innovativeness (a climate that is tolerant of failure and within which information freely flows), and affiliation (a climate characterized by pro-social norms). The current study will consider the nine dimensions related to the organizational climate as discussed later and will examine different cultural settings.

This case study will focus on the Saudi context. However, since, as discussed in Chapters 1 and 2, culture is sometimes found to be a strong barrier to knowledge management, this study examines climate, which can be changed and managed over a relatively short time (Schwartz and Davis 1981; Denison, 1996). Therefore a great opportunity has emerged to discuss the important impact organizational climate might have on information communication technologies' support for knowledge management. In doing so, this study draws heavily on the Situational Outlook Questionnaire developed by Ekvall (1974). This will be discussed in the next section.

3.4.1 Facilitating knowledge management via organizational climate

Over the last decade there has been growing interest in organizational climate and relative agreement that climate is a critical factor contributing to the innovation and creativity of an organization (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar; 2003;

Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007). Organizational climate appears to be a very important factor (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar, 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007).

Climate is defined as 'the recurring patterns of behavior, attitudes, and feelings that characterize life in the organization. At the individual level of analysis, the concept is called psychological climate. At this level, the concept of climate refers to the individual perceptions of the patterns of behavior. When aggregated, the concept is called organizational climate. These are the objectively shared perceptions that characterize life in the organization. Although climate is perceived by individuals within the workplace, it exists independently of these perceptions and is considered an attribute of the organization' (Ekvall, 1987, cited in Isaksen et al., 2001).

Climate is distinct from culture in that it is more directly observable within the organization. Culture refers to the deeper and more enduring values, norms and beliefs within the organization (Ekvall, 1996; Schneider, Brief and Guzzo, 1996, cited in Isaksen et al., 2001; Denison, 1996), whereas climate – as discussed in the previous section – is often 'transitory, tactical and manageable over the relatively short term; culture, on the other hand, is usually long-term and strategic. It is very difficult to change' (Schwartz and Davis, 1981. p.33). However, the use of the term 'organizational climate' seems to be rare: even in a pioneering work such as Ichijō and Nonaka's 2007 book, titled *Knowledge Creation and Management*, the word climate is used only once, on page 226, which refers to a 'climate of transparency', and there is no mention of the word 'climate' at all in Nonaka and Toyama's 2008 book *Managing Flow: A Process Theory of the Knowledge-Based Firm*, or in the index of Hislop's *Knowledge Management in Organizations* (2009).

In recent research, the management domain provides an extensive overview of potential knowledge management areas that either facilitate or hinder the use of ICT to support knowledge management. Riege (2005; 2007) usefully summarizes possible areas that might affect knowledge management practices. He reports a number of researchers who identify these factors.

Table 3.6 Knowledge-sharing barriers

Level of analysis	Knowledge-sharing barrier
Potential individual barriers (e.g. Argote et al., 1990; Baron and Markman, 2000; Davenport and Prusak, 1998; De Long and Fahey, 2000; Fai and Marschan-Piekkari, 2003; Husted and Michailova, 2002; Jarvenpaa and Staples, 2001; Marschan-Piekkari et al., 1999; Michailova and Husted, 2003; Nahapiet and Ghoshal, 1998; Nonaka and Takeuchi, 1995; Probst et al., 2000; Tiwana, 2002)	• General lack of time to share knowledge, and time to identify colleagues in need of specific knowledge • Apprehension or fear that sharing may reduce or jeopardize people's job security • Low awareness and realization of the value and benefit of possessed knowledge to others • Dominance in sharing explicit over tacit knowledge such as know-how and experience that requires hands-on learning, observation, dialogue and interactive problem-solving • Use of strong hierarchy, position-based status, and formal power ('pull rank') • Insufficient capture, evaluation, feedback, communication, and tolerance of past mistakes that would enhance individual and organizational learning effects • Differences in experience levels • Lack of contact time and interaction between knowledge sources and recipients • Poor verbal/written communication and interpersonal skills • Age differences • Gender differences • Lack of social network • Differences in education levels • Taking ownership of intellectual property due to fear of not receiving just recognition and accreditation from managers and colleagues • Lack of trust in people because they misuse knowledge or take unjust credit for it • Lack of trust in the accuracy and credibility of knowledge due to the source • Differences in national culture or ethnic background; and values and beliefs associated with it (language is part of this)
Potential organizational barriers (e.g. Connelly and Kelloway, 2003; De Long and Fahey, 2000; Gold et al., 2001; Hansen, 1999; Knott, 2001; McDermott, 1999; McDermott and O'Dell, 2001; Michailova and Husted, 2003; Nonaka and Konno, 1998; Nonaka and Takeuchi, 1995; O'Dell and Grayson, 1998; Probst et al., 2000; Szulanski, 1996; Sveiby and Simons, 2002; Sveiby, 1997)	• Integration of KM strategy and sharing initiatives into the company's goals and strategic approach is missing or unclear • Lack of leadership and managerial direction in terms of clearly communicating the benefits and values of knowledge-sharing practices • Shortage of formal and informal spaces to share, reflect and generate (new) knowledge • Lack of transparent rewards and recognition systems that would motivate people to share more of their knowledge • Existing corporate culture does not provide sufficient support for sharing • practices • Deficiency of company resources that would provide adequate sharing opportunities • External competitiveness within business units or functional areas and between subsidiaries can be high (e.g. 'not invented here' syndrome) • Communication and knowledge flows are restricted into certain directions (e.g. top-down) • Physical work environment and layout of work areas restrict effect sharing practices • Internal competitiveness within business units, functional areas, and subsidiaries can be high • Hierarchical organization structure inhibits or slows down most sharing practices • Size of business units often is not small or manageable enough to enhance contact and facilitate ease of sharing
Potential technology barriers (e.g. Attewell, 1992; Erickson and Kellogg, 2000; Gold et al., 2001; Hendriks, 1999; Iansiti, 1998; O'Dell and Grayson, 1998; Sarvary, 1999).	• Lack of integration of IT systems and processes impedes the way people do things • Lack of technical support (internal and external) and immediate maintenance of integrated IT systems obstructs work routines and communication flows • Unrealistic expectations of employees as to what technology can do and cannot do • Lack of compatibility between diverse IT systems and processes • Mismatch between individuals' need requirements and integrated IT systems and processes restricts sharing practices • Reluctance to use IT systems due to lack of familiarity and experience with them • Lack of training regarding employee familiarization with new IT systems and processes • Lack of communication and demonstration of all advantages of any new system over existing ones

(Source: Riege, 2005; 2007; Serenko et al., 2007)

Riege, in his 2007 paper 'Actions to overcome knowledge transfer barriers in MNCs', offers a list of actions that might help managers to overcome numerous internal knowledge transfer barriers. His work is based upon theory in knowledge management and related fields, and in-depth interviews with over 60 senior and middle managers in 20 Australian-based multinational corporations (MNCs), companies with regional outposts largely in Western countries: the USA, UK, Germany, and South Africa. It can be argued that, although his work is valid and justified in its own right, barriers identified in these places, or any Western countries, might differ from those in countries in the Arab world, which have somewhat 'been under-represented as participants in the knowledge society' (Butler et al, 2004, p.84), Saudi Arabia in particular (see section 2.2). This therefore presents an opportunity to explore the question:

How can knowledge management be developed and improved?

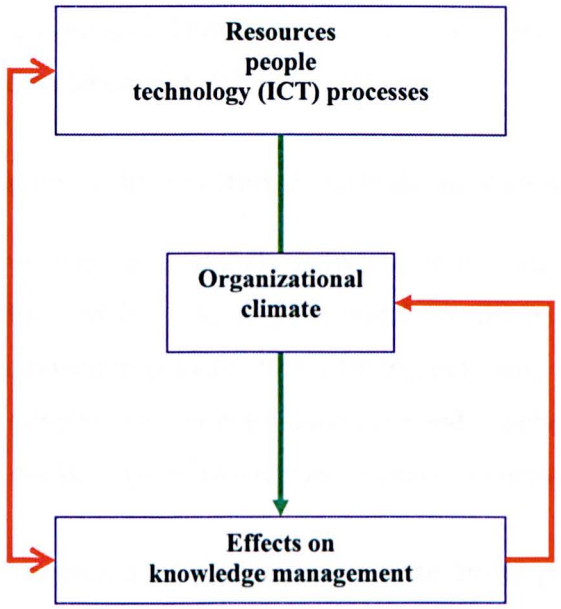
in relation to the Saudi Arabian context.

It can also be argued that many of the barriers listed above are to some extent related to organizational climate rather than culture, for example lack of time, lack of job security, lack of a strong hierarchy, tolerance of past mistakes, lack of trust, lack of leadership and managerial support, and lack of technical support. These, as will be discussed later, were of concern to Ekvall's work (1996).

Serenko et al. (2007) further argue that the intra-organizational work climate also drives knowledge-sharing behaviours. They illustrate some examples such as perceptions of job security, tolerance of failure, freedom in decision-making and interpersonal trust, and interpersonal communication. Similarly, the APQC 2000 study identified a number of barriers such as no time to share and a fear of sharing knowledge that could potentially make them less valuable to the organization; lack of awareness of the value and importance of knowledge sharing; and no support from top management (APQC, 2000, pp.17–18). Together, these barriers to knowledge management play a significant role in determining the organizational climate's impact and are to some extent covered by Ekvall's nine dimensions, later examined.

Organizational climate is seen as an intervening variable, as shown in Figure 3.1, that affects individual and organizational performance due to its modifying effect on organizational climate. The organization has resources of different kinds – people and technology (ICT) – which are used manage knowledge. These processes either help or hinder the practices of knowledge management. Climate exerts a strong influence on these outcomes. But the effects in turn influence both resources and climate (Ekvall, 1996). This climate, whose dimensions are defined in Table 3.5 above, is influenced by many factors within the organization and, in turn, affects organizational and psychological processes. Therefore, climate can be defined and should be amenable to measurement (Isaksen et al., 2001).

Figure 3.1: Organizational climate as an intervening variable affecting the use of ICT to support knowledge management



(Adapted from Ekvall, 1996)

Following on from above, it stands to reason that facilitating knowledge via climate is vital, as available evidence in the literature suggests that knowledge workers place a lot of importance on having high levels of autonomy at work (Robertson and Swan, 2003) and opportunities for self-development (Hunter et al., 2002) and coaching and mentoring, which can facilitate the informal sharing of knowledge (Gravey and

Willamson, 2002; Harrison and Kessels, 2004; Karaoulian et al. ,2008; Kets de Varies, 2005; Orlikowski, 2002, cited in Hislop, 2009).

Davenport, Long and Beers (1999, p.105) state that 'the complexity of human factors to be managed was much greater than for most data or information management projects. Unlike data, knowledge is created invisibly in the human brain, and only the right organizational climate can persuade people to create, reveal, share, and use it.' Similarly, Robert Buckman (1999, p7): 'To move from a culture that calls for the hoarding of knowledge in order to gain power toward one that rewards the sharing of knowledge with an increase in power, we need to create a climate that fosters long-lived, trusting relationships. We must be able to trust that we receive the best information that can be sent to us, and those who send it must be able to trust that it will be used in an appropriate manner'. Zack (1999), in his book *Knowledge and Strategy*, writes, 'organisations must create a social climate and work context which supports and encourages knowledge creation and sharing, openness and trust, cooperation and collaboration' (1999, p.313)

3.4.1.2 Dimensions of the Situational Outlook Questionnaire (the SOQ)

The SOQ survey used in this study grew out of a research programme in Sweden during the 1980s pertaining to organizational conditions that stimulate or hamper creativity and innovation (Ekvall, 1990; 1996), and many studies have examined the organizational climate in relation to innovation and creativity. The topic is addressed by considering the findings of two relevant empirical climate measurement studies.

Hunter (2007) conducted a meta-analysis to examine 42 prior generic studies related to climate dimensions (illustrated below). These dimensions were found to be effective predictors of creative performance across criteria, samples and settings. It was found, moreover, that they were especially effective predictors of creative performance in turbulent, high-pressure, competitive environments.

Isaksen and Lauer (2002) conducted a study to examine the ability of the Situational Outlook Questionnaire (SOQ) to effectively discern climates that either encouraged or discouraged creativity and the ability to initiate changes in a team setting. The

measure was able to discriminate consistently and significantly between the two types of experience. This followed work by Lauer et al. (2001), who reported the results of two studies conducted to examine the ability of the SOQ to effectively discern climates that either encouraged or discouraged creativity and the ability to initiate change. The results of both studies show that, when individuals completed the SOQ based on their recollections of best- and worst-case work experience, the measure was able to consistently and significantly discriminate between the two types.

According to SPCG, the power behind the SOQ is that the dimensions it measures have been validated against measures of organizational innovation. Research over the past 30 years has examined the relationship between people's perceptions of the organizational climate and the organization's ability to develop original products and services, expedite delivery of these products to the marketplace, and commercialize original and successful products (SPCB, 2002). These nine dimensions (Isaksen et al., 2001, p.175) are:

Challenge and involvement: Degree to which people are involved in daily operations, long-term goals, and visions. When there is a high degree of challenge and involvement, people feel motivated and committed to making contributions. The climate is dynamic, electric and inspiring. People find joy and meaningfulness in their work. In the opposite situation, people are not engaged, and feelings of alienation and apathy are present. Individuals lack interest in their work and interpersonal interactions are dull and listless.

Freedom: Independence in behaviour exerted by the people in the organization. In a climate with much freedom, people are given the autonomy and resources to define much of their work. They exercise discretion in their day-to-day activities. Individuals are provided with the opportunity and take the initiative to acquire and share information about their work. In the opposite climate, people work within strict guidelines and roles. They carry out their work in prescribed ways with little room to redefine their tasks.

Trust/openness: Emotional safety in relationships. When there is a high degree of trust, individuals can be genuinely open and frank with one another. People count on

each other for professional and personal support. People have a sincere respect for one another and give credit where credit is due. Where trust is missing, people are suspicious of each other, and therefore, they closely guard themselves, their plans and their ideas. In these situations, people find it extremely difficult to openly communicate with each other.

Idea time: Amount of time people can (and do) use for elaborating new ideas. In the high idea-time situation, possibilities exist to discuss and test suggestions not included in the task assignment. There are opportunities to take the time to explore and develop new ideas. Flexible timelines permit people to explore new avenues and alternatives. In the reverse case, every minute is booked and specified. The time pressure makes thinking outside the instructions and planned routines impossible.

Playfulness/humour: Spontaneity and ease displayed within the workplace. A professional yet relaxed atmosphere where good-natured jokes and laughter occur often is indicative of this dimension. People can be seen having fun at work. The climate is seen as easy-going and light-hearted. The opposite climate is characterized by gravity and seriousness. The atmosphere is stiff, gloomy and cumbrous. Jokes and laughter are regarded as improper and intolerable.

Conflict: Presence of personal and emotional tensions in the organization. When the level of conflict is high, groups and individuals dislike and may even hate each other. The climate can be characterized as 'interpersonal warfare'. Plots, traps, power and territory struggles are usual elements of organizational life. Personal differences yield gossip and slander. In the opposite case, people behave in a more mature manner; they have psychological insight and control of impulses. People accept and deal effectively with diversity.

Idea support: Ways new ideas are treated. In the supportive climate, ideas and suggestions are received in an attentive and professional way by bosses, peers, and subordinates. People listen to each other and encourage initiatives. Possibilities for trying out new ideas are created. The atmosphere is constructive and positive when considering new ideas. When idea support is low, the automatic 'no' prevails. Fault-finding and obstacle-raising are the usual styles of responding to ideas.

Debate: Occurrence of encounters and disagreements between viewpoints, ideas, and differing experiences and knowledge. In the debating organization, many voices are heard and people are keen to put forward their ideas for consideration and review. People can often be seen discussing opposing opinions and sharing a diversity of perspectives. Where debate is missing, people follow authoritarian patterns without questioning them.

Risk-taking: Tolerance of uncertainty and ambiguity in the workplace. In the high risk-taking case, bold initiatives can be taken even when the outcomes are unknown. People feel as though they can 'take a gamble' on their ideas. People will often 'go out on a limb' to put an idea forward. In a risk-avoiding climate, there is a cautious, hesitant mentality. People try to be on the 'safe side' and often 'sleep on the matter'. They set up committees, and they cover themselves in many ways (Isaksen et al., 2001, p.175).

Based on the evidence set out above and in line with the fact that culture (e.g. DeLong and Fahey, 2000; Sveiby and Simons, 2002; Kayworth and Leidner, 2003; Alavi et al., 2005) was amongst the highest-ranked barriers to KM implementation (e.g. Cloete and Snyman, 2003; Singh et al., 2006; Alavi et al., 2006; Mariano and Casey, 2007), culture has been widely researched compared to climate. Based on other climate studies, (e.g. Seveiby and Simons, 2002; Bock et al., 2005) which have not used the SOQ to examine climate, the researcher believes that utilizing the SOQ approach can effectively examine the impact of organizational climate on ICT support for KM. A dedicated study needs to be carried out to diagnose the organizational climate in which knowledge management activities occur. Hence, the current study attempts to do this.

The author suggests that in reporting this work, the proposed thesis will add to the body of existing SOQ work in relation to knowledge management systems, as this area has not been linked to the impact of climate. What made the researcher positive about this approach is that his supervisor has good contacts with one of the Core UK Team at CPSB (Creative Problem Solving at Buffalo), who welcomed the idea as showing originality. More detail on this originality was given earlier in section 2.3.4.

Hence, a great opportunity exists to investigate the connection between ICT, KM system and organizational climate, to see whether or not this factor has an impact on information communication technology support for knowledge management. Based on the SOQ survey, the study attempts to diagnose the climate and pose the following question:

What does the organizational climate look like?

This, alongside the qualitative interviews, will help us to gain an insight into the following question:

How does the organizational climate affect the use of information communication technology to support knowledge management?

3.5 Concluding remarks

This chapter has provided an overview of the existing literature concerning knowledge management and how it can be supported via information communication technologies. It has also looked into the issue of how knowledge management can be facilitated through the use of organizational climate as an effort to shape workers' attitudes and behaviour in particulars ways. This climate can help to create a positive attitude towards, and willingness to participate in, knowledge management activities. While there is significant awareness of the role organizational climate might play to ease the use of information communication technology to support knowledge management, there has been little empirical study to explore this area of research, as mentioned above. In the next chapter, the researcher attempts to provide a detailed discussion of how the research was carried out.

Chapter 4

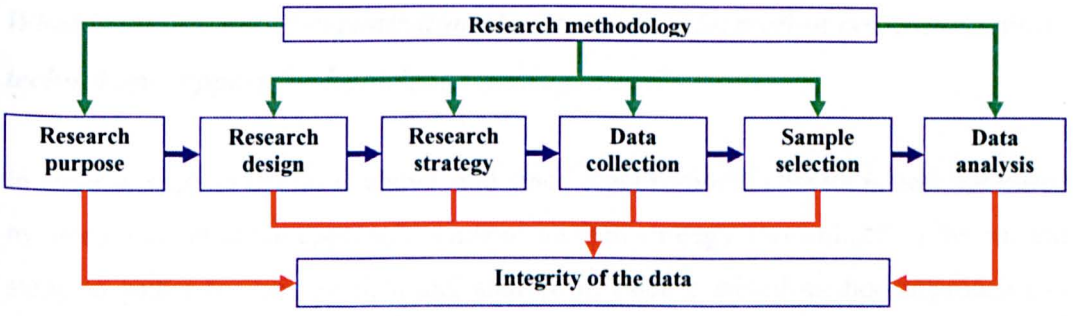
Research Methodology

If we could first know where we are, and whither we are tending, we could better judge what to do and how to do it. (Abraham Lincoln)

4.1 Introduction

This chapter describes the research methodology, methods for data collection and analysis producers used in the study, the aim of which is to explore the relationships between organizational climate, information communication technology support and, ultimately, knowledge management. This study utilizes a mixed method: while chiefly a qualitative study, whenever appropriate, quantitative data are used to assist in answering the research questions, which concern the diagnosis of organizational climate. In this chapter, a purpose statement is outlined, followed by the research design, which involves an examination of the philosophical assumptions, the strategy of inquiry and the specific methods used in this study. The approach to data analysis is also explained in detail and the integrity of the data is discussed in this chapter.

Figure 4.1: Organization of Chapter 4



4.2 Purpose statement

To state the purpose of a study is to inform the reader about what the researcher is likely to accomplish (Marshall and Rossman, 2006, p.53). Yin (2002, p.5) states that case studies have three major purposes: to explore, to explain or to describe. Case studies are also undertaken for a variety of reasons, but usually involve 'the study of

the particularity and complexity of a single case ... [c]oming to understand its activity within important circumstances' (Stake 1999, p.xi; Simons, 2009). Thus the aim of this study is in line with the motives mentioned previously in Chapter 2.

As illustrated above, in the preceding chapter, much of the literature pertaining to the study addresses the question of why the relationship between ICT and KM is so challenging. For many authors (e.g. DeLong and Fahey, 2000; Sveiby and Simons, 2002; Kayworth and Leidner, 2003; Alavi et al., 2005), culture was identified as the most significant barrier to effective KM implementation. After much thought, the researcher decided that an alternative route could be taken by looking at climate in place of culture to navigate around the barrier of cultural issues.

The researcher found that there was relative agreement among researchers that a climate encouraging creativity is an important factor contributing to the innovation and creativity of an organization (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007). However, what has been less researched is the impact of climate on information communication technology support for knowledge management. Given the significance of the study, as introduced in Chapter 1, the researcher, more precisely, seeks to address the following question:

What is the impact of organizational climate on information communication technology support for knowledge management?

In order to explore the issue above, and since organizational climate is best measured by using a quantitative approach, a mixed-method strategy was utilized in the current study to gather the needed data and analyse it. Such a mixed-method approach can contribute to the verification and validation of qualitative data analysis (Patton, 2002, p.556). It is important to note that the case study was chiefly qualitative: such a combination can lead to a greater confidence in results (Jick, 1979). A quantitative questionnaire was used to examine the respondents' perceptions of the organizational climate. A qualitative interview provided the means to explore the impact of organizational climate on information communication technology support for knowledge management.

An almost parallel design was selected in an attempt to confirm and corroborate findings within a single (case) study (Greene et al., 1989; Morgan, 1998; Creswell et al., 2008; Bryman, 2008, p.624) to compensate for the weakness inherent within one method with the strengths of the other methods. This design is 'advantageous because it is familiar to most researchers and can result in well-validated and substantiated findings' (Creswell, 2008, p.183). This strategy employed a single exploratory case study, and in relation to business, is 'probably the most well-known example of a research design' (Maylor and Blackmon, 2005, p.256). The researcher shall examine the research design in the following section.

4.3 Research design

Research design is subject to various constraints. In the real world, choices are limited by ethical approval, resources, time and access to required sites; these major elements must be addressed prior to the design of the methodology (O'Leary, 2004, p.93). The topic of the research is a major influence on the research design, as are the 'rules' of doing research on that topic in general. Such rules deal with the logic of the researcher and describe which questions the researcher can ask and what method can be used to answer them (Maylor and Blackmon, 2005, p.137). Therefore, the research methods chosen should be appropriate and relevant to answering the research question(s). The research questions, in a way, shape the choice of methods and the type of research setting, and not the other way round (Eriksson and Kavlaieng, 2008, p.27).

Creswell (2009, p.5) suggests that three components be involved in research design: philosophical assumptions, which he refers to as 'philosophical worldviews', strategies of inquiry, and finally, specific methods. These mechanisms are addressed later in this chapter. Ignoring philosophical issues, though not necessarily fatal, can seriously affect the quality of research in management (Amaratunga and Baldry, 2001) because they influence the practice of research and need to be identified. Creswell (2009, p.5) suggests that individuals preparing a research proposal or plan make explicit the larger philosophical ideas they wish to promote. This information will help explain why the choice of qualitative, quantitative, or mixed methods approaches has been made.

This study describes and analyses how organizational climate influences the information communication technology support for knowledge management. The study at hand employs a mixed methodology (Creswell, 2003): while it is mainly a qualitative study, whenever appropriate, quantitative data were used to assist in the investigation of the organizational climate, since the latter is better studied using quantitative means. Before we proceed any further, the researcher shall outline the research problem and questions on which this study is based.

4.3.1 Research problem

As discussed in Chapter 1, and given that knowledge is a vital resource to improve organizational performance, in what ways, if any, can the organizational climate have an impact on information communication technology support for knowledge management? The core research problem that generated the research activity can be re-stated as follows:

What is the impact of organizational climate on information communication technology support for knowledge management?

Thus, in order to achieve the objectives of this study, described in 1.4, the problem statement may be adequately addressed with reference to the following questions:

- How does the climate affect the use of information communication technology to support knowledge management? In order to obtain an 'overall understanding', the question 'What does the climate look like?' can help provide an insight into the effect of organizational climate.
- How does information communication technology participate in knowledge management activities?
- How can knowledge management be improved?

These questions could be formed in different ways. When a researcher devises research questions and problems, the way in which the world is viewed may lead to different choices in collecting and analysing relevant data. This in turn could lead to varying interpretations of one's findings (Goetz and LeCompte, 1984). As Stake

(2000, p.449) explains, 'seen from different worldviews and in different situations, the "same" case is different'.

The paradigms and perspectives, strategy of inquiry and research methods are outlined below, respectively.

4.3.2 The philosophical assumptions

The 'philosophical worldview' is an alternative term used by Creswell (2009, p.6) to mean 'a basic set of beliefs that guide action', referred to by others as paradigms (Babbie, 2004; Lincoln and Guba, 2000; Mertens, 1998). The case study which was utilized in this study is grounded on philosophical perspectives. Two distinct philosophical approaches to designing research have been the subject of 'a long-standing debate in science: positivism and realism or interpretivism' (Amaratunga and Baldry, 2001).

The philosophical assumptions that support these theoretical paradigms are based on ontology, epistemology and methodology – the latter is sometimes called the 'philosophy of methods' – to describe how a given issue or problem can be studied (Eriksson and Kovalainen, 2008, p.16).

Ontology is concerned with the nature of social entities: whether social entities can and should be considered objective entities that have a reality external to social actors, or should be built up from the perceptions and actions of social actors. These positions are frequently referred to respectively as objectivism and constructivism (Bryman, 2008, p.18). The constructivist approach is based on the belief that knowledge is socially constructed (Denzin and Lincoln, 2000b; Stake, 1999) and is closely associated with the interpretive paradigm. This paradigm assumes relativist ontology, meaning that there are multiple realities, and a subjectivist epistemology, which assumes that the researcher and respondent together create understandings (Denzin, 1997).

Epistemology, on the other hand, concerns the question of what is (or should be) regarded as acceptable knowledge in a discipline. The central point in this context is

the question of whether the social world can or should be studied according to the same principles, procedures and culture as a natural science, and is associated with positivism (Bryman, 2008, p.13).

However, it is possible to undertake business research without much knowledge of the basic concepts in the philosophy of the social sciences. It is, however, helpful for designing a solid piece of study that delivers what it promises (Eriksson and Kovalainen, 2008, p.11). The ontological and epistemological assumptions of this study are informed by the interpretive paradigm (discussed later) and the role of the researcher is to construct meaning as well as to actively interpret reality.

The author of this study assumes that knowledge management is a social construction and can be understood via interactions between members of the RD who attempt to make sense of their knowledge world. This study sought to explore the practices of knowledge management at the RD by using an organizational climate lens to observe and probe barriers to information and communication technologies support for knowledge management in the RD.

An interpretive paradigm based on a mixed-methods approach was adopted to shape the study at hand. Interpretive approaches commonly attempt to understand phenomena through the meanings that people assign to them and are 'aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context' (Walsham, 1993, pp.4–5). In other words, 'Interpretive methods relate to how things are represented in communities and organizations. Information and communication technologies, including so-called knowledge management systems, are deeply involved in providing interpretive schemes' (Walsham, 1993, p.11). Table 4.1, below, summarizes the advantages and drawbacks of the philosophical perspectives on which the method chosen here may be based.

Table 4.1: Advantages and drawbacks of research paradigms

Research paradigm	Advantages	Drawbacks
Positivism	Attempts to test theory, in order to increase the predictive understanding of phenomena. Many exemplars to draw on. High acceptance within IS, especially within the USA.	Not appropriate for an exploratory study such as the current research. 'Some studies may have a legitimate reason for not having any propositions. This is the condition in which a topic is the subject of "exploration"' (Yin, 2003, p.22).
Interpretivism	Focuses on an understanding of the context of the information system, and the process whereby it influences and is influenced by the context. Addresses many of the shortcomings of positivism. Good for explaining a situation.	Interpretive research does not predefine dependent and independent variables. Still an emerging research paradigm within IS research. Does not include an explicit agenda for change.
Critical	Assumes that social reality is historically constituted and that it is produced and reproduced by people. Takes interpretivism further; investigates historical aspects of the organizational context.	Least common research paradigm within IS. Strong emphasis on class relations.

(Adapted from Myers, 1997; Yin, 2003; Freke, 2005)

It is also significant that interpretivism does not predefine dependent and independent variables, but focuses on the full complexity of human sense-making as the situation emerges (Kaplan and Maxwell, 1994). Hence, the case study to be carried out for this research is an interpretive one, where an understanding of the context of KM has been sought to identify ways in which information communication technology can be used to support it (Freke, 2005). It is assumed that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings; therefore, all participants have different viewpoints, shaped by their values, beliefs, norms and experiences. There is no objective reality to be discovered;

instead, an interpretation of social reality can be gained from participants' interaction with that social reality.

The researcher therefore assumed that having a better understanding of the organizational climate can in turn help us to understand knowledge management practices in the R&D centre in which this study was undertaken. However, since this study employs a mixed-method approach, and the priority is given to the qualitative method, the philosophical approach underlying the study is mostly an interpretive/realism approach within a qualitative research paradigm with a view to testing the organizational climate quantitatively.

4.3.3 Strategies of inquiry

The nature of the research questions will be a key determining factor in exploring potential method logics, or as O'Leary (2004, pp.90–91) describes it: 'the research question can go much further in directing the nitty-gritty of methods'. For Bryman (2005), three distinct approaches can be utilized to make an inquiry: quantitative, qualitative and the approach that is variously called multi-methods (Brannen, 1992), multi-strategy (Bryman, 2004), mixed methods (Creswell, 2003; Tashakkori and Teddlie, 2003) or mixed methodology (Tashakkori and Teddlie, 1998). In the following section, some key features of these approaches are given.

4.3.3.1 Quantitative as opposed to qualitative research

> *Not everything that can be counted counts and not everything that counts can be counted.* (Albert Einstein, quoted in Patton, 2002, p.12)

Quantitative research usually emphasizes quantification in the collection and analysis of data. It employs strategies of inquiry such as experiments and surveys to collect data on predetermined instruments that yield statistical data (Creswell, 2003; Bryman, 2004). A quantitative approach needs to translate research questions into hypotheses, which then determine what data needs to be collected and how it is collected. This is known as a deduction logic, and the assumption that underlies it is that the world is

seen as real and knowable, that the researcher can be objective and that all phenomena can be reduced to a set of numbers (Maylor and Blackmon, 2005, p.150, 162).

Four criticisms may be made of quantitative research: it fails to distinguish people and social institutions from 'the world of nature'; the measurement process possesses an artificial and spurious sense of precision and accuracy; the reliance on instruments and procedures hinders the connection between theory and everyday life; and the analysis of the relationship between variables creates a static view of social life that is independent of people's lives (Bryman, 2004). Table 4.2 summarizes some common contrasts between quantitative and qualitative research.

Table 4.2: Some common contrasts between quantitative and qualitative research

Quantitative	Qualitative
Numbers	Words
Point of view of researchers	Point of view of participants
Researcher distant	Researcher close
Theory testing	Theory emergent
Static	Process
Structured	Unstructured
Generalization	Contextual understanding
Hard, reliable data	Rich deep data
Macro	Micro
Behaviour	Meaning
Artificial setting	Natural setting

(Source: Bryman, 2008, p.393)

By contrast, qualitative research places emphasis on words rather than quantification in the collection and analysis of data (Bryman, 2004). Qualitative inquiry is particularly oriented towards exploration, discovery and inductive logic to build toward general patterns (Patton, 2002, pp.55–56) to develop concepts and/or a conceptual framework from data. The assumption underlying it is that the world is complex and only knowable through interaction with the social system that it contains (Maylor and Blackmon, 2005, pp.150, 162, 163). Qualitative research is considered to have emerged primarily during the last three or four decades and what constitutes a qualitative inquiry is now relatively well understood (Creswell, 2003).

On the other hand, qualitative research can be criticized as being emergent rather than 'tightly pre-figured'; it is fundamentally interpretative, views social phenomena holistically, is introspective and acknowledges biases, values and interests. This study is thus best served by including a quantitative paradigm, adjacent to the dominant qualitative method that helps to offset the deficiencies inherent within the latter.

Table 4.3 below lists some of the fundamental differences between quantitative and qualitative research. Bryman (2008) further characterises qualitative research as being subjective and difficult to replicate, suffering from problems of generalization and lack of transparency.

Table 4.3: Fundamental differences between quantitative and qualitative research strategies

	Quantitative	Qualitative
Principal orientation to the role of theory in relation to research	Deductive: testing of theory	Inductive: generation of theory
Epistemological orientation	Natural science model, in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructionism

(Source: Bryman, 2008, p.22)

The approach employed for the current study is mixed-method in nature; this shall be expanded upon in the following section.

4.3.3.2 Justification for mixed methods (triangulation):

> *The method must follow the question. Campbell, many decades ago, promoted the concept of triangulation – that every method has its limitations, and multiple methods are usually needed.* (Tashakkori and Teddlie, 1998, p.22)

A major strength of case study data collection is the use of multiple sources for evidence (triangulation: Yin, 2009, p.114). The mixed-method technique that was used in this study is a combination of quantitative and qualitative approaches

incorporated into the research methodology of a single or multiphase study. It evolved from the pioneering work of Campell and Fiske (1959, cited in Tashakkori and Teddlie, 2006, p.90), who used more than one method to measure a psychological trait, a technique that they called the 'multi-method–multi-trait' approach.

Mixed methods (triangulation) may provide a better understanding of a phenomenon than if just one method had been used (Bryman, 2008, pp.603, 624), because each research method has particular strengths and weakness. There 'is always a danger that research findings will reflect, at least in part, the method of inquiry', so 'one's own research should bring more than one method to bear on the topic' (Babbie, 2004, p.113).

There are situations where a researcher should use multiple methods in a single research project. Maylor and Blackmon (2005, pp.256–58) suggest three circumstances: (a) in some projects a researcher will not find all the information needed using solely one method, and in order to fill in the gaps of information, must 'buttress' the findings with data drawn from another approach (Bryman, 2007, p.649); (b) another situation may be when one finds out different answers depending on the method used, and no one method reveals the 'truth'; further, (c) when conducting research in stages, it might become clear as the research progresses that different methods are appropriate for each stage.

In this study, the researcher found out that the gathering of data pertaining to the organizational climate impact on ICT support for KM could not be completed without a quantitative questionnaire, as the literature suggests in section 3.4.1.1, and could also not be completed without using the qualitative method of study. Combining the two methods may result in confidence in one's research findings.

Greene et al. (1989) point out five issues that might enhance confidence in one's findings as follows:

- Triangulation: seeks to triangulate findings in order that they may be mutually corroborated. For the given mixed-method approach, the use of interviews and qualitative and quantitative questionnaires illustrates this intent. Bryman

(2007), in Business Research Methods, cites an example of this: 'a study that uses a triangulation is an investigation by Stiles (2001) into the impact of boards of directors on corporate strategy, which involved in-depth semi-structured interviews with 51 main board directors of UK public companies, and a questionnaire survey of 121 company secretaries'. The logic behind this, as Stiles states, is that the mixed methods were required in order to understand fully the nature of board activity, which enabled exploration of the strategy-making role of the board and its multifunctional nature (Bryman, 2007, p.647).

- Complementing: refers to seeking elaboration, enhancement, illustration and clarification of the results from one method using the results from the other method. The case study intends to bring together a more comprehensive account of the area being investigated. This study explores one element of the research – namely the climate issues within the organization – quantitatively, as the climate is more quantitative than otherwise. This is to develop a better understanding of the phenomenon being investigated.
- Development: results from one method to help develop or inform the other method. For this case study, this was not applicable, as the questionnaire was already developed and its use was inevitable.
- Initiation: intends to discover paradoxes and contradictions. In this study, this may well emerge rather than constitute a planned intention. However, the aim of combining the mixed methods is not to uncover paradoxes or contradictions between the two. Rather, it is aimed at triangulating as well as complementing findings.
- Expansion: seeks richness and detail to the study by exploring specific features of each method. In the given study, this intention is illustrated by the use of quantitative questionnaires to assess the organizational climate and qualitative interviews to investigate all the elements of the research including, again, the organizational climate.

This triggers the question of how one can design a mixed-method study, which is further explored in the following segment.

4.3.3.3 Mixed methods design

Creswell (1995) used the following distinctions in defining four of the mixed-method designs. These are, firstly, sequential studies, where a researcher conducts the qualitative phase of a study first, followed by the quantitative phase (he calls them two-phase studies). For the present study, the two methods are applied almost in parallel, and as such, the previously stated method is not applicable. The second design method is the parallel/simultaneous study, where a researcher carries out a study using both approaches at the same time. This study aims to employ such a parallel approach. The logic behind this is that the researcher wanted to offset the weakness inherent in the qualitative method, as it was not appropriate to measure the organizational climate, which is usually tested quantitatively. Therefore, the researcher used both methods to measure the same phenomenon, albeit the qualitative interviews were different in nature.

The third design identified by Creswell is the equivalent status approach, in which a researcher conducts a study using both approaches roughly equally to understand the phenomenon under investigation. The study at hand does not make use of said method, since the quantitative technique was used solely to examine one component of the research: the impact of organizational climate. This component was also examined through qualitative methods. The researcher relied primarily on the use of qualitative research methods to obtain the requisite results with regard to all elements of research: organizational climate impact, information communication technology support and knowledge management.

The fourth and final design is the dominant–less dominant approach, where a researcher conducts the study 'within a small component of the overall study drawn from an alternative design'. In this case study, the qualitative method has priority (Creswell, 1995, p.177). This gives rise to the issue of method priority, to be discussed in the following section.

4.3.3.4 Justification for giving priority to the qualitative method

The decision about the priority given to qualitative over quantitative methods (or the reverse) is somewhat difficult to make (Morgan, 1998). In most cases, the decision is

based on the comfort level of the researcher with one approach as opposed to the other. A researcher needs to make informed decisions about the weight or attention given to both quantitative and qualitative research (Creswell, 2008, p.172).

In the present study, the design treated qualitative interviews as the dominant method, with a small-scale questionnaire survey to assess the organizational climate. The rationale for this is the author's calculation that a reliance on qualitative interviews would not allow the study to address the full picture of organizational climate, which is normally tested quantitatively. The intent of this almost parallel mixed-methods study is to shed light on the impact of organizational climate on information communication technology support for knowledge management.

In this case study, the author used the quantitative method to diagnose the organizational climate. At the same time, the impact of the organizational climate, information communication technology support and knowledge management were explored using qualitative interviews with the key informants at an R&D centre.

The reason for combining the methods is to better understand the research problem as well as to satisfy the study's objectives. For this purpose, the researcher collected information from 77 informants using quantitative questionnaires and from 51 qualitative interviews. The following section (4.3.3.5) illustrates the appropriateness of sampling techniques used in this study. Questions such as what is the target population, who should be excluded from the sample and who should be included are to be explored in the coming sub-section.

4.3.3.5 Sample selection

The context for the study as described in section 2.3.2.2 was a research and development (R&D) centre at Company A. This company inhabits an advanced R&D complex inaugurated in early 2001 to accommodate 400 employees (at the time) and provide state-of-the-art facilities for cutting-edge Company A technology research. Scientists and engineers are recruited worldwide to provide research expertise and to help develop the company workforce. The centre's current research workforce

numbers more than 250, including PhD and MSc degree holders as well as university graduates. The next sub-section will explore the targeted population sample.

4.3.3.5.1 Sampling in mixed-method approaches

> *'Tis the motive exalts the action* (Margaret Preston, 1875, quoted in Patton, 2002, p.230)

Since priority in this study is given to qualitative research, there are no rules or limits in determining sample size. Sample size depends on what you want to know, the purpose of the inquiry, what will be useful, and what can be done with the available time and resources (Patton, 2002, p.244). In qualitative research, the appropriateness of sampling is ascertained by how well the sample represents the phenomenon of interest: that is, to what extent the participants have experienced the phenomenon and can articulate their experiences. The sample is deemed adequate when saturation of data is reached (Morse, 1987).

Sampling in qualitative research is for the purpose of furthering understanding and creating new, more refined interpretations – what McWhinny (1989) refers to as 'an acquaintance with particulars'. The sample size in a qualitative study is typically small – often between five and twenty units of analysis (Marshall, 1996, cited in Benjamin, Crabtree and Miller, 1999, p.34).

Although there are no hard and fast rules, 'experience has shown that five to eight data sources or sampling units will often suffice for homogeneous samples and 12 to 20 or more are commonly needed when looking for disconfirming evidence or trying to achieve maximum variation' (Lincoln and Guba, 1985; Marshall and Rossman, 1989, 1995, 1998; McCracken, 1988; Benjamin, Crabtree, and Miller, 1999, cited in Patton, 2002).

After reconsidering a range of sampling techniques to fit the purpose of this study, a purposive sampling method was used. The purposive sampling size in mixed methods is also typically small (Tashakkori and Teddlie, 2008). Since the purposeful sample can also be stratified and nested by combining types of purposeful sampling, the

researcher used this technique to help capture major variations (Patton, 2002, p.240) within the R&D centre. For that reason, the author made sure that the coordinator sampled different groups that included top management, middle management and technicians. This helped to get a variety of information about the topic under investigation from different angles, with a view to achieving a holistic understanding. This is what Patton calls 'the power of maximum variation heterogeneity sampling' (2002, p.235).

An important point is that this sort of sampling means that one might encounter one or two people in rather unusual positions who might have very particular and valuable insights. Having said that, the researcher was also assuming that there are multiple realities. In other words, what is a 'fact' for one individual may not be the case for another person.

Attention was also needed to guard the research from possible charges of bias in the selection of participants. Consequently, at the outset of the study, the researcher had an important meeting with the coordinator, who had good experience in sampling techniques and also had access to a wide range of details about personnel in the R&D centre that could help to inform the study with genuine data. The researcher was able to establish clear criteria for the selection of both interviewees and survey participants. The criteria were based on three elements: knowledge (the person must know what KM means), authority (the company permitting the interviewees to disclose information relevant to the topic under investigation) and willingness to participate and contribute to the study in question. Therefore, in the sample in the study given, the population of the R&D centre was about 250 people at maximum. This was according to information provided by a coordinator who was appointed by the department concerned.

'Large qualitative studies do not often interview more than 50 or 60 people' (Britten cited in Pope and Mays, 2006, p.19). In the study, therefore, 51 employees were interviewed between August 2007 and October 2008; all interviews were carried out voluntarily at their place of employment. Note-taking was the only method allowed, although the researcher had originally intended to tape-record the interviews. Due to

ethical issues, the author was very careful not to go further in pressuring the interviewees to participate against their will.

The researcher did not select the participants: this was done by the coordinator who was a division head and was in charge of knowledge management practices in the R&D centre, and the selection was a non-random, purposeful sample. Selection of participants believed to represent various groups and perspectives within the R&D centre (e.g. the top management, middle management and technician levels) was achieved.

For the survey, out of 150 employees, 77 participants completed the questionnaire. According to Naiman and Zirkel (1977, cited in Mababaya 2006 p.155), 'a sample size effect of 30 should be sufficient to yield fairly accurate results'. The coordinator was the only one who was allowed to distribute the questionnaires and collect them afterwards. A method that can be useful in investigating the real-life context is the case study. The following section will discuss the case-study approach utilized in this study and make explicit the specific details and internal rationale for its use.

4.3.4 The case-study approach

'The organization is no stranger to the use of case study. Indeed many of the significant advances in organization analysis over the past forty years have arisen through the employment of the case study technique' (Bryman, 2004, p.91).

'The case-study method is a frequent mode of thesis and dissertation research in many disciplines and fields' (Yin, 2003, p.xiii). It is also seen as an accepted method in the field of information systems, and more case studies are required to examine how context and innovations interact, since 'interest has shifted to organizational rather than technical issues' (Benbasat et al., 1987). Case studies are broadly considered to be qualitative, quantitative (Yin, 2003) or both, depending on the research questions, design and purposes. The term 'case study' is strongly associated with qualitative research and sometimes appears to be synonymous with qualitative research (Ritchie and Lewis, 2003, pp.51–52). It appears to be compatible with

qualitative approaches if it shares an underpinning belief of contextual holism (Luck et al., 2006, p.105).

Among scholars, there is no standard definition of a case study (Benbasat et al., 1987); however, Yin defines it 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 in which multiple sources of evidence are used' (Yin, 2003, pp.13–14).

Benbasat et al. (1987) suggest three reasons why case-study research is a viable information system research strategy. First, 'the researcher can study the phenomenon in a natural setting, learn about the state of the art, and generate theories about the state of the art'; second, the case method allows the researcher to answer 'how' and 'why' questions; finally, a case approach 'is an appropriate way to research an area in which few previous studies have been carried out'. To understand the complexity and nature of a phenomenon, a case study allows researchers to explore the rapidly changing technology in organizations without prior theory development (Benbasat et al., 1987).

The study at hand meets these criteria in that the phenomenon under investigation was happening at the time and in a real-life context: the phenomenon under study was occurring within the R&D centre; finally the boundaries were not fully known, let alone clear. Thus, the current case study is undertaken in a complex real-life setting in order to capture the complexity of a single case and to understand its activity within important circumstances (Stake, 1995, p.xi).

Three types of case study are identified by Stake (1995): (a) the intrinsic, where one is interested in a case study for the sake of needing to learn about that particular case; the researcher's first obligation is to understand this one case. This kind of case is pre-selected; (b) the instrumental case study: a means mainly to provide an insight into an issue or to revise a generalization. Although the case is studied in depth, the main focus is on something else. In instrumental case studies, some cases would do a better job than others; (c) the collective case study may be designed with more concern for

representation, but again, the representation of a small sample is difficult to defend (Stake, 1999, pp.3–5).

The case study at hand is instrumental in that it provides an insight into the impact the organizational climate might have on information communication technology support for knowledge management. Stake (1995) suggests that much attention needs to be paid to the practices within the study, i.e. how research data will be identified, gathered and then analysed. He suggests the triangulation of a number of methods in case studies to increase validity: hence the current study uses different data sources to study the same object (e.g. interviews and questionnaires). The study thus utilized a mixed-method approach to validate findings.

Nevertheless, the case study, like any other method, has advantages and disadvantages. Table 4.4 below has been adapted from a summary by Galliers (1992) of the strengths and weaknesses of various IS research approaches. It is presented to illustrate the complementary nature of the various research methodologies discussed above. Our case study, however, is a single case, which will be detailed below.

Table 4.4: Methodology: Key features, key strengths and key weaknesses

Methodology	Key features	Key strengths	Key weaknesses
Case studies	Describe relationships that exist usually within organizations.	Can help understand 'real world' in great depth, analysing more variables	Restricted to a single event/organization, difficult to compare and generalize.
Surveys (and interviews)	Obtain a point-in-time snapshot of views from which inferences are made.	Can help generate a 'snapshot' of understanding/describe real-world situations /easier or more appropriate generalizations.	Little insight may be obtained about the causes/processes underpinning the phenomena. Possible respondent, researcher and timing biases. Difficult to understand causes behind processes.
Action research	Applied research that aims to deliver practical value to the subject while at the same time contributing to theory.	Practical and theoretical outcomes (relevance is high). Bias of the researcher is made explicit.	Similar to case study, but responsibility on researcher when objectives are at odds with subject. Ethics are an issue.
Grounded theory	Develop theory or hypotheses from data gathered from the field or library sources.	Parsimony is essential. The theory must fit the data. Constant comparative method well accepted.	Limited use in IS research. Adequacy of the research process and grounding of the concepts in the data.

(Adapted from Galliers, 1992, pp.150–52)

4.3.4.1 Single case study justification

As discussed in the previous section, case-study research may be considered especially appropriate when there is little related theory or prior work on a phenomenon that may be drawn upon (Benbasat et al., 1987; Yin, 2003; Cavaye, 1996; Darke et al., 1998; Freke, 2005). A case study can be a single or multiple case (Yin, 2003).

Miles and Huberman (1994) argue that much qualitative research examines a single 'case', and the classic application of the case study is to a single case (Thomas, 2004). Many classic examples in business and management research have been single-case studies (Maylor and Blackmon, 2005). According to Dubé and Paré (2003), who coded 168 case articles from eight major IS journals over a period of 10 years from 1990 to 1999, single-case studies seems to be more common than multi-case ones: their findings reveal that 64 per cent of all studies in their sample included a single case, while 36 per cent adopted a multi-case design strategy.

It is widely accepted that multiple cases have the potential to yield more general research results than single cases (Benbasat et al., 1987; Yin, 2003). Nevertheless, Dyer and Wilkins (1991) argue that the in-depth investigation of one case is the essence of case-study research, since it enables deep understanding and rich theory construction, whereas multiple case studies seem less likely to yield the same quality of understanding and theorizing, given that 'a multi-case design would introduce a complication that different organizations would be at different stages of development, [it] would possibly confound the influences of value with the mere influence of time' (Alavi et al., 2002).

A single case is useful in specific instances (Benbasat et al., 1987). Yin (2003) suggests that the single-case study is an appropriate design under a certain sets of circumstances, some of which are given below:

- if it represents the critical case;
- if it represents an extreme or unique case (commonly in clinical psychology);
- if it is a representative or typical case (a project among many different projects);
- if it is a revelatory case (when a researcher has an opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation).

The single-case study undertaken in this project is a revelatory case and reflects a real-life situation (Yin, 2003, p.185). The rationale for studying a single case is that this is an attempt to explore a new area, as the subject has not been researched before in Company A; evidence for this claim has been provided in section 2.3. On the other

hand, looking at a greater number of cases would actually make this study less distinctive, hence the study at hand is single-case in nature.

It is also relevant that the researcher has received confirmation of the potential site for the research as discussed in section 2.3.2. According to Yin (2003), single-case studies are appropriate if the objective of the research is to explore a previously unresearched subject, whereas multiple-case designs are desirable when the intent of the research is description, theory building or theory testing.

Taking all the above arguments into account, and since knowledge management is not a well-defined concept and there is little consensus or theory to guide research in the KM literature (Alavi and Leidner, 2002), a single-case study is appropriate in enabling exploration and theory generation (Freke, 2005).

The case used in this research is instrumental, in that it is examined to provide insight into the impact of the organizational climate on information communication technology support for knowledge management. The case study at hand is purely inductive, interpretative and exploratory, starting from no theoretical position (Gray, 2004, p.126). In the next section, therefore, a justification for the exploratory case study is given.

4.3.4.2 Justification for the exploratory case study

For Miles and Huberman (1994), 'qualitative studies are only good for exploratory forays'. Similarly to this, Babbie (2004) argues that much of this type of research is conducted to explore a topic: that is, to start to familiarize a researcher with the topic. This approach typically occurs when a researcher examines a new interest or when the subject of the study itself is relatively new (p.87).

The case study at hand is, therefore, an exploratory one in the sense that the literature to date does not lend itself to the development of precise hypotheses pertaining to the specifics of the relationships between organizational culture (or climate) and knowledge management systems (Alavi and Leinder, 2002) and that KM as described

by Nonaka and Peltokorpi (2006) is a 'mixed bag because of its evolution from several disciplines. As a young and emergent field, no consensus of KM exists'.

The nature of this case-study research is exploratory. Such a study might have already been undertaken, but on the other hand, even when there is a relevant theory or model, the goal of the study is to explore the phenomenon as completely as possible without being restricted to the topics that have been researched in earlier studies. As Lincoln and Guba (1985) suggest, 'social phenomena are investigated with minimal *a priori* expectations in order to develop explanations of these phenomena' (Bowen, 2005).

However, like any other study, this kind of research has its limitations, and the chief shortcoming of an exploratory study such as this has to do with representativeness (Babbie, 2004, p.89): that is, generalization. However, again, the reason for the study is not to generalize, but rather to understand the case under investigation. Stake (1995, p.85) states that 'case studies are undertaken to make the case understandable'. Furthermore, Eriksson and Kovalainen, in their book *Qualitative Methods in Business Research*, draw on Humphrey and Scapens' (1996) example of a case study in accounting, which suggests that:

Establishing the case itself as the focal point of the research process (rather than focusing on a particular social theory), accounting research becomes driven by problem and issue relating to accounting practices, rather than by concerns of social theory. (Eriksson and Kovalainen, 2008, p.121)

Since the case study is not hypothesis- or theory-driven, but exploratory in nature, the study at hand attempts to explore the problems and issues relating to the impact of the organizational climate on ICT support for KM. In addition, with an interpretive qualitative study, it is somewhat difficult to claim reliability of the methods utilized. Therefore, this work will rely on mixed methods to provide balance and dependability. Consequently, the case study undertaken required the multiple data collection techniques discussed in the next section.

4.3.5 Data collection

In an attempt to measure the impact of organizational climate on information communication technology support for knowledge management, the researcher utilized a mixed-method approach as discussed in section 4.3.3: a quantitative questionnaire and a qualitative interview (4.3.5.2). A decision was made, after a thorough understanding of the various instruments, to adopt both surveys and interviews to conduct the current study. Since the researcher is the most important tool for the job at hand, any decision on which methods or instruments can be utilized must be made by the researcher him-/herself (below, in section 4.3.5.1, the author shall discuss the researcher as an instrument). On the other hand, decisions on which instrument to use need to be based on questions that, for example, might differentiate between the need for a mixed-method slant or a single-method approach (Mason, 1996, p.39).

4.3.5.1 The researcher as instrument

Since priority is given to the qualitative approach, the researcher in such cases becomes the instrument, and therefore the credibility of qualitative methods hinges to a great extent on the skills, competence and rigour of the person doing the fieldwork (Patton, 2002). Furthermore, it might be assumed that the researcher's biases have affected the analysis and interpretation of this study data. The qualitative researcher is therefore guided by highly abstract principles, which combine belief and ontology (the nature of reality), epistemology (the relationship between the researcher or the inquirer and the known), and methodology (how do we know the world and gain knowledge from it?). The terms may be described in an interpretive framework as 'a basic set of beliefs that guides action' (Gupa, 1990, cited in Denzin and Lincoln, 2008, p.31).

Since the nature of this research is a qualitative interpretive approach, the researcher is positioned at the centre of the process of data collection, analysis and interpretation. Guba and Lincoln (1981, cited in Patton, 2002, p.14) comment on this aspect of qualitative research:

Fatigue, shifts in knowledge, and cooperation, as well as variations resulting from differences in training, skills, and experience among different 'instruments', easily occur. But this loss in rigor is more than offset by the flexibility, insight, and ability to build on tacit knowledge that is the peculiar province of the human instrument (p.113).

This, however, can be applied to both quantitative and qualitative methods, since both are carried out by human instruments and subsequently examined through the eyes of both the researcher and the participants. The nature of the researcher is critical to the quality of the scientific knowledge in any research project (Kvale, 1996, p.117). It is therefore advisable to provide details of the researcher's own background.

The researcher is of Saudi nationality, born in 1970, and married with five children. He has over two decades of experience in a wide range of government jobs in Saudi Arabia. This experience, together with completing a postgraduate course of study in public administration, which involved three years carrying out a mixed-method research project into the Saudi private business sector, is likely to have enhanced his experience of conducting both interviews and survey methods. This is in line with training the researcher undertook at Cass Business School, which involved completing 13 research training courses plus some business skills courses; Applying Knowledge Management: Principles and Practices, Change Management , Essential Project Management, and Advanced Project Management courses at Oxford University. The researcher also received training with his supervisor Clive Holtham (a Professor of Information Management at Cass Business School) whose own research is in the strategic exploitation of information systems, knowledge management and management learning.

Since the researcher has been enrolled in the School, his supervisor has introduced him to David Gurteen, who initiated Gurteen Knowledge community (a global learning community of over 15,000 people in 154 countries across the world). Becoming a member of this community meant attending a number of events held by the community in London. In addition, he is also a member of the ActKM forum, which was initiated by a small group of Australian Public and private-sector knowledge management practitioners. Related conferences in the UK and Saudi

Arabia involved many pioneering scholars in the business research method, such as Alan Bryman (a Professor of Organisational and Social Research at the University of Leicester) or in the knowledge management arena, such as von Krogh (a professor of competitive strategy, technological innovation and knowledge management), and Paul Duguid (an adjunct professor at the School of Information at the University of California, Berkeley) which provided valuable experience. It also gave a framework within which he as a researcher could understand the case study under investigation and give a satisfactory interpretation of what was happening in the fieldwork. During the fieldwork, he formed a good relationship with the coordinator, as well as with interviewees, gaining their trust and becoming, as he thought, 'one of them'.

Equally important in qualitative inquiry is the question of clarifying understanding of the notion of KM. The researcher deliberated this with his supervisor. The latter shares Sveiby's (2002) belief that knowledge is a human thing and therefore cannot be managed. Taking an opportunity when attending a lecture on KM presented by Paul Duguid (a professional fellow in knowledge management at the School of Information at the University of California, and co-author of the very influential *Social Life of Information*), the researcher asked Duguid about this matter. The response was in kind, helping the researcher to cement his belief that knowledge is " a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers.', as identified by Thomas Davenport, knowledge management guru at Babson College (a highly acclaimed speaker on the topic of information and knowledge management).

For the current research, he borrowed the definition of knowledge introduced by APQC (1997, p.13), that knowledge is 'valuable information in action' and that the value of knowledge is determined through the eyes of the recipient, and he modified the definition introduced by Hislop (2009) of KM as '*a systematic attempt to share and use organizational knowledge within its context through the use of particular organizational climate which can be achieved through a wide range of methods, including the use of ICT in order to increase organizational performance*'.

By interviewing his own people, the role of the researcher is magnified because the interviewer is the main instrument for obtaining knowledge (Kvale, 1996, p.17). Since 'knowledge relevant to the arena being examined is crucial as a foundation', thematic data analysis was employed in the study. For example, it is difficult to perceive and make sense of patterns in Shakespeare without understanding Greek and Roman mythology (Strauss and Corbin, 1990, cited in Boyatzis, 1998). Being Saudi and conducting the study in Saudi Arabia , communicating with his own people, gave the researcher the ability to capture the 'overall picture' about the phenomena under study and to recognize what is important, give it meaning and conceptualize the observation.

To sum up, all research is shaped by the paradigms and philosophies held by the researcher and, in this instance, led to the adoption of an interpretive paradigm and a qualitative methodology. Nonetheless, the integrity of the researcher, his honesty and fairness, knowledge and experience are the decisive factors (Kvale, 1996, p.117). Having said that, it cannot be guaranteed that the researcher was free of bias (this will be discussed in section 4.3.7.2.1). In the next section, attention is given to the instrument being used to collect the data for the current study.

4.3.5.2 Semi-structured interviews

> *Interviewing is rather like a marriage: everybody knows what it is, an awful lot of people do it, and yet behind each closed door there is a world of secrets.* (Oakley, 1981, p.41, cited in Patton, 2002, p.340)

For Bryman (2004), semi-structured interviews cover a wide range of types. They are typically used in a context in which the interviewer has a series of questions in the general form of an interview guide but is able to vary the sequence of questions. Because of the extensive use of interviews, Silverman (1993) goes so far as to suggest that we live in an 'interview society'.

The rationale behind using the interview method is that the objective of the current study is largely exploratory: in such situations, the interview is the most logical research technique to examine feelings or attitudes (Gray, 2004, p.214) towards the

organizational climate and its impact on information communication technology support for knowledge management.

The current study used one-on-one interviews, a type which should be adequate to collect rich data on the phenomena under investigation. Developing interview questions involves more than simply thinking of the right words. Selecting an appropriate approach as to how to go about asking questions and how best to conduct and present oneself is a decision that is likely to depend upon the research questions (Mason, 1996, p.44).

Since the overarching question forming this study is concerned with the impact of organizational climate, as mentioned above, interview questions were based upon and shaped by the research questions. An example of an interview study that was used in 2008 is illustrated below.

Semi-structured interviews shaped the core of the case study. The reason underlying the use of the semi-structured technique is that such method allows for probing of views and opinions, and it is also vital when the objective is to explore the subjective meanings that respondents ascribe to concepts or events (Gray, 2004, p.217).

For the present study, the questionnaire used for the interview was standardized. This technique helped improve the reliability of the data (Gray, 2004, p.215). The unit of analysis was the individuals in the R&D centre. Interviews were in two phases as follows:

Phase I

In 2007, interviews with 34 participants took place at the R&D centre. Interviews were conducted through face-to-face dialogue, except in the case of two participants who were absent due to personal circumstances. The coordinator suggested sending the interviews to the absent participants: the two interviews were completed and emailed back.

The 2007 interviews were carried out to explore in more depth (a) the question 'how does information communication technology participate in knowledge management activities?' and (b) 'how can knowledge management be improved?'

Phase II

In 2008, 17 semi-structured qualitative interviews were undertaken with the aim of understanding in more depth the impact of organizational climate on information communication technology support for knowledge management. The qualitative interview questions concerned the climate for the use of ICT to support knowledge management (research question number 1). These questions (Parther, 1996) are:

- How challenged, how emotionally involved and how committed are you to using ICT to support KM?
- How free are you to decide how to use ICT to support KM?
- Do you have time to think of alternate uses of ICT to support KM before having to take action?
- Do you have resources to give new ideas a try, with regards to using ICT to support KM?
- Do you feel safe in speaking your mind and openly offering different points of view on using ICT to support KM?
- How relaxed is your workplace – is it OK to have fun?
- To what degree is there emotional tension in using ICT to support KM?
- To what degree do people engage in lively debates about the issues of IT to support KM?
- Is it OK to fail when trying to use ICT to support KM?

A tape-recording provides an accurate, verbatim record of the interview, capturing the language used by the participants, including their hesitation and tone, in far more detail than would ever be possible with note-taking (Ritchie and Lewis, 2003, p.167). This was initially the favoured method for the present study.

However, interviews were not audio-taped, as the interviewees did not agree to such a condition. When it is not possible to use a tape-recorder because of some sensitive situation such as interviewee request, notes must become more thorough and comprehensive.

Therefore, notes, which are discussed later in this section, were taken instead. Note-taking helps the interview by providing non-verbal cues about what is important and providing feedback to the interviewee about what kinds of things are especially 'noteworthy'. On the other hand, failing to take notes may indicate to the respondent that nothing of particular importance is being said (Ritchie and Lewis, 2003, p.167).

For example, it becomes critical to gather actual quotations when the interviewee has said something that seems particularly important or insightful. It may be necessary to say 'I'm afraid I need to stop you at this point so that I can get down exactly what you said because I don't want to lose that particular quote. Let me read back to you what I have and make sure it is exactly what you said'. (That was very much what happened when conducting the interviews and jotting down notes). The data collected is the raw data of interviews, i.e. actual quotations spoken by interviewees. There is no substitute for these data: the actual things said by real people. 'That's the prize sought by the qualitative inquirer' (Patton, 2002, p.380).

4.3.5.2.1 Note-taking technique

All interviews conducted in 2007 and 2008, as discussed in Chapter 2, involved note-taking. Fundamental to note-taking was the recording of certain phrases or key quotes (in total, the notes amounted to 12,432 words or 57 pages, including the narrative questions, which constituted 1,940 words or 11 pages, with 11 responses missing in questions 1 and 2 and 12 missing in question 3. Each answer averaged one or two sentences, but most were one sentence).

4.3.5.2.2 Participants

Participants in both phases – a total of 51 individuals – were selected by the coordinator as discussed above. Furthermore, the chosen participants were selected

from different levels within the R&D centre, mostly Saudis, and were of differing ethnicity, nationality and experience (ranging from five to thirty years).

Although the researcher did not differentiate participants by age, ethnicity or nationality, as this is beyond the study's scope, such sample variation allowed themes from the scattered data to be augmented (Patton, 2002, p.235).

Each interview lasted from 30 minutes to an hour and a half, but most lasted for approximately 45 minutes. The participants were thanked, and requested to provide any additional data that might add extra information for the topic under investigation. The participants thought the questions asked were comprehensive, and that the interviewer had not missed valuable information.

Upon returning home after the interviews, the researcher made a back-up of the interview documents to prevent any data loss during data analysis. The back-up was secured and stored in a separate location at the researcher's home.

4.3.5.3 Questionnaire (the SOQ)

For Bulmer (2004), a questionnaire is 'any structured research instrument which is used to collect social research data in a face-to-face interview, self-completion survey, telephone interview or web survey'. It is a collection of questions administered to respondents. When used on its own, the term usually denotes a self-completion questionnaire (Bryman, 2004).

The current study, however, used the questionnaire alongside interviews. The aim of using such an instrument is to gain a better understanding of the current work environment and subsequently how it supports or limits the release and productive use of information communication technology support for knowledge management using the interview instrument.

The SOQ was utilized as it was, because '[n]o other measure, available in the behavioral scientific literature, had the same degree of evidence of its ability to effectively discriminate creatively productive organizations from their stagnated

counterparts' (Isaksen et al., 2001, p.177). Furthermore, the SOQ held the best record in terms of applying it to organizations in different countries and cultures around the world (Isaksen et al., 2001, cited in Bakkar, 2003), who used the SQO in Saudi Arabia, and more importantly, it is based on more than adequate evidence of reliability and validity (Isaksen, 2007b; Isaksen and Ekvall, 2007; Isaksen and Akkermans, 2007).

The SOQ (see appendix) is based on work done in Sweden in the 1960s and 1970s into how the working atmosphere of different companies affected the degree of participation in idea suggestion schemes (Ekvall, 1974).

The Situational Outlook Questionnaire SOQ has two parts: Part A was used to collect data on participants' perceptions of the climate's nine dimensions, as shown in Table 4.5.

Table 4.5: The climate's nine dimensions

Dimension	Description	Sample item
Challenge and involvement	The degree of emotional involvement, commitment and motivation in the operations and goal	The work atmosphere is filled with energy
Freedom	The level of autonomy, discretion and initiative in behaviour exerted by individuals to acquire information, make decisions, etc.	People here make choices about their own work
Trust and openness	The degree of emotional safety and openness found in relationships	People here do not steal each other's ideas
Idea time	The amount of time people can use for elaborating new ideas	Time is available to explore new ideas
Playfulness and humour	The display of spontaneous, easy, good-natured joking and laughter	People here exhibit a sense of humour
Conflict	The presence of personal and emotional tensions or hostilities	There are power and territory struggles here
Idea support	The degree to which new ideas and suggestions are attended to and treated in a kindly manner	People usually feel welcome when presenting new ideas here
Debate	The expressing and considering of many different viewpoints, ideas and experiences	A wide variety of viewpoints are expressed here
Risk-taking	The tolerance of ambiguity and uncertainty	People here often venture into unknown territory

(Source: Isaksen et al 1999, p.668)

The first part of the SOQ contains 53 statements that ask the respondents to ponder their current work environment and select from a four-point scale, as shown in Figure 4.2.

Figure 4.2: Response key

0 = not at all applicable	2 = fairly applicable
1 = applicable to some extent	3 = applicable to a high degree

Part B was originally in standard SOQ template concerning three narrative innovation questions; a modification was made (with permission) to substitute questions about knowledge management instead. The three narratives served as an opportunity for participants to put their situation in perspective and to elaborate upon the specific attitude towards knowledge management activities. These questions are as follows:

- What aspect of the climate within your organization is most helpful in supporting your knowledge management?
- What aspect of the climate within your organization most hinders your knowledge management?
- What is the most important action you would take to improve the climate for knowledge management?

Responses to Part B were in a text format. However, 90 per cent of the respondents (n=77) misunderstood question 1 in general terms. To solve the problem, the researcher coded the question as what the participants thought would support or hinder knowledge management activities within the R&D centre. To analyse the answers of the narrative questions, a content analysis process was conducted.

In order to use the instrument in Saudi Arabia, the researcher had to translate it into Arabic. That required permission from the Creative Problem Solving Group (CPSG), the owner of the SOQ, which then was secured by their representative in the UK. The initial translation into Arabic began in June 2007. Two independent interpreters

voluntarily reviewed the translation for face validity. The two reviews were merged to produce a final draft of the Arabic version. Later, the final draft was sent to the contact person at the R&D centre for pilot testing and he was asked to distribute it among his colleagues. Changes suggested by the coordinator were considered and reflected in the final version of the survey.

Both versions of the SOQ questionnaires – the English and the Arabic (see Appendix A) – were distributed through the coordinator, who delivered the surveys personally and followed up with the employees by phone or by email. The researcher also met some of the department heads in the R&D centre and asked them to encourage their employees to fill in the questionnaire. The coordinator also collected the completed questionnaires and handed them to the researcher.

The response rate was 50 per cent, which is deemed high, but this mode of survey tends to generate a high response. However, since the SOQ was collected by the coordinator, anonymity or even confidentiality could not be assured, and the data may also be affected by bias (O'Leary, 2004, p.154). The completion of the survey took two months during October and November 2007 due to the time available to the personnel on site, who seemed to be very busy doing their own tasks and jobs.

All participants were made aware that completion of the questionnaire was voluntary. They were informed that they could withhold demographic information, such as staff, gender and approximate length of employment in the R&D if they wanted to. This was deemed to be unimportant, since the interest of the research was not personal information; rather, it was to develop an understanding of the impact of organizational climate on information communication technology support for knowledge management. The researcher also wanted participants to feel free in speaking their minds about the issues under investigation.

Even when participants completed the survey in the interview sessions, the researcher made them aware that the personal information was not important but the clarity of the issue under study should be as great as it could be to help R&D manage knowledge as effectively and efficiently as possible, though no claim was made to indicate that the study would produce a magic solution. Rather, it was emphasized

that the research was to make the case more obvious and get 'an overall picture' of what was going on in the fieldwork in terms of KM practices. This step acted to make the participants feel free to talk about the issue under investigation. The next section will discuss the treatment of the data collected and how they were analysed and interpreted.

4.3.6 Data analysis and interpretation

The study employed a quantitative and a qualitative method. These two methods are discussed below.

4.3.6.1 Quantitative analysis

The quantitative data included numerical ratings obtained from 53 items on the SOQ (Part A) survey to diagnose the organizational climate in which the RD operated. The responses of 77 participants to the SOQ overall scores on the nine dimensions of a complete SOQ were derived by taking the aggregated averages of the respondent's results for each dimension and multiplying this score by 100. All dimensions therefore had a theoretical range from 0 to 300. The dimensions are not considered to be of equal weight, so no cumulative score was derived (Isaksen et al., 2001).

After the questionnaires were gathered, they were coded and transformed into a spreadsheet. Then the data were emailed to the contact person at CPSG for treatment, as agreed. However, since the scale of the SOQ ranges from 0 to 300, with a significant difference being around 25 points (e.g. challenge and involvement scored 188, a difference of 25 points that when compared to innovative organizations can be considered a significant deviation) (Isaksen , 2007), the analysis, when received, was not, as had been thought, sufficient for PhD thesis level, and it was necessary to run more statistical tests (e.g. the frequency and percentage of responses to the 53 items).

The Statistical Packages for Social Sciences (SPSS) v15.0 for Windows was then utilized to analyse the SOQ survey data. Responses were converted into numerical codes using Excel format, which were then imported into SPSS for analysis. Four-point Likert-scale responses were used to code the attitude statements of the organizational climate, ranging from 0 (not at all applicable) to 3 (applicable to a high

degree). Similarly, education status ranged from 1 (elementary) to 8 (doctorate). The duration of employment ranged from 0–6 months (coded as 1) to 20 years or more (coded as 7). A few submissions were found to have missing responses to individual questions. These missing data were replaced with mean values during the course of data analysis.

The survey data were analysed using descriptive statistics, principally frequencies, means and standard deviation. The SOQ data were explored by comparing their specific values and interdependence, highest and lowest values, totals, proportions, and distributions. The frequency and percentage of responses to the 53 statements were displayed using descriptive statistics and tables. Significance was set at the $p \leq 0.05$ level.

Part B of the SOQ, which was in a text format, contained three narrative questions (illustrated in section 4.3.5.2) about the participants' perceptions of the organizational climate and whether it helps or hinders the use of information technology support for knowledge management. It also included their perceptions about the actions they would take to enhance the use of ICT to support KM activities. However, 90 per cent of the respondents (n=77) misunderstood question 1 in general terms. To solve the problem, the researcher (as demonstrated in 4.3.5.2) coded the question as what the participants thought would support or hinder the knowledge management activities within the R&D centre. To analyse the answers to the narrative questions, a thematic analysis process was conducted. This is discussed later in section 4.3.6.3.

4.3.6.2 Qualitative analysis

Miles and Huberman (1994, p.10) give an overview of qualitative data analysis as consisting of three concurrent flows of activities: data reduction, data display and conclusion and verification. They describe data reduction in terms of data selection and condensation. Data are reduced in anticipatory ways as conceptual frameworks are chosen as instruments. In addition, cases and questions are refined. Data here are summarized, coded and broken down into themes, clusters and categories. Data display, the second sub-process, describes the way in which reduced data are

displayed. This can be done using diagrammatic, pictorial or visual forms in order to show what those data imply.

As Miles and Huberman describe it, data display should be viewed as an 'organized, compressed assembly of information that permits conclusion drawing and/or action taking'. Miles and Huberman's third analytical process is conclusion and verification. This is where the displayed data are interpreted and meanings are drawn. Again, they suggest that this can be done by employing a variety of different tactics, such as looking for comparative and contrasting cases or noting and exploring themes, patterns and regularities and metaphors.

Wolcott's (1994) description of what analysis means presents a rather different way of thinking about how we explore and interpret qualitative data. Wolcott uses the term 'transformation' to describe a variety of strategies. He suggests the question of 'what is going on?' He recognizes that there is no such thing as pure description. Description, he observes, is to tell the story of data in as descriptive a way as possible.

Analysis, in Wolcott's terms, refers to a rather specialized way of transforming data; it is, in this context, the process by which the researcher expands data beyond a descriptive account. The emphasis is on the search for themes and patterns from the data. Analysis also involves identifying essential features and relationships. The third way, in Wolcott's terms, is interpretation. That is where the researcher attempts to offer his or her own interpretation of what is going on. It is the understanding and explanation that are sought. At first glance, Wolcott's three approaches to the analysis or transformation of qualitative data appear similar to the set of approaches offered by Miles and Huberman.

Nevertheless, transforming data into findings has no set formula or recipe; it is the making sense of data (Patton, 2002; Coffey and Atkinson, 1996; Pope and Mays, 2006) in a process guided by the research purpose and questions. Whatever strategies or processes a researcher uses to make sense of data, they all involve sorting, refining, refocusing, interpreting, making analytic notes and finding themes in the data. Some, like coding, categorizing, thematic analysis and cognitive mapping, relate more to

formal inductive analysis (Simons, 2009, p.139). Similarly, Coffey and Atkison (1996) argue that analysis is on the whole an inductive, data-led activity (p.10).

The aim of any form is to move from raw data to meaningful understanding (O'Leary, 2004, p.195). The qualitative analysis process typically centres on presentation of specific cases and thematic analysis across cases. The themes, patterns, understandings and insights that emerge from fieldwork and subsequent analysis are the fruit of qualitative inquiry (Patton, 2002, p.297).

Since the current study deployed a mixed method, the data analyst must decide whether the quantitative and qualitative approach findings will be used approximately equally or whether the results from either of the two techniques will be dominant over the other (Tashakkori, 2002). In this study, the qualitative method was the main source for data collection and the quantitative measure, used to diagnose the nature of organizational climate, was the secondary technique employed.

The decision to use almost parallel mixed analysis techniques is influenced by the purpose of mixed-methods research. In parallel mixed analyses, once both sets of analyses have been conducted and verified, the researcher has the option of interpreting and writing up the two sets of findings separately or in some integrated manner (Tashakkori, 2002, p.365). In mixed methods, as employed by the current study, the researcher has undertaken what Tashakkori and Teddlie (1998) call 'quantitizing data', which involves some form of counting representations. For example, the researcher wanted to find out how many times words such as 'bureaucracy' or 'time' were used during the interviews. In order to give some evidence on how qualitative statements or results occur, words or themes were thus converted to numbers. The researcher determined the percentage of participants that contributed to themes in the data (Johnson and Christensen, 2008, p.453). This is shown in reporting the qualitative data as in section 5.3.

Given the above, in order to make sense of the data gathered, Walker (1980, cited in Simons, 2009, p.118) noted that experimental biologists make sense of evidence; the data does not tell the story, the researcher does. The researcher employed thematic analysis, which will be discussed in the following sub-section. Making sense is

essentially a matter of selecting meaning. Simons goes on to suggest that 'presenting quotation or observation without any thematic structure, analysis or interpretation is unlikely to convey the meaning of the case' (Simons, 2009, p.118).

4.3.6.3 Thematic analysis

Thematic analysis is a way of seeing, as well as a process for coding, qualitative data (Bryne, 2001). Qualitative questioning and thematic analysis, by their very nature, guide analysis (Patton, 2002, p.182). The emphasis of thematic analysis is on the content of a text: what is said more than how it is said. Investigators collect many stories and inductively create conceptual groupings from the data. Organizing by theme is the typical representational strategy, with case studies or vignettes providing illustration.

The thematic analysis approach is useful for finding common thematic elements across research participants and the events they report (Jupp, 2006, pp.186–87). It is 'the simplest and most straightforward form of analysis and perhaps for this reason, it is the most commonly used in health care' (Pope and Mays, 2002, p.69) as well as in business research as a technique for organizing empirical data (Erikson and Kovalainen, 2008) and is regularly used by researchers in many fields (Crabtree and Miller, 1992; Denzin and Lincoln, 1994; Marshal and Rossman, 1989; Silverman, 1993 cited in Boytzis, 1998, p.6).

Thematic analysis is a process to be used alongside qualitative information; it is not another qualitative method but a process that can be used with most, if not all, qualitative methods (Boytatiz, 1998, p.4), and should be seen as a foundational method for qualitative analysis (Braun and Clarke, 2004). Thematic analysis is well equipped to deal with the themes expressed in a text. It is ideally suited to getting a clear picture of the basic content of a text. It allows the researcher to answer such questions as, 'What is in the mind of your interviewees? What is in your field notes?' (Melissa and Bryman, 2004, p.562). It provides a researcher with a more comprehensive understanding of the phenomenon (Boytzis, 1998, p.6). That is 'precisely the reason why qualitative methods are appropriate for capturing such outcomes' (Patton, 2002, p.525).

Thematic analysis involves a number of underlying abilities or competencies (Patton, 1988, p.452). One competency can be called pattern recognition: the ability to see patterns in a seemingly random arena (Boyatzis , 1998, p.7). Knowledge relevant to the arena being examined is crucial as a foundation, and is often referred to as tacit knowledge. For example, as mentioned in section 4.3.5.1, there are patterns in Shakespeare that can only really be understood with reference to Greek and Roman mythology. Strauss and Corbin (1990) argue that the goal of the researcher is to recognize what is important, give it meaning and conceptualize the observation. In this sense, a researcher needs to have patience to perceive themes or patterns and an appropriate 'lens' through which to view them. 'Cleaning your glasses helps, but conducting qualitative research involves emotions, preferences, and worldviews' (Boyatzis , 1998, p.8).

In thematic analysis, a decision the researcher must make when analysing data is whether to analyse the interview data obtained from each participant independently or whether to use cross-case analysis (Bryne, 2001). The author decided to use cross-case analysis: that is, grouping together answers from different people to common questions or analysing different perspectives on central issues (Patton, 1990, p.57) for the SOQ data, as the climate with its nine dimensions mapped clearly onto themes in terms of the thematic analysis. Therefore the researcher decided to use them from Ekvall's work (Isaksen and Ekvall, 2007) and leave them as they were.

On the other hand, while variations in the experience of individuals are the primary focus of the study, it is appropriate to begin writing a case study using all the data from each person. Only then are cross-case analysis and comparative analysis done (Patton 2002, p.438). This begins the search for patterns and themes that cut across individual experience. It helped the researcher to focus on a full understanding of individual cases before these unique cases were combined or aggregated thematically. Such a method also helped to establish how well my data addressed the research questions (Mason, 1996, p.129).

For example, the current study's focus is on a KM programme, to see whether the impact of organizational climate helps or hinders the use of ICT to support KM. The researcher therefore began the analysis with a description of the various responses

that came from quotes and paraphrased the ideas which emerged from the data in answer to the three research questions described in sections 1.3 and 4.3.1,

In order to answer these questions and conduct the thematic analysis technique, the researcher followed the steps recommended by Braun and Clarke (2006) and Aronson (1994), who suggested that after collecting the data (obtained, in this case, either through the interviews or the SOQ Part B responses to which were in qualitative text format), they should be transcribed immediately, making sure that the transcripts reflect the interview or the text as closely as possible. Reading both versions of the transcripts enabled the researcher to notice and touch upon themes that were familiar either from his experience or from the literature.

The author moved back and forth as required to expand, clarify and rearticulate initial ideas in relation to the decisive questions of the study. The next step was generating initial codes that gave rise to interesting features across the entire data set, and then aligning the data with the codes used. The codes were grouped into potential themes, gathering all data that were relevant to each potential theme, as some candidate themes under due investigation, may not really be themes, as there was not enough data to support them, or they might collapse into each other – i.e. two separate themes might form one single theme. The reverse might also occur when one theme can be broken into two themes. Therefore, reviewing themes was the next step.

After devising a satisfactory thematic representation (that was dependent on the research questions that guided the analysis), defining and naming the themes was the next step; this was concerned with how each theme fits in relation to the research questions being answered. Producing the report, and relating the analysis to the research question and literature, might help the reader to understand the relation between organizational climate, ICT and KM. The discussion of themes and sub-themes was supported and enriched by direct quotations and the related existing literature.

4.3.7 Quality in the current case study

> '*The truth is out there*' (Fox Mulder) vs. '*There are no facts, only interpretations*' (Nietzsche). *No science is immune to the infection of politics and the corruption of power.* (Jacob Bronowski, cited in O'Leary, 2004)

Reliability and validity 'are never far from the surface. They are probably of particular importance for the case study method since the reliance on the data generated from either limited or particular samples or situation' (Gray, 2004, p.260). As the present study employed a mixed method, the reliability and validity of both measures are discussed. First, the reliability and validity of the SOQ are presented, followed by the qualitative interview.

4.3.7.1.1 Reliability in the SOQ

'Reliability and validity are crucial issues in all measurement. Both concern how concrete measures are connected to constructs' (Neuman, 2007, p.115). Reliability refers to the consistency of a measure and whether it yields the same result each time (Babbie, 1998, p.150). Reliability entails two aspects – external and internal. The former is more common and concerns the degree of consistency of a measure over time, whereas internal reliability is particularly important in connection with multiple item scales: it raises the question of whether the items that make up the scale are internally consistent (Bryman, 2008; Cramer, 1990), although there is rarely perfect reliability (Neuman, 2007, p.116). Reliability does not ensure accuracy (Babbie, 2004, p.150).

Reliability can be tested in several ways, but one of the most common is via a statistic known as Cronbach's alpha, which presents the average of all possible split-half correlation and so measures the consistency of all items (Gray, 2004, p.208). The SOQ's internal reliability, as shown in Table 4.6, was tested using a sample of 7,345 and all dimensions were found to be above the .70 standard except for trust/openness, which was .69, very close to .70 (Isaksen et al., 1998). The degree of reliability is measured using a reliability coefficient that has a scale ranging from 0.00 (very

unreliable) to 1.00 (perfectly reliable). In practice, a score of 0.9 is generally considered to be acceptable (Gray, 2004, p.208).

Table 4.6: The internal reliability of the SOQ Version Six (n=7,345)

Dimension	Cronbach's alpha
Challenge/involvement	.86
Freedom	.84
Trust/openness	.69
Idea time	.85
Playfulness/humour	.88
Conflict	.85
Idea support	.89
Debate	.88
Risk-taking	.80

(Source: Isaksen et al., 2009)

4.3.7.1.2 Validity in the SOQ

Validity suggests truthfulness (Neuman, 2007, p.115). It refers to the extent to which a measure adequately reflects the real meaning of the concept under investigation (Babbie, 2004, p.150). It can be affected by the wording of the questions a measure contains, but even if individual questions are valid, a poor sequencing of questions or a confusing structure or design can pose a threat to validity (Gray, 2004, p.207).

Validity is more difficult to achieve than reliability (Neuman, 2007, p.116), but at the very minimum, a researcher should establish a measure which has face validity, reflects the content of the concept in question (Bryman, 2008; Cramer, 1990), and covers the research issues (Gray, 2004, p.207). The SOQ's validity was tested with a sample of 1,830 individuals from a variety of organizations and statistically

significant relationships were found to exist between individuals' perceptions of the supportiveness of their own environment and all nine of the questionnaire's dimensions (Isaksen and Lauer, 2001).

The current study, as illustrated in section 3.4.1, however, assumed that climate, as Ekvall (1991) asserts, acts as an intervening variable in an organization. Climate therefore influences and is influenced by the outcome of organizational operations (Isaksen and Lauer, 2001, p.32): hence the use of the SOQ as a measure of organizational climate based on the conceptual and theoretical foundation of earlier work done by Ekvall (1987, 1991, 1996, 1977). Numerous studies have been conducted to examine the SOQ's reliability and validity (Talbot et al., 1992; Lauer, 1994; Turnipseed, 1994; Carba, 1996, cited in Isaksen, 2007, p.459). The reliability and construct validity were also tested using a sample of 1,111 subjects. Cronbach's alpha and exploratory factor analysis supported reliability and construct validity (Isaksen, Lauer and Ekvall, 1999, p.665).

Neuman (2007, pp.116–17) proposes four ways to improve reliability and validity in quantitative research, as follows:

- clearly conceptualize all constructs;
- increase the level of measurement;
- use multiple indicators;
- Use pre-test pilot studies.

The SOQ is designed to help the respondents make observations about behaviour and interaction among individuals (Isaksen et al., 1999, p.668). The steps suggested by Neuman above were followed in the present study. For the first step, the SOQ questions asked were straightforward and easy to follow. The second step was also ensured by assigning a four-point scale, with 0 indicating 'not at all applicable', 1 indicating 'applicable to some extent', 2 indicating 'fairly applicable' and 3 indicating 'applicable to a high degree'. The third step was also ensured, as the SOQ uses multiple indicators. It has 53 items, and for each dimension, there are three to seven items. All the items were developed to measure one of the nine dimensions and were randomly ordered (Isaksen et al., 1999, p.3). The fourth and final step was also

confirmed, as the SOQ 'is based on more than 50 years of research and development and practical application and has more than adequate evidence of reliability and validity' (Isaksen, 2007b; Isaksen and Ekvall, 2007; Isaksen and Akkermans, 2007, p.16). The technical update report of 2009 offers a summary of the current status of reliability and validity, reviewing over 7,300 participants (Isaksen et al., 2009). The next section details the integrity of the data used in the current study.

4.3.7.2 Trustworthiness and transferability in qualitative research

In qualitative research and other kinds of research, there are no ways to ensure rigour in the conduct of the study (Merriam, 2002, pp.22–24) and there is no single 'correct' interpretation of the data (Wolcott, 1994). Rather, 'we try to let the reader know something of the personal experience of gathering the data and the researcher's interpretation. A case study is subjective, relying heavily on our previous experience and our sense of worth of things ... Seldom are we primarily trying to generalize to other cases ... Often the case is handed to us – we don't choose it. Our interpretive and our descriptive report is laced with and followed by interpretation, but we offer ours too ... Yet no amount of caring for the case will assure its worth' (Stake, 1995, pp.134–36).

Nonetheless, all qualitative researchers need credibility to be useful (Patton, 2002, p.51) and all researchers seek to produce valid and reliable knowledge in an ethical manner. Furthermore, one has to be assured that the findings of an investigation are to be believed and trusted (Merriam, 2001, p.22), and that data integrity is enhanced through validity and reliability. Consequently, the following section will discuss these issues in more detail.

4.3.7.2.1 Validity in qualitative research

The issue of validity is the extent to which a qualitative researcher can demonstrate that the data are accurate and appropriate (Denscombe, 2007, p.297). Validity is associated with quantitative research (Mason, 1996, p.25), since positivist work sees no difference between the natural and the social world (Silverman, 2006, p.282). Nonetheless, validity is a major concern in all research (Merriam, 2001, p.422). For Wolcott (1990a), 'validity neither guides nor informs' his work. He does not dismiss

validation, but rather places it in a broader perspective (Creswell, 2007, p.205) and ultimately tries to understand rather than convince, voicing the view that validation distracts from his work of understanding (ibid., 207). Therefore, using more than one method of data collection enhances the validity of the findings (Merriam, 2001, p.12), although this is not to say that the bias of the researcher has not influenced the study. Identifying the researcher's biases or subjectivities is of importance.

In the current study, where the semi-structured interview was employed, the issue of validity was directly addressed by attempting to ensure that the questions asked in the interview sessions were focused on the research objective and questions (Gray, 2004, p.219). Additionally, the study at hand followed Creswell's suggestions (2006, pp.207–08). He proposes eight procedures that the qualitative researcher should engage with. At least two of them should be employed in any given study where there is prolonged engagement or observation in the field, including 1) building trust with participants 2) clarifying researcher bias from the outset; 3) member checking; 4) rich and thick description, and 5) external audits (pp.207–09).

In the present study, the author employed three techniques that aid in 1) building trust with participants (my field story is outlined in section 2.3; 2) clarifying bias and 3) member checking. In the former, the researcher identifies his bias in order for the reader to understand his position. The author understands that qualitative research and the data were interpreted reflexively because of his worldview as an interviewer and subsequently an interpreter. He strove to understand the meanings people have constructed about their world and their experiences and how they make sense of these experiences (Merriam, 2002, pp.4–5).

Member checking was also utilized in the study. It is a method one can use to establish credibility (Lincoln and Guba, 1985, p.314). As was explained in section 4.3.5.2, audio-taping was not allowed due to the sensitivity of the project. The researcher took notes instead, and double-checked with the participants with regard to their comments to the questions posed. He checked with the interviewees about the language used and asked them to provide alternative language when appropriate. They too liked the checking, as it met their needs. He frequently heard the words 'off the record', which meant that he should not take notes about a particular point. This gave

him the confidence that participants wanted to say a lot about the project, but for ethical reasons he will not publish these off-the-record comments, although they helped to sketch the 'overall picture' about the given study, which he believes enhances its conclusion.

4.3.7.2.2 Reliability in qualitative research

The issue of reliability is 'the extent to which a measure, procedure, or instrument provides the same result on repeated trials' (O'Leary, 2004, p.59). In other words, if the study were repeated, would it yield the same result? Mason (1996, p.24) provides a technique in which qualitative researchers rely upon standardization of research instruments or tools and cross-checking of the data yielded by such instruments. In an absolute sense, there is probably no way of knowing this for certain (Denscombe, 2007, p.298), but the question here is how to deal with issue of reliability. Merriam (2001, p.27) suggests that reliability is a problematic issue in the social sciences simply because human behaviour is never static and there can be numerous interpretations of the same data. Mason further proposes the question of 'whether the results are consistent with the data collected'.

Since the interview was standardized, with the same question being asked of each participant, the issue of interviewer bias comes into play – does the interviewer ask the question in the same way with the same tone of voice with all respondents? Gray calls this issue the 'interviewer effect'. He further suggests a way to avoid such an effect by standardizing not only the interview schedule but also the behaviour of the interviewer (Gray, 2004, p.220). This was attempted by the researcher when conducting the interviews, but some difficulties occurred: for example, the researcher would change his tone of voice when interviewees showed low levels of interest in the research (this occurred in approximately three cases). Another issue is that a telephone interview was conducted with the manager of the R&D: this might affect the data obtained. As the issue of consistency arises, Silverman (2006, p.46) argues the shortage of space means that many qualitative researchers provide readers with little more than brief, persuasive data extracts. A way to ensure consistency and dependability or reliability is through triangulation, as Merriam suggests (2001, p.27).

In the current research, reliability was enhanced partly through the use of mixed methods. The SOQ was employed to provide insights into the R&D climate, followed by the interviews conducted in 2008 concerning the question of climate in connection with the use of information communication technology to support knowledge management.

Caution should be taken, however: although triangulation may enhance reliability, qualitative researchers are highly sceptical of the value or feasibility of such triangulation and further suggest that triangulation of different methods is not straightforward. Silverman (2006) goes on to suggest that 'reliability is not a problem since we treat social reality as always in flux, then it makes no sense to worry about whether your research instruments measure accurately and reliably, only arising in quantitative research design' (p.282).

4.4 Concluding remarks

This chapter has focused on the methodology utilized in an attempt to answer the set of research questions posed by this study. A mixed research method was employed for this study. The SOQ survey served as a diagnostic tool to gauge the climate in nine dimensions. The qualitative interviews helped the researcher to gain a better understanding of the elements that might influence the current knowledge management practices. A case study was used to investigate employees' experiences, perceptions and opinions about the use of ICT to support KM in the light of the impact that organizational climate might have. Justification was given for all methods and instruments that were used in this study. Finally, the integrity of the data was discussed. The next chapter reports the findings of this case study.

Chapter 5

Reporting the Results of the Case Study

5.1 Introduction

This study is intended to investigate the impact of organizational climate on information technology support for knowledge management. In Chapter 4, the research methodology used to gather and analyse the data was discussed. This chapter presents the results of the data analysis for the three research questions (see sections 1.2 and 4.3.1) that guided the specific focus of this study as follows:

- How does the climate affect the use of information communication technology to support to knowledge management? This question has a sub-question: What does the climate look like?
- How does information technology participate in knowledge management activities?
- How can knowledge management be improved?

As discussed in the previous chapter, this study utilized the mixed-method technique. The data for this case study was collected through two major phases. Phase I, in 2007, involved distributing 150 questionnaires to the R&D centre's employees: 77 participants completed and returned the survey. This was conducted alongside a qualitative interview with 34 participants to reflect on questions 2 and 3 (above). Phase II, in 2008, involved conducting 17 qualitative interviews with the aim to better understand the impact of organizational climate on information technology support for knowledge management. The qualitative interview questions concerned the climate for the use of ICT to support knowledge management (question number 1).

Since the study utilized mixed methods, the researcher has the option of interpreting and writing up the two sets of findings separately or in an integrated manner (Tashakkori, 2002, p.365). In order to maintain a certain degree of focus, the researcher has decided to present the data gathered by way of the quantitative study separately, except for Part B (the qualitative text), which is combined with the

qualitative interviews, followed by the findings from the larger qualitative data set as described in section 4.3.3.4. Data from the SOQ survey will be presented first.

5.2 The quantitative results

This section presents the findings of the SOQ. The results stem from the analysed data obtained from 77 participants who voluntarily completed the survey. The results of the SOQ shed light on the first research sub-question of 'What does the climate look like?' Subsequently, the data that emerge from the SOQ enhance the awareness and understanding of the organizational climate in which the R&D centre operated. The SOQ (see section 4.3.5.3) adds to the data obtained from the qualitative interviews, concerning the first research question: 'How does climate affect the use of ICT to support knowledge management?' The first part of the SOQ asks respondents to consider their current work environment and select from a four-point scale, as shown in Figure 5.1, below.

Figure 5.1: Response key of the SOQ

0 = not at all applicable	2 = fairly applicable
1 = applicable to some extent	3 = applicable to a high degree

The second part of the SOQ contains three short-answer questions:

- What aspect of the climate within your organization is most helpful in supporting your knowledge management?
- What aspect of the climate within your organization most hinders your knowledge management?
- What is the most important action you would take to improve the climate for the use of ICT to support knowledge management?

The purpose of these questions is to provide participants with an opportunity to elaborate on their perceptions of the climate. They are asked to identify specific factors in the environment that support or hinder their use of information communication technology support for knowledge management.

The results from the SOQ involved quantitative and qualitative data. The quantitative data (Part A of the SOQ) will be presented in this section. The qualitative data (Part B of the SOQ) are combined with the qualitative interview data. Thereafter, in order to answer the first, second and third research questions, a subsequent analysis of the interview data is presented.

The researcher structured this section according to Ekvall's nine dimensions, discussed earlier (see section 4.3.6.3), which map clearly onto themes in terms of his own thematic analysis. In this section, a diagnosis of the climate in which the R&D operated is illustrated and the results are compared to the innovative, average, current case and stagnated organization scores. The means and standard deviations for the R&D are shown in a table, followed by a discussion of each of the nine dimensions to determine which theme is most frequently answered according to the Likert scale. Taking each of the nine dimensions, the researcher will present:

- A definition for each dimension based on the literature (Isaksen, Lauer, Ekvall and Brits, 2001; Isaksen and Akkermans, 2007), since it gives precise meanings to all nine dimensions in a structured way. Although all dimensions are defined either in the Chapter 3 or in Table 4.5, the author touches on them again to maintain reader focus and attention;
- quantitative results for each dimension, presented as a short table.
- themes identified from the quantitative evidence. This is achieved through counting the frequency with which they occur. The underlying reason for this is to determine the item weight. It also serves to colour the description of the dimension.
- the researcher will comment on key data presented in the tables and figures. They selection of what is key data is based on combining the statistical results with the researcher's own judgments. It should be noted that the headings 0 = not at all applicable; 1 = applicable to some extent;2 = fairly applicable; and 3 = applicable to a high degree which appear at the top of some tables are derived from the SOQ response key (discussed in sections 4.3.5.3 and 5.2).

The author shall first present the respondents' demographic data, which include their educational status and the length of time they have worked at the R&D centre. Age and gender were shown in the questionnaire as optional and hence the majority of the participants did not provide this data. Given that there were so few responses (roughly less than ten), the researcher discarded data regarding age and gender. Had he had such voluntary data, he would have been able to provide a more detailed picture of the demographic situation. The demographic data are discussed below.

5.2.1 Demographic data

Demographic information is relevant in summarizing the types of employees who participated in this study. Table 5.1 presents the study respondents' demographic data. From the table below, we can see that the largest group held doctorates, representing almost a third of respondents. Holders of Masters' degrees accounted for 22 per cent of the participant sample and a minority of the respondents, 7.7 per cent, held only high school qualifications.

Table 5.1: Demographic data: Education

Education status	Respondents	Percentage
High school	6	8
Some college	9	11
Bachelor's degree	15	19
Master's degree	17	22
Doctorate	21	27
No response	9	11

With regard to experience, Table 5.2 shows that the largest group, 27 per cent of participants, had more than twenty years' experience at the R&D centre, followed by 17 percent of respondents who had between 10 and 20 years' experience. In other words, 38 percent had more than ten years' work experience. It is apparent from this table that only very few (2 percent) had between 2 and 5 years' experience.

Table 5.2: Demographic data: Time at R&D centre

Time at research and development (R&D) centre	Respondents	Percentage
1–6mo	8	10
6mo–1yr	7	9
2–5yrs	2	2
5–10yrs	9	12
10–20yrs	17	22
20+yrs	21	27
No response	13	17

5.2.2 Comparative findings

The SOQ results generated in this study compared employees' perceptions of the various climate dimensions for a very positive or 'best-case' situation against a negative or 'stagnated-case'. The SOQ used their proprietary software to generate the reports (as discussed in section 4.3.5.3). They compared this organization (the R&D centre) with three distinct scenarios in order to gauge the status of said organization.

The three scenarios – best, average and stagnated-case – are, respectively, those of an innovative, average and stagnated organizational climate. The technique of benchmarking should not be used as an 'absolute', but rather can help by providing very general guidelines in order to examine and compare the current results against other relevant findings (Isaksen and Akkermans, 2007).

Table 5.3 below shows the comparative scores for the above-listed dimensions between innovative, average and stagnated organizations. The scale ranges from 0 to 300, with significant differences being around 25 points (Isaksen , 2007) (e.g. challenge and involvement scored 188, a difference of 25 points that, when compared to innovative organizations, can be considered a significant deviation). A high score is indicative of an innovative company, except where the conflict dimension is concerned, where a high score reflects badly on the cohesiveness and necessary bedrock conducive for an innovative atmosphere. Of the innovative organizations examined in 2008, nine of the ten are still in business. Of the stagnated organizations, four of the five are no longer in business as reported by the CPSB. The innovative case was defined as an environment in which people feel best able to do their work. The stagnated case was characterized as an environment in which employees felt unproductive.

Table 5.3: SOQ normative benchmarks

SOQ climate dimensions	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Challenge/involvement	238	190	188	163
Freedom	210	174	155	153
Trust/openness	178	160	153	128

Idea time	148	111	171	97
Playfulness/humour	230	169	154	140
Conflict	78	88	118	140
Idea support	183	164	192	108
Debate	158	128	179	105
Risk-taking	195	112	142	53

From the Table 5.3, it can be seen that the R&D centre scored positively in the following aspects (Figure 5.2).

Figure 5.2: The nine dimensions sores for this study order of discussion below

Dimension	Points
Idea support	192
Challenge and involvement	188
Debate	179
Idea time	171
Freedom	155
Playfulness and humour	154
Trust and openness	153
Risk-taking	142
Conflict	118

Although the conflict dimension is at the bottom of the table, its score of 118 was deemed negatively high compared to the innovative and average organizations, as shown in Table 5.3, which scored 78 and 88 respectively. From the data, we can see that the highest scores compared to the innovative organization are Idea time (23 points higher), followed by Debate (21 points higher) and Idea support (9 points higher). The lowest scores, also compared to the innovative organizations, are Playfulness and humour (76 points lower), followed by Freedom (55 points lower), Risk-taking (53 points lower) and Challenge and involvement (50 points lower).

The R&D, as shown in Table 5.3, scored higher than the average in four aspects, namely Idea time (60 points higher), Debate (51 points higher), Risk-taking (30 points higher) and Idea support (28 points higher). However, the R&D was relatively close to the stagnated organizations in one dimension, namely Freedom, as it scored just two points higher than the stagnated ones. Each dimension will be discussed separately in a later section, along with items relating to each dimension.

Each dimension of the SOQ is 'factorially independent' (see Appendix A). As Isaksen et al. (2009) suggest in their manual report, some degree of inter-correlation among the nine dimensions is expected. This was the case when a correlation test was run, as shown in Table 5.4.

Table 5.4: Inter-item correlation matrix (Sample size: n=77)

		Challenge/ involvement	Freedom	Trust/ openness	Idea time	Playfulness/ humour	Conflict	Idea support	Debate	Risk-taking
Challenge/ involvement	Pearson Corr	1								
Freedom	Pearson Corr	.592**	1							
	Sig. (2-tailed)	.000								
Trust/ openness	Pearson Corr	.701**	.559**	1						
	Sig. (2-tailed)	.000	.000							
Idea time	Pearson Corr	.598**	.619**	.529**	1					
	Sig. (2-tailed)	.000	.000	.000						
Playfulness/ humour	Pearson Corr	.487**	.529**	.534**	.549**	1				
	Sig. (2-tailed)	.000	.000	.000	.000					
Conflict	Pearson Corr	−.421**	−.166	−.246*	−.239*	−.046	1			
	Sig. (2-tailed)	.000	.149	.031	.036	.693				
Idea support	Pearson Corr	.713**	.478**	.563**	.666**	.398**	−.486**	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000			
Debate	Pearson Corr	.706**	.622**	.623**	.687**	.672**	−.150	.729**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.192	.000		
Risk-taking	Pearson Corr	.594**	.519**	.513**	.556**	.594**	.014	.468**	.605**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.906	.000	.000	

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

The table above shows there was a significant positive relationship among the dimensions, with the exception of conflict, which does not significantly correlate with freedom, playfulness/humour, debate or risk-taking, and correlates negatively with the rest of the dimensions. From Table 5.4, we can also observe that there is a strong positive correlation between debate and idea support, with a coefficient of 0.729 ($p<0.01$). However, there is a significant and negative weak correlation between conflict and idea time, with a coefficient of -0.239 ($p<0.05$).

5.2.3 Descriptive statistics

The SOQ was used to gather participants' perceptions toward the R&D centre climate. Table 5.5 reports the means and standard deviations for the nine climate dimensions. Descriptive statistics were used to summarize the climate data, with descriptions of the minimum and maximum scores as well as means and standard deviations being used.

Table 5.5: Means and SD of SOQ dimensions as perceived by participants

	N	Min.	Max.	Mean	SD
Challenge/ involvement	77	42.9	300	187.8	56.7
Freedom	77	16.7	300	154.5	51.6
Trust/openness	77	40.0	300	153.0	55.4
Idea time	77	33.3	300	171.2	60.4
Playfulness/humour	77	0.0	250	154.3	61.0
Conflict	77	0.0	266	118.2	73.3
Idea support	77	80.0	300	192.5	59.2
Debate	77	66.7	300	178.6	54.4
Risk-Taking	77	20.0	240	141.6	50.3

Overall, out of a sample size of 77, idea support had the highest mean score of all climate dimensions (192.5), with a standard deviation of 59.2 and a minimum and maximum value of 80 and 300 respectively. This was followed by challenge/ involvement, with a mean score of 187.8 and a standard deviation of 56.7 and minimum and maximum values of 43 and 300 respectively. Conflict had the lowest mean score of all the climate dimensions (118.2), with a standard deviation of 73.3 and minimum and maximum values of 0 and 266 respectively.

In the sections below each dimension is summarised using the four categories; 0 = not at all applicable; 1 = applicable to some extent; 2 = fairly applicable; and 3 = applicable to a high degree. In each section the researcher has selected key items only which are noteworthy. This selection has been made primarily based on the 'fairly applicable column, also at times taking into account column 3 , 1 and 0. There were and are other possible methods that could have been used to make the selections. For example, column 0 and 1 could have been combined, and columns 2 and 3 could have been combined, getting simple binary categorisations. The mean of the four numbers could have been calculated. It is felt that none of the methods is ideal and approach taken (Stake , 1995) even though dependent on researcher judgment enabled the key items to be selected whether 0,1,2 or 3.

5.2.4 Challenge and involvement

The 'challenge and involvement' dimension focuses on the extent to which individuals are given opportunities to become involved in the daily operation, long-term goals and vision of the organization. At the R&D centre, challenge and involvement scored within the average organization score range: it is two points lower than the score for average organizations, 50 points lower than the score for innovative organizations and just 25 points higher than the stagnated ones.

The overall response to this dimension was fairly positive, as it was within the range of scores for an average organization, as discussed below. On the other hand, challenge and involvement ranked second after idea support, as shown in Figure 5.2 above.

Table 5.6: Challenge/involvement

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Challenge/involvement	238	190	188	163

To determine which items within the challenge and involvement dimension scored high or low, the researcher ran descriptive statistics on all items linked to challenge and involvement, as shown in Table 5.7.

Table 5.7: Percentage distribution of respondents to challenge and involvement theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
People desire to improve the quality of work here	3	23	44	20
People are committed to solving problems here	0	23	53	23
People here take a sincere interest in their work	3	25	51	21
People here feel deeply committed to their jobs	4	24	55	17
The atmosphere here is richly stimulating and motivating	9	32	47	12
The work atmosphere here is filled with energy	1	30	60	9

Among the challenge and involvement items, participants believed that their work atmosphere was 'filled with energy', as the majority of responses to this statement indicated that it was 'fairly applicable' (60%) and only 1% of respondents believed that this statement was not at all applicable.

The majority of respondents also indicated that they felt deeply committed to their jobs: 55% rated this statement as 'fairly applicable' and only 4% viewed it as 'not at all applicable'. It was also found that most respondents took a sincere interest in their work, as this statement was rated 'fairly applicable' by 51% of participants. Interestingly, all participants reported that they were committed to solving problems, as none rated this statement to be 'not at all applicable'.

5.2.5 Freedom

Freedom indicates the degree to which people can take the initiative or are at liberty to act without constantly referring to higher authorities or 'rule books' for decision-making. The SOQ measure shows that the 77 participants gave the 'freedom' dimension scores that were nearly as low as the stagnated-case score, at 155 and 153 respectively.

This outcome, as shown in Table 5.8, remains a long way off the innovative-case scenario, which scores 210. The R&D centre scored 19 points less than the average organization. Freedom ranked fifth among the nine dimensions, as illustrated in Figure 5.2 above.

Table 5.8: Freedom

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Freedom	210	174	155	153

The response to the freedom items, as shown in Table 5.9, illustrates that less than 20% of participants found any freedom item to be applicable to a high degree. Only 18% indicated that the statement 'People here feel free to take individual initiatives' was applicable to a high degree. Similarly, only 4% of respondents thought that the

statement 'People made decisions on their own' was applicable to a high degree. 39% believed that the statement 'Most people prioritize their own work to some extent' was applicable to some extent, whereas half of them thought such a statement was not at all applicable in their workplace.

On the other hand, 51% of respondents indicated that the statement 'People here usually control their own work' was fairly applicable. The same statement was rated 'not at all applicable' by just 1% of respondents. 46% believed that the statements 'People here feel free to take individual initiatives' and 'People here tend to define their own work projects' were fairly applicable.

Table 5.9: Percentage distribution of respondents to freedom theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
People here feel free to take individual initiatives	7	29	46	18
Most people here prioritize their own work to a rather large extent	18	39	31	12
Most people here usually control their own work	1	38	51	9
People here tend to define their own work projects	7	42	46	5
People here make decisions on their own to a fairly large extent	14	45.5	36	4

5.2.6 Trust/openness

Trust/openness refers to the degree of emotional safety in relationships between colleagues. The quantitative measure shows that the 77 participants scored trust/openness at 153 points. This result, as shown in Table 5.10, lay in between the innovative and stagnated case scenarios. For the stagnated case, the score was 128, whereas the innovative score was 178. It is 7 points less than the average organization score range. Trust and Openness ranked seventh; it comes before risk taking and conflict, as shown in Figure 5.2.

Table 5.10: Trust/openness

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Trust/openness	178	160	153	128

The response to the trust/openness items, as illustrated below in Table 5.11, found that the majority of respondents (51%) rated the statement 'People here try to live up to their commitments' as fairly applicable. Only 1% believed that this statement was not at all applicable. 46% of the participants indicated that the statement 'People here appear to act in an open and sincere manner' was fairly applicable, while a further 29% believed that this statement was applicable to a high degree.

Of the 77 participants, 22% indicated that the statement 'People here do not talk behind each other's back' was not at all applicable in their workplace. In contrast, 45% thought this statement was applicable to some extent. When giving their views on the statement 'People here often confide in each other', only 4% thought such a statement was applicable to a high degree.

Table 5.11: Percentage distribution of respondents to trust/openness theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
People here act in an open and sincere manner	8	17	46	29
People here do not talk behind each other's back	22	45	20	13
There is no fear of being 'stabbed in the back' here	18	38	33	10.5
People here often confide in each other	21	44	31	4
People here try to live up to their commitments	1	28	51	20

5.2.7 Idea time

Idea time is the time people take to generate new ideas or consider the merits of existing ideas and opportunities. The quantitative measure shows that the 77 participants scored idea time at 171 points. This result, as shown in Table 5.12, was significantly high. In fact, it is higher than the score for an innovative case, which is 148 (the stagnated case is recorded at 97). It is 60 points higher than the score for an average organization. Idea time comes fourth in the scale shown in Figure 5.2 above.

Table 5.12: Idea time

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Idea time	148	111	171	97

The items that are related to idea time, as shown in Table 5.13, illustrate that 27% of participants from the R&D centre thought the statement 'Time is available to explore new ideas here' was applicable to a high degree. A further 34% reported that this statement was either applicable to some extent or fairly applicable.

What is interesting about this dimension of idea time is that six similarities arise in our data: apart from the above-mentioned score of 34%, the statements 'People here have enough time to think about their ideas' and 'The pace of work here allows for the testing of new ideas' were both reported to be not at all applicable by 6.5% of participants. The latter statement and the statement 'Flexible time-lines allow people here to consider alternatives' were both rated 'applicable to some extent' by 32.5% of respondents and 47% rated the same statements as 'fairly applicable'.

Table 5.13: Percentage distribution of respondents to idea time theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
Time is available to explore new ideas here	5	34	34	27
Most people have time to think through new ideas here	4	35	40.5	20
One has the opportunity to stop work here in order to test new ideas	8	39	35	18
People here have enough time to think about their ideas	6.5	27	49	17
The pace of work here allows for the testing of new ideas	6.5	32.5	47	14
Flexible time-lines allow people here to consider alternatives	13	32.5	47	8

5.2.8 Playfulness and humour

The 'playfulness and humour' dimension refers to the amount of spontaneity and levity displayed within the organization. The SOQ measurement shows that playfulness and humour scored at 154 points, close to the stagnated-case scenario of 140. This outcome, as shown in Table 5.14, is 76 points less than the innovative-case scenario of 230. It is 15 points lower than the score that would be expected in an average organization. Playfulness and humour comes sixth on the scale shown in Figure 5.2 above.

Table 5.14: Playfulness and humour

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Playfulness/ humour	230	169	154	140

From the items related to this dimension, as shown in Table 5.15, it is found that only 13% of the participants rated the statements 'People here exhibit a sense of humour', 'People here have fun when they work and 'The atmosphere is easygoing and

lighthearted' were applicable to a high degree. The statement 'People here exhibit a sense of humour' was rated fairly applicable by 48% of respondents: this was the highest scoring statement among all items within this dimension. Only 9% of respondents rated the statements 'People here often engage in laughter' and 'People here exhibit a sense of humour' as not at all applicable.

Table 5.15: Percentage distribution of respondents to playfulness and humour theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
People here often engage in laughter	9	39	36	16
People here exhibit a sense of humour	8	31	48	13
People here have fun when they work	9	33	45	13
The atmosphere is easy-going and lighthearted	13	33	41	13
Good-natured joking and teasing occurs frequently here	13	38	42	7
A playful atmosphere prevails here	14	42	40	4

5.2.9 Conflict

Conflict refers to the presence of personal and emotional tensions. The SOQ measure shows that the 77 participants scored conflict at 118 points, as shown in Table 5.16. This is lower than the score that would be expected in a stagnated case (140), but higher than that of an innovative case, which is as low as 78 points. Conflict was ranked the lowest on the scale shown in Figure 5.2 and yet is closer to the stagnated compared to the innovative and the average organization.

Table 5.16: Conflict

SOQ climate dimension	Innovative organizations	Average organization	Current study on R&D centre	Stagnated organizations
Conflict	78	88	118	140

Evidence from the items in Table 5.17 shows that there was a good deal of tension due to prestige differences, as this statement scored the highest (43%) among all items on the scale of 'applicable to some extent'. This table is quite revealing in that, unlike other tables, it illustrates the greatest response on the zero scale 'not at all applicable' – when respondents were asked about whether it was common to have people plot against each other, 40.5% of respondents indicated that this statement was not at all applicable to their workplace.

The statements 'There are power and territory struggles here' and 'The atmosphere here is filled with gossip and slander' had the same response of 37% for the category 'applicable to some extent'. It was also found that there was a great deal of personal tension, as 35% of respondents believed that such a statement was applicable to some extent, and 34% thought that it was fairly applicable.

Table 5.17: Percentage distribution of respondents to conflict theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
There are quite a few people here who cannot tolerate each other	27	36	21	17
There is great deal of personal tension here	17	35	34	14
There is a good deal of tension here due to prestige differences	30	43	16	12
There are power and territory struggles here	18	37	33	12
The atmosphere here is filled with gossip and slander	34	37	21	8
It is common here to have people plot against each other	40.5	31	23	5

5.2.10 Idea support

Idea support refers to the ways new ideas are considered, taken up or advocated. The SOQ measure shows that the 77 participants rated idea support at 192 points. This result, as shown in Table 5.18, was significantly high. It was higher than the innovative case, whose score was 183 (the stagnated-case scenario scored at 108), and 28 points higher than the average organization. Idea support ranked the first on the scale shown in Figure 5.2 earlier.

Table 5.18: Idea support

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Idea support	183	164	192	108

Evidence for this, as shown in Table 5.19, comes from the statement 'People generally share their ideas here because they are listened to and encouraged', which the majority of respondents rated as at least fairly applicable. On the other hand, none of the 77 participants believed that when they presented new ideas, they were not welcome, or that initiative often received unfavourable responses and people felt discouraged to generate new ideas.

In contrast, 46% reported that the statement 'People usually feel welcome when presenting new ideas here' was fairly applicable, while 38% thought initiative often received a favourable response. On the other hand, most of them strived to do a good job, as this statement scored the highest (65%) among all items on the 'fairly applicable' rating. Only 1% thought R&D people did not strive to do a good job or that they were not usually accepting of new ideas.

Table 5.19: Percentage distribution of respondents to idea support theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
People here receive support and encouragement when presenting new ideas	3	23	44	30
People usually feel welcome when presenting new ideas here	0	24	46	30
Initiative often receives a favourable response here so people feel encouraged to generate new ideas	0	38	38	24
People here are usually accepting of new ideas	1	25	52	22
Most people here strive to do a good job	1	12	65	21
People generally share their ideas here because they are listened to and encouraged	3	32.5	53	12

5.2.11 Debate

Debate is the occurrence of encounters and disagreements between viewpoints, ideas and differing experience and knowledge. The quantitative measure shows that the 77 participants scored debate at 179 points. This was 21 points higher than the score that would be expected of an innovative organization, 51 points greater than the score for an average organization and 74 points higher than the score for a stagnated organization. This outcome, as shown in Figure 5.2, positioned debate in third place after idea support and challenge/involvement.

Table 5.20: Debate

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Debate	158	128	179	105

This is evidenced , as shown in Table 5.21 below, by the fact that in the present survey, 64% of participants believed that different points of view were shared during

discussion to a fairly applicable degree, and on the same scale, 48% of the participants thought differences of opinion were frequently expressed, while 47% considered that people often exchanged opposing viewpoints. None of the 77 participants believed that it was impossible for them to discuss different ideas and opinions or that different points of view were not shared during discussion. In contrast, 47% believed that the statements 'People here often discuss different points of view' and 'People here often exchange opposing viewpoints' were fairly applicable.

Table 5.21: Percentage distribution of respondents to debate theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
It is possible to discuss different ideas and opinions here	0	29	43	28
Differences of opinion are frequently expressed here	3	32.5	48	17
A wide variety of viewpoints are expressed here	7	32	46	16
Many different points of view are shared here during discussion	0	22	64	14
People here often discuss different points of view	3	39	47	12
People here often exchange opposing viewpoints	3	43	47	8

5.2.12 Risk-taking

Risk-taking refers to the degree to which people can tolerate ambiguity and make decisions with some uncertainty. The quantitative measure shows that the 77 participants scored risk-taking at 142 points, as shown in Table 5.22. This was 53 points lower than the innovative case (195), but well above the stagnated-case

scenario, scoring just 53, and 30 points higher than the average organization. Risk-taking comes last in the scale shown in Figure 5.2 above.

Table 5.22: Risk-taking

SOQ climate dimension	Innovative organizations	Average organizations	Current study on R&D centre	Stagnated organizations
Risk-taking	195	112	142	53

Although risk-taking was the lowest-rated among the nine dimensions, the most striking result to emerge from the table 5.23 below, is that almost 60% of the participants indicated that the statement 'People make changes here even when results are uncertain' was at least fairly applicable. This sign of freedom was also supported by four other statements, for which at least 40% of respondents more believed that they were at least fairly applicable: these were 'People here can move forward even in the face of uncertainty', 'People here are likely to put forward new or untested ideas', 'People here often venture into unknown fields or areas' and 'People here feel they can take bold action even if the outcome is unclear'.

Table 5.23: Percentage distribution of respondents to risk-taking theme

Item	0 = not at all applicable	1 = applicable to some extent	2 = fairly applicable	3 = applicable to a high degree
People here can move forward even in the face of uncertainty	6.5	42	43	9
People here often venture into unknown fields or areas	17	47	26	9
People here are likely to put forward new or untested ideas	5.5	44	45	5.5
People here feel they can take bold action even if the outcome is unclear	17	49	30	4
People make changes here even when results are uncertain	12	28	59	1

5.3 The qualitative results

In the previous section, the SOQ results were presented. In this section, the qualitative interview data pertaining to the following questions are illustrated:

- How does the climate affect knowledge management activities?
- How does information communication technology participate in knowledge management activities?
- How can knowledge management be improved?

Quotes from the participants' interview data are used to provide supporting evidence for the themes that emerged from the questions above. It is worth mentioning that the data gathered in 2008 with 17 participants to shed light on the first question posed above sometimes amounted to little more than 'yes' and 'no' answers. For this reason, the author will cite at least two appropriate quotes that shed light on the point being made. On the other hand, for the 2007 interviews with 34 personnel concerned with the second and third questions above, the researcher back up the evidence with more than two quotes, purely because of the richness of data when compared to that gathered in 2008.

The researcher has structured this section according to the following themes:

- Theme 1: The organizational climate factors that affect the use of ICT to support KM.
- Theme 2: The participation of information communication technology in knowledge management activities
- Theme 3: Knowledge management improvements

For each theme, data from the appropriate phases are drawn upon, specifically linked to key dimensions / factors which are different for each theme. Demographic data are given first to show the types of participants who were interviewed. Thereafter, the themes that emerged from the research questions are illustrated.

5.3.1 Demographic data

In 2007, 34 participants took part in the interview phase of the current study. They responded to the second and third questions detailed above. The interviews took between 25 and 75 minutes and were mostly conducted between October and November 2007. All interviews were on site and all interviewees participated voluntarily, representing a stratified purposeful sample, as discussed in Chapter 4.

The profile of respondents, shown in Table 5.24, reflected their current position. Interviewees' tenure ranged from six months to over 20 years. Most of the respondents were scientists (29%), followed by unit supervisors (23%). Only one manager was interviewed, and this interview was conducted via telephone, as he was absent from the centre while the author was conducting interviews. A day later, his secretary telephoned the researcher to inform him that the manager was ready for the interview, which lasted about 35 minutes.

Table 5.24: A profile of respondents in the 2007 interviews (n=34)

Position	Frequency	Percent
Resource Developers	4	12
Programme Directors	3	9
Unit Supervisors	8	23.5
Division Heads	4	12
Technicians	2	6
Secretaries	2	6
Scientists	10	29
Managers	1	3

In 2008, only 17 participants took part in the interviews, which were held during the month of July. They responded to the first question, which concerned how climate affects the use of information technology to support knowledge management. The largest group among this sample consisted of scientists (29%) followed by unit

supervisors (23.5%). Resource developers, programme directors, and division heads had the same percentage among the participants with 12%. Scientists were the largest group among the interviewees in both 2007 and 2008 phases.

Table 5.25: A profile of respondents in the 2008 interviews (n=17)

Profile	Frequency	Percent
Resource Developers	2	12
Programme Directors	2	12
Unit Supervisors	4	23.5
Division Heads	2	12
Technicians	1	6
Secretaries	1	6
Scientists	5	29

5.3.2 Theme 1: The organizational climate factors that affect the use of ICT to support KM

In this section, the qualitative results related to the areas of organizational climate for the use of ICT to support KM are presented. The sub-themes that support the main theme are: (1) challenge and involvement, (2) freedom, (3) trust and openness, (4) idea time, (5) playfulness and humour, (6) conflict, (7) idea support, (8) debate and (9) risk-taking. These are derived from Ekvall's work which mapped clearly onto themes in terms of the thematic analysis employed by this study (section 4.3.6.3), whereas the themes that are related to ICT to support KM emerged from that data gathered for this study.

The researcher will now address each of the nine dimensions in turn. For each dimension there will be a presentation of:

- qualitative results derived from the thematic analysis, often summarized as a quantitative percentage;

- an initial assessment of the significance of the data collected relating to the specific dimensions. This is done briefly, with more detail in the following Chapter 6 where the results are discussed.

5.3.2.1 Challenge and involvement

The qualitative interviews appear to show that challenge and involvement was one factor that positively affected the use of IT to support KM. It seemed from the qualitative interviews that interviewees (64%) felt motivated and committed to making a contribution to their daily IT work to support knowledge management. As one interviewee stated, '*We are very committed to the use of IT in order to support knowledge management*'. Another participant expressed his commitment by stating that he felt that it was '*part of my daily activities; otherwise, all knowledge cannot be captured*'. It was also found that participants were interested in the development of their workplace, as one stated: '*We all are interested in knowledge management ... we think that will advance our position as a company*'. Challenge and involvement did not always have a positive effect on the climate for knowledge management. For some (36%), that commitment was a missing factor. One interviewee expressed that he did not care about knowledge management because knowledge management was not a priority or central to his main work. He put it as: '*indifferent to me ... busy with our work*', with another interviewee stating, '*no, not really*'. Another said that he was '*frustrated with the work*'.

5.3.2.2 Freedom

The qualitative interviews demonstrate that interviewees had little freedom to define much of their work in relation to using information technology to support knowledge management; they carried out their work in prescribed ways. 64% of participants mentioned the word '*bureaucracy*' and appeared to believe that they had little room to redefine the knowledge management task. One interviewee stated: '*We are not free as we're governed by the company's regulations and standards – bureaucracy, if you like*'. Another expressed his anger by saying that he was '*handcuffed by the company's regulations plus budget ... guided by the group*'. The remaining 36% had different opinions, as they thought they had the freedom needed to manage knowledge. They were provided with opportunities to take the initiative to acquire

and share information about their work-related knowledge management. One interviewee stated: '*The company has provided all means of e-resources for us to use*'. Another expressed his take on the matter as follows: '*I am lucky because I am an information technology-oriented person so I am free*'.

5.3.2.3 Trust/openness

The qualitative interviews appeared to show that employees trusted each other in their working relationships. When the question 'Do you feel safe in speaking your mind and openly offering different points of view?' was asked, the majority, 82% of the respondents, reported that they felt they could be genuinely open and frank with one another. A typical comment was '*yes, very safe*'. Moreover, people from the R&D centre counted on each other for professional and personal IT support for knowledge management, as one participant stated: '*Yes, there is no harm in doing so*'.

On the other hand, the remaining 18% of R&D participants appeared to contradict the majority feeling. As one put it, '*No, I do not most of the time*'. In their experience, trust was missing. They also sensed that people were suspicious of each other, and therefore, they might hide themselves, their plans and their ideas. In such a climate of lack of trust, personnel may find it difficult to openly communicate knowledge. One interviewee stated, '*if you ask, you look stupid, and people do not want this to happen*'.

5.3.2.4 Idea time

The majority of interviewees (77%) indicated that the amount of time participants had for elaborating on new ideas was insufficient. It seemed that opportunities to discuss fresh suggestions were not planned or included in their task assignments. The participants frequently expressed their concern with regard to this matter: '*what comes naturally to mind, you put it through*', or, '*no time for it*'. Another stated, '*who cares about knowledge management? Our concern is with the real work*'.

The remaining 23% of participants indicated that there was time to explore and develop thoughts about using IT to support knowledge management. One interviewee said, '*we do have time to think*'. Another stated: '*yes, absolutely*'. A further

participant stated, '*new ideas should not take time to be implemented ... the management encourage us to generate new ideas - everything is here*'.

5.3.2.5 Playfulness/humour

The qualitative interviews show that interviewees thought it was acceptable for them to have fun. Two-thirds of the 17 participants believed that their climate was easy-going and that laughter and jokes occurred very often. One interviewee among those who answered 'yes' was cautious when commenting on the question 'Is it OK to have fun?': '*For me it is OK. I think for them* [other people] *it is not OK*'. Another participant was reluctant and suggested: '*Yes and no; it is nice but it doesn't happen much*'. One interviewee stressed the fun they had in their workplace, saying '*It's fun – we always have fun and enjoy being in good spirits*'. Another who had the same view stated '*If you don't take it easy the work stress will kill you*'.

For almost a third of the participants, a relaxed and easy-going atmosphere was a missing factor. One interviewee laughed at the question posed and commented: '*No. Are you kidding me?!*' Another interviewee said '*This is a serious business – no time for laughs or jokes ... when you go home, laugh as much as you wish*'.

5.3.2.6 Conflict

The qualitative interviews appeared to show that 82% of interviewees perceived little or no emotional tension, and did not feel that this factor adversely affected their use of information technology to support knowledge management. One suggested that the learning centre assisted in reducing work-related emotional tension: '*when you introduce a new system you will have resistance from people. There is a learning centre so we can reduce the emotional tension*'. Another went on to comment: '*Not much, no more emotional tension than there used to be; now we like IT*'. One interviewee asked '*Why should we have conflict? We love each other. We usually go out for dinner together*'.

A few participants (18%) disagreed: as one put it, 'Of course there's tension, and it's high'. Another went on to explain: 'We are different – some have, some do not'. A further interviewee suggested, 'it is not necessary to like your colleagues – you can

work without loving anyone', while another, when asked 'To what degree is there emotional tension to using IT to support KM?', rated this tension as 'eight out of ten'.

5.3.2.7 Idea support

The qualitative interviews suggest that new ideas were treated and received in a helpful and professional way, and that people listened to each other and encourage initiatives. They also had opportunities to try out new ideas using ICT in order to support knowledge management as an end-product. Frequently, participants used the word '*yes*' and stressed it by saying '*yes we do*' as a typical comment as to whether they had the resources to try new ways to use ICT to support KM. It seemed they had adequate resources for managing knowledge. The majority (70%) answered 'yes' to the question posed. One participant stated: '*We do resources such as an idea management system, and ShareK*'. Another confirmed this: *'Yes; like the idea management system'*. Further participants stated: *'Yes we do. You have resources to give new ideas a try, like idea management'* and '*We have an innovation system, so have resources to give new ideas a try*'.

Approximately a third of those interviewed stated that the issue of being encouraged to generate new ideas or thoughts was not at all applicable. One interviewee stated '*They do not care*'. Another went further to suggest, '*If you have new ideas, just keep them for yourself*'. A third participant gave a reason for this attitude: '*The credit for new ideas will go unless you protect it, so why bother in the first place?*'

5.3.2.8 Debate

The qualitative interviews revealed that participants seemed to have a degree of disagreement between ideas, with differing experience and knowledge. Many people (64%) were keen on putting forward their ideas for consideration and review. They seemed keen to discuss opposing views and share a diversity of perspectives on the issue of ICT to support knowledge management. One interviewee stated: '*We are engaged in lively debates all the time*'. Another expressed his view as follows: '*to a very high degree, people are aware of knowledge management, so they support it and debate about it*'.

However, for over a third of those interviewed, debate over the issue of the use of information technology to support knowledge management was thought to be absent. Debate was a missing factor and, as such, people tended to follow set patterns without questioning them. One participant expressed his opinion as if it were a widely held view: '*The majority do not care about knowledge management systems, only very few*', while another stated '*They do not want to listen. For example, I had some ideas about knowledge management but they seemed to be uninterested, so I gave up*'. One interviewee said, '*There is some time for debate and good debate but not about knowledge management – about the work*'.

5.3.2.9 Risk-taking

The qualitative interviews showed that 99 per cent of the participants seemed to have a degree of tolerance of uncertainty and ambiguity in the R&D centre. In high risk-taking climates, people do not strive to be on the 'safe side' and are often prepared to 'take a gamble' on their ideas. This in turn can positively affect the initiative of supporting knowledge management. When participants in the present study were asked 'Is it OK to fail when trying to use IT to support KM?' The typical comment was '*yes*'. Only one voice was hesitant and reluctant, saying: '*yes and no, but generally speaking it is OK*'. Among the positive answers was one participant whose enthusiasm led him to say: '*Yes: reward failure*'. Another responded '*Absolutely*'. A further interviewee was more cautious about the question: '*If you mean to take risk without knowing the consequences, that would be a bit crazy, but, okay, we take risks to explore, to try new ideas. That's the sort of risk we take*'. Another interviewee explained the risks taken in the R&D centre: '*We deal with experiments in laboratories – this, however, is a dangerous risk to take, as it might cost your life*'. He went on to say '*For knowledge management stuff, we could take the risk, no problem*'. Another participant expressed his views on the issue of risk by saying '*The danger is if we don't use our knowledge, this is it*'.

5.3.3 Theme 2: Information communication technology participation in knowledge management activities

In this section, the researcher reports on the results related to the participation of information technology in knowledge management activities. The sub-themes that

support the main theme are: 1) perceptions of information communication technology, 2) method used, and 3) current situation. The researcher presents supporting evidence as illustrated in quotations extracted from the notes.

5.3.3.1 Perceptions of information communication technology

The author begins this section by presenting the participants' perceptions. This includes two themes: 1) information communication technology is essential, and 2) information communication technology is only one element of three (*'ICT is just a vehicle'*).

5.3.3.2 ICT is essential

The interview participants reported that the role of information technology in supporting knowledge management was 'crucial', 'essential' and 'important' – these were the sort of words the researcher heard very frequently when he was conducting the interviews. Virtually none of the participants the researcher interviewed had any shadow of a doubt about the role of information technology as a key issue for knowledge management activities. A typical response was 'How can we capture, share, and use knowledge without IT?' All participants accepted the role of IT as an 'essential', 'important' and 'crucial' component in the KM process.

5.3.3.3 ICT is only one element of three (*is just a vehicle*)

Three participants held similar views regarding the role and importance of IT: '*IT is only one element of three* [people, process, and technology]. *Tech won't be enough*'. The author asked one participant why he believed this to be the case, and he responded as follows: '*Look at the three elements ... they cannot be divorced. They have to be hand-in-hand with one another if we want to manage knowledge*'. He further expanded: '[you] *first need people willing to share knowledge,* [you] *need a clear and easy process to follow, and* [finally] *you need tools that are easy to use*'. IT is not an end-product, nor is it a solution in and of itself. IT is deemed to be a means to an end and nothing more. It has to provide what people need in order to accomplish their tasks successfully. One interviewee expressed his view of this issue succinctly: '*IT is just a vehicle but it can help*'.

5.3.4 Three methods and tools used to carry out knowledge management activities

The author starts this section by demonstrating the themes that are related to the methods and tools used to carry out knowledge management activities. Themes include 1) face-to-face interaction with ICT support and 2) ICT tools for supporting KM. The tools involved are ShareK, which as a tool has a number of features, including a 'People-to-People' connector and a 'People-to-Knowledge' connector. The feature's description was offered by the coordinator.

5.3.4.1 Face-to-face interaction with ICT support

Questions were asked about the method(s) participants would prefer for sharing knowledge. As is apparent in Table 5.26, face-to-face interaction with ICT support was the method most commonly championed by participants. Almost two thirds of those interviewed (65%) indicated that face to face with ICT was the main method to support their knowledge management activities. The traditional face-to-face interaction would nonetheless appear to leave something to be desired. Less than a third (29%) of interviewees indicated that they regarded this method as more trustworthy than IT-mediated interaction. On the other hand, some 6% of the interviewees preferred the use of IT when the participants are geographically and temporally dispersed.

Table 5.26: Method used, percentage and rank

Method used	Percentage	Rank
Face-to-face interaction with ICT support	65%	1
Face-to-face interaction	29%	2
Dispersed interaction with IT support	6%	3

5.3.4.2 ICT tools for supporting KM

Table 5.27 shows the technologies being used in managing knowledge. Email, telephone and ShareK seem to be the primary means of displaying and distributing knowledge in the organization, with 100% of the employees using them. The second most common tool was web portals, browsers and the extranet, used by 88% of respondents, followed by personal knowledge management, search engines and retrieval tools, used by 82%. Use of the more traditional corporate yellow pages and other relevant knowledge directories registered a score of 76%. Video and audio

conferencing and electronic bulletin boards and forums were equally likely to be preferred methods of IT communication within the organization, as both were used by 65% of respondents. The least likely method of communicating knowledge was via podcasts, chat and instant messaging, used by only a relatively low figure of 41% of respondents.

Table 5.27: ICT tools for supporting KM by percentage and rank

Tool	Percentage	Rank
Email	100	1/1
Phone	100	1/2
Sharek	100	1/3
Web portals, Browsers, Extranet	88	4
Personal knowledge management, Search engines, Retrieval tools	82	5
Corporate yellow pages, knowledge directories	76	6
Workflow tools , virtual teams, community of practice	71	7
Videoconferencing/Audio conferencing	65	8
Electronic bulletin board / Forums	65	9
Web 2.0: Social network service: MySpace, Facebook, blogs, Wikis	53	10
Podcasts, chat, instant messaging	41	11

5.3.4.2.1 ShareK contains knowledge management tools

ShareK was regularly used to share and manage knowledge. As previously stated, it seemed to be preferred over other means, and is used by the entire organization. The 'ShareK' system has been customized by the company to fit its needs; the original software is the SharePoint programme. In Arabic, the word *Sharek* means to share. Participants in this study seemed to be quite happy with the ShareK system. One interviewee thought that ShareK was similar to Google in its features: '*The ShareK tool is similar to Google, where you can find everything at one button*'. Another employee said: '*Yes, we have a good system called ShareK. This tool has been evaluated and is a promising tool for effective KM implementation*'. ShareK appeared to be one of the successful attempts made by the company to manage knowledge. As one interviewee noted, '*ShareK was one of the biggest attempts* [made by the R&D

centre] *so far*'. It appeared that the interviewees recognized ShareK as a promising and powerful tool to manage knowledge.

5.3.4.2.1.1 People-to-People connector

According to one participant, who described these tools in detail, the People Connector is similar to MS Outlook. Everyone in the R&D has his or her own profile, which contains details of personal qualifications, skills and relevant expertise. The People Connector consists of three elements: Expert Communication (Community of Practice), Expert Locator and Unified Communication. It also contains calendar options and personal availability integrated in the status locator.

The same participant made clear that one of the most important tools was the Community of Practice (CoP) tool. It was suggested that the CoP was an essential element for capturing R&D experts' tacit knowledge and management solutions; these tools are integrated into ShareK. He also gave his estimation of the drawbacks CoP had: a limited interaction between communities of practices, unrelated posts junk, a loss of many relevant posts, more than one place to collect feedback, and recursive, time-consuming searches of other CoPS. Another type of CoP used at the centre was Virtual Team (VT). This tool is designed to share and disseminate information to create knowledge in areas of interest that are not directly associated with the research programme. Through VT, R&D personnel can exchange and help each other in virtual teams. The interviewee suggested that although VT can help, success depends on people's willingness and openness to share knowledge.

5.3.4.2.1.2 People-to-Knowledge connector

The R&D personnel believe knowledge is categorized into internal and external forms. They also have the following tools that connect people to knowledge, such as search engines and external knowledge. As the above-mentioned participant commented, '*the role of connecting people to knowledge or knowledge to people is like a broker where two sources are integrated or joined: those who seek specific knowledge with those who can provide the specified knowledge*'.

5.3.5. Theme: Current situation

5.3.5.1 Technologies are scattered

The existing tools in the R&D centre were scattered, and as such, made managing knowledge somewhat difficult and needlessly time-consuming. One interviewee explained, '*Knowledge is a huge topic: we need good technology to capture it*'. Another suggested, '*the tools we have do not allow us to effectively share knowledge*'. Another commented that, '*due to lack of good tools, most knowledge is stored in email boxes*'. A further interviewee explained, '*Many tools use different processes and several are duplicated through the R&D centre*'. A further participant complained that '*many tools create confusion*' and '*when you want to upload knowledge you sometimes put it in the wrong folder. This can cause misplaced or irrelevant information*'.

5.3.5.2 Search capabilities

'*Knowledge should be retrieved through one search portal, not like now where several different search engines exist*', as one interviewee suggested. It appeared that the problem with search engines was aligned with another: the existing database does not differentiate between internal and external knowledge. A further problem was the lack of a distinction between scanned (approved by experts and specialists in the relevant topic in the R&D centre) knowledge and unscreened knowledge to balance the search results in terms of '*reliability and freshness*', as one participant suggested. Many of the search engines that existed were unrelated. One interviewee explained that there was a need for a search engine characterized by '*easy access, easy to search, which we lack*'. A further explanation from an employee stated that current IT tools were not '*easy to use*' and were '*limited*' in providing what was needed for jobs and tasks. An interviewee stated: '*No, I think IT tools we have at present are not enough, not to mention the difficulty in using them*'.

5.3.5.3 Email communication

Email appeared to have a positive impact on the employees. They seemed to accept it as a method for sharing, retrieving and storing knowledge. Emails and messages were

used to disseminate information relating to their tasks and assignments. It seemed that the majority (two-thirds) used them to communicate knowledge. It is also considered an easy method by which to share knowledge. The amount of knowledge shared via email is believed to be (80%) of all communicated knowledge, as one interviewee stated. People in the R&D centre would share bite-sized pieces of knowledge and would rely on emails for storing and capturing knowledge. One stated that, when attempting to share knowledge, '*I used emails to document information and knowledge ... it's familiar to us*'. Another: '*It* [email] *can be saved to store your knowledge through it ... for quite a long time*'. Another interviewee stated, '*due to the lack of good tools, most knowledge is stored in email boxes*'.

However, concern about the 'blunt storing of all email communication remains, and creates resistance against capturing all email communication', as one interviewee noticed. Another proffered 'adaptive and flexible integration of emails within the R&D knowledge management system' as a solution.

5.4 Knowledge management themes

In this sub-section, the researcher will examine knowledge management themes that emerged from the research question 'How can knowledge management be improved?' as well as those emerging from the responses to Part B that were in a text format. Before we proceeded any further, the author posed this question: 'Is there significant knowledge sharing between people here? If yes, is it done regularly?' Almost two-thirds of respondents believed that knowledge was not shared and almost the same percentage thought it was not done regularly. Only about 30 per cent believed that significant knowledge was shared and that this was done regularly. Nonetheless, the following themes emerged as barriers to effective knowledge management. As the participants suggested, it will be necessary to remove these to improve the knowledge.

The following themes emerged: 1) Why bother with KM? (willingness); 2) Awareness programme (*what's in it for me?*); 3) Training; 4) Time to think; 5) Support from senior management; 6) Trust; 7) Changing habits (making knowledge part of daily work); 8) Creating a good climate; 9) A dedicated R&D library; 10)

Easier access (*like Google*); 11) Intellectual property; 12) Concerns for managing knowledge.

5.4.1 Why bother with KM? (Willingness)

Success in managing knowledge is dependent on people's willingness to share knowledge. '*People are the key issue if they are willing to share knowledge – that's it; but if they don't want to ... you cannot force them*', as one participant stated. It appears that willingness is an important factor to create a good climate for knowledge management. One participant expressed his view that '*willingness* [is] *the most important in supporting the activities (of knowledge management)*'.

Although information communication technology can play a major role in enabling knowledge, willingness remains 'the cornerstone' in managing knowledge, as one interviewee stated: '*If you have the latest technology ... but people are unwilling to share knowledge, what will you do?*' There are times when willingness alone is insufficient. '*In our R&D laboratory, willingness is there but we cannot communicate our tacit experience with others*', as one interviewee explained. Another interviewee suggested, '*We do not want to lose our power ... you know knowledge is power. If I do not see the return, why should I share?*'

5.4.2 Awareness programme (*what's in it for me?*)

It appears that people must understand and be aware of the importance and benefits of knowledge management. In the R&D centre, the level of understanding of the purpose and usefulness of knowledge management appeared unclear. There was '*Poor awareness of the benefits of using, and availability of the existing KM tool*', as one interviewee explained, and another expanded on a similar point, saying '*we lack awareness, we need a clear plan for this*'. Another went further in suggesting that technology is not enough to do the job. He explained: '*IT is just a tool, but creating success and improving the knowledge management needs awareness*'. A further participant suggested a remedy: '*Launch awareness programmes to get people engaged in these activities*'. It appears that clarifying the benefits for both people and the organization is '*a must*'. One participant expressed this as follows: '*What's in it*

for me?' It also appeared that people needed, as one interviewee put it, '*a wake-up call*' to understand the value of knowledge management: '*The danger is the ignorance people have about the value of knowledge*'. He went further to suggest that '*knowledge is owned by the company; they also need to know that it is not theirs, it is the company's*'.

5.4.3 Training

During the interviews, a number of participants emphasized the benefits of training. Training all R&D personnel on how to use ICT to support KM was essential to ensure sustained knowledge upload and continuous updating of knowledge content within the R&D centre. As one participant explained, '*training goes hand-in-hand with the awareness of the available KM system*'. Another interviewee suggested '*Training is very important but we don't have enough training. If you want to improve the knowledge management you have to train people how to use the system*'. It appeared that the personnel of the R&D centre lacked training: one participant stated, '*Yes, there is a lack of training in how to use the IT available effectively*'. Another concurred: '*We have the right technology, but people need to be trained properly*'. Training necessarily has to be aligned to willingness to participate. One participant suggested that willingness must come first and training second.

5.4.4 Time to think

'*Time, time, time*'. This was one participant emphasizing the importance of this factor. Another suggested '*we don't have time to do knowledge management*'. Yet a further interviewee explained that knowledge management is '*time-consuming and the process of it is another story*'. One employee made clear that '*These activities take time, so they only occur if we can afford time to do them*'. One other declared, '*Let us have time first*'. The consensus on this issue was that '*searching for knowledge is time-consuming ... we cannot afford the time for it ... we have a lot of work to do*'.

5.4.5 Support from senior management

The R&D centre employees thought the top management support was not up to the level expected. One interviewee saw no encouragement from the top level at all: '*I*

think there is no encouragement from the top management and no motivation to use and share knowledge'. Another participant also complained that there was '*no support from the top management*'. Making knowledge management a habit needed top management-level support: '*You cannot tell people what to do if you don't exhibit that behaviour yourself*'. A supporting quotation from another employee stated that '*Achieving full management "buy-in" would be a key factor to any degree of success in improving knowledge management in the R&D centre*'. Another interviewee proposed that '*Buy-in and support from senior management will pay off for any KM initiative*'.

5.4.6 Trust

Creating trust was seen as '*very essential to improve knowledge management*'. Almost everyone was concerned about 'trust'. It appeared that employees were '*afraid to share their knowledge*'. One interviewee explained that '*trust is very important to build confidence in people to share knowledge*'. The absence of trust was perceived as '*a big barrier*'. Another stated that '*trust is easier said than done*'. One interviewee said: '*We don't have trust and the atmosphere doesn't help*'. A further interviewee suggested that '*trust can be created through a good climate*'. In the R&D centre, it appeared that '*trust is needed of the other experts if the issue you are investigating is beyond your own area of knowledge*'. Trust seemed to mean '*accepting others' mistakes*', as one interviewee explained: '*In a laboratory, anyone can make a mistake, but we need to correct mistakes, not repeat them*'.

5.4.7 Changing habits (making knowledge part of daily work)

R&D personnel appeared to have no time for knowledge management, as was illustrated earlier. Time was one of the most common make-or-break factors for knowledge management. As one participant explained, '*The nature of work* [here] *is the problem,* [we need time to manage knowledge]'.

It seemed that knowledge was not recognized as 'real' work. One employee put it as follows: '*We have real work to do ... loads of work ... Knowledge is not a priority here*'. Another interviewee suggested the need to '*change their habits to create a climate where people can share and exchange knowledge*'. However, changing habits

and making knowledge a part of their daily work appeared to be a challenging task, as expressed by a further participant: '*changing habits is the hardest part ... it needs time*'.

5.4.8 Creating a good climate

Organizational climate appeared to be of importance to the people of the R&D: 'One of the big players is climate. If you have a good climate your knowledge management should be doing well'. 'Creating a climate is not easy – it needs a lot of work', as one participant commented. Although at the outset of the interviews, the researcher made clear the meaning of the term 'climate' and how it differs from the concept of 'culture', the researcher still heard the two terms used to mean the same thing. One interviewee said 'We thought they meant the same thing, but we now know the meaning of it and I think that's the problem – why we stand still and not take further steps towards knowledge management'. Another interviewee liked the idea of climate and commented 'if we really want to succeed, we must apply a good climate to our R&D'. Another said, 'Looking at the nine dimensions of climate, I think they are just marvellous and that we do indeed need to address them'. One interviewee expressed his views on this aspect as follows: 'Climate is the missing word in our organization, so how can we implement it?'

5.4.9 A dedicated R&D library

Need for external knowledge was of paramount importance to R&D personnel and experts. During the interviews, the author felt that the people concerned voiced their opinions about a dedicated R&D library strongly. One interviewee suggested the need '*to have all knowledge needed in one place and serve the people's hunger for knowledge with a simple unified process, hard copies of key journals and reference books*'. Another suggested '*a conventional library with books and printed journals in a large sitting place*'. However, dedicating a library of this kind was not the end of the story, as another respondent pointed out that, '*the content of the library is the important*'.

5.4.10 Easier access (*like Google*)

Access to knowledge was one of the most important enablers to knowledge management.

One interviewee explained: 'Sharing knowledge is not easy ... it is not always culture or climate, [it is also] related to organizational process and technology'.

Another suggested, '*if you want people to share ... make it as easy as possible*'. Another suggested a tool that could be integrated with people's '*day-to-day practice*'. One interviewee went further to suggest Google. Google was a popular search engine and was perceived to be able to do the job needed. Money or cost was not the problem, as one interviewee suggested: '*Google is easy to use so why do we not have such an engine? We have the money ... so why wait?*'

5.4.11 Intellectual property

Intellectual property (IP) was an important concern among the people of the R&D centre, and it appeared that this term was on everyone's lips. There was a fear among them about telling people what they had in mind before a guarantee was established. One respondent commented on this by saying '*you know this is an R&D centre and is meant to have very highly knowledgeable people; they come from everywhere. Do you think they will cheapen their knowledge?*' Another participant said, '*No one can tell something special – something other people might not have – without recognition and acknowledgement ... some colleagues would steal your idea if it were not credited*'. One interviewee explained, '*You know, knowledge is power. If you tell someone your idea, it might be stolen and you would get no credit for it*'. Another mentioned protecting the '*patent and intellectual property first*'. Another interviewee complained, '*How can we manage knowledge before our knowledge is protected? Theft sometimes occurs here, so we have to be careful*'. A further respondent made the following point: '*You come here because of what you have in mind, so what is the point in having you if you have nothing new to say?*'

5.4.12 Concerns for managing knowledge

Participants were asked to clarify which of the issues displayed in the table below concerned them with regard to managing knowledge. The pre-eminent concerns that the employees expressed were a lack of both time and training.

Time was cited as a concern by the greatest percentage of respondents, 76%, and was thus the biggest concern with regard to effective knowledge management. It is interesting that the same percentage of respondents highlighted the issue of idea time in sections 5.2.7 and 5.3.2.4, where we heard that 77% of respondents believed that not enough time was available for generating ideas. Training was the second greatest concern, as two-thirds of the 17 participants voted for the need for training. Trust and openness were a concern for 64% of respondents: this result contradicts the quantitative findings on trust and openness, which reported that 82% of the respondents believed that the centre enjoyed these qualities. Risk-taking was a concern for 53% of respondents. However, as illustrated in 5.3.2.9, the qualitative aspect of this study showed almost 100% of participants thought they could take risks. Support from top management was another concern, according to 47% of respondents. Freedom was voted by 41% to be another concern. It was 23% lower than it was shown in 5.3.2.2. Compatibility of technology infrastructure was a concern for 47% of respondents. Security was at the bottom of the table as the least common concern, being selected by only 35% of respondents.

Table 5.28: Concerns for managing knowledge

Concern	Percentage	Frequency
Time	76%	13
Training	70.5%	12
Trust and openness	64%	11
Risk	53%	9
Support	47%	8
Freedom	41%	7
Compatibility of technology infrastructure	41%	7
Security	35%	6

5.5 Conclusion

In this chapter, the results obtained in this study have been presented. The SOQ outcome diagnosed the climate in the R&D centre, followed by the qualitative results that are presented through direct quotation depicting the themes that arose from a process of inductive thematic analysis. This chapter has merely presented the results without elaborate discussion or comment from the researcher, except for some comments on the significance of data presented in the table and figures. In the next chapter, the results of this study are discussed.

Chapter 6

Discussion of the Results

6.1 Introduction

In Chapter 5, the researcher outlined the results of this study by presenting the themes that emerged either through the literature (commitment, freedom, etc.) or through the data collected. Chapter 6 is a reflection on the themes that emerged in the light of the existing literature. It also incorporates the author's own interpretation of the data gathered.

6.2 Findings of the study

Since the discussion here is a self-contained chapter, it is helpful to recap the major findings reported in the previous chapter. Therefore a brief summary of the main results is given. In this section, the author relates his results (Chapter 5) to the existing literature relevant to his overall research question. The researcher has structured this section according to the outline used in Chapter 5. He begins by discussing the findings of the study which relate to the organizational climate data (quantitative and qualitative). It is worth noting that, where there are any contradictions between the quantitative and qualitative data, greater weight will be accorded to the quantitative (the SOQ), since the reliability and validity of the SOQ are better established (see sections 4.3.7.1.1 and 4.3.7.1.2). This provides a more secure platform for the discussion. Besides, where climate, as opposed to culture, is concerned (see section 3.4), a quantitative methodology is better suited to assessing the unique views, thoughts, feelings and behaviours people manifest (Denison, 1996). Having said which, the researcher will further synthesize the two sets of results when discussing the main conclusion (see section 7.2). There follows a presentation of the findings of the study in relation to the information communication technology support themes, followed by a discussion of the findings in relation to the knowledge management improvement themes.

6.2.1 Themes related to organizational climate dimensions

As discussed in section 5.3.2, climate with its nine dimensions provides more meaningful information on what is working and what is not, and what needs to be done to make the climate more conducive to using information communication technology to effectively support knowledge management. Prior studies have noted the importance of a climate that encourages creativity as an important factor contributing to the innovation of an organization (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007). But what has been less researched, as discussed on many occasions throughout this research, is the effect of organizational climate on information technology support for knowledge management, hence the study was to explore this impact.

It is worth mentioning that the researcher will not discuss the demographic information that is available (education and time at R&D) due to the fact that this is beyond the scope of the study. This is worth noting because the literature is based on innovation and creativity and there is scope for expanding it in new directions by relating it to the KM literature the researcher refers to with regard to the climate dimensions. In most cases these dimensions relate to innovation or creativity, and the specific area this study is concerned with has been little researched. Below is a discussion of the said dimensions and the potential causes of these behaviours based on what the literature on organizational climate (Isaksen and Akkermans, 2007) suggests, and also on the researcher's own interpretation and judgement, as illustrated in sections 2.3.2.4, 4.3.5.1 and 4.3.6.

6.2.1.1 Challenge and involvement

Challenge and involvement refers to the extent to which individuals are given opportunities to become involved in the daily operation, long-term goals and vision of the organization (Isaksen and Akkermans, 2007). In the literature there has been a suggestion that levels of organizational commitment are related positively to perceptions of organizational climate (Guzley, 1992), and improving or implementing knowledge management involves commitment not only from management but from all personnel (Mvungi and Jay, 2009). However, this study approaches the assessment of climate through the perception of individuals (Isaksen and Akkermans, 2007).

The SOQ results show that the challenge and involvement dimension scored 188 points (50 points lower than the innovative organization but ahead of the stagnated one by 25 points). The dimension was examined through 6 items (as seen in the previous chapter, Table 5.7). Its score was just two points short of the average organization score of 190. This would suggest that R&D is doing fine. Commitment, as one of the challenge and involvement outcomes, was tested through 3 items, they are: 'People are committed to solving problems here', 'People here try to live up to their commitments', and 'People here feel deeply committed to their jobs', all of which scored above 50 per cent on the scale of 'fairly applicable'. None of the other items scored higher than the commitment items. This also demonstrates some degree of commitment in the R&D centre, which is needed for effective knowledge management.

A review of the literature reveals a strong relationship between commitment and knowledge management. Nonaka for example, suggests knowledge, amongst other elements, is about commitment (Nonaka, 1994). It has also been suggested that when there is a high degree of challenge and involvement, people feel motivated and committed to making contributions (Isaksen et al., 2001). Evidence of this commitment is the statement of 'The work atmosphere here is filled with energy', which had the highest response of fairly applicable (59.7%).

Interestingly, 188 points represents 62.6% of the possible 300 points (all nine dimensions range from 0–300 points). The SOQ therefore was in line with the qualitative interview which showed that 64% appeared to feel motivated and committed to making a contribution to their daily ICT work to support knowledge management. In other words the quantitative data were further supported by the interview data.

On the other hand, building commitment to sharing knowledge is not an easy task, as the literature suggests (Durrance, 1999, p.35). It involves engaging employees' emotional energy and attention (Ulrich, 1999, p.131). Evidence of this can be seen as the respondents failed to reach 30% on the scale of applicable to a high degree. This is also illustrated further by the remaining percentages, from both the SOQ and the

interview. The qualitative result illustrates that some 36% believed that commitment was lacking in their case.

Nonetheless, the current study seems to concur with the findings of Parther (1996), who conducted many of his studies on R&D organizations and found challenge and involvement to be in good shape, as it was in this R&D. Furthermore, the score achieved here was higher than that in the study in Saudi Arabia by Bakkar (2003), which used the SOQ to examine creativity enhancement in Saudi media organizations, or that achieved in a comparative study by Parrish (2004), concerning the organizational climate at the Army Martial Command (AMC) in the USA. These studies scored challenge and involvement at 146 and 150 respectively. The implication of this is the possibility that R&D might promote aspects of challenge and involvement more than other sectors. Assessing such a claim would, however, require further investigation.

6.2.1.2 Freedom

Freedom reflects the level of autonomy in behaviour exercised by the people in an organization (Isaksen, 2007). In the literature, a strong relationship between freedom and effective knowledge management has been reported, for example Adam (1998) points out that the willingness to share knowledge is affected by the degree of freedom needed to implement knowledge management. He also reports that 3M had found that the ideal people were interested more in freedom to do their own work than in money or power.

However the data illustrates low levels of freedom exercised by the people at the R&D centre (155 points). Such low levels are evident from responses to the statement 'People here make decisions on their own to a fairly large extent' as it had the lowest response of 4% out the 77 respondents on the scale of 'applicable to a high degree'. This result is further corroborated by the qualitative interviews, which show that almost two-thirds of the participants believed 'bureaucracy cuffed their hands'.

The implication here is that, since the current results show low levels of freedom, this might suggest the opposite to those firms that allow freedom of data to spread throughout the organization and hence are more likely to promote idea creation

(Gabberty and Thomas, 2007). And since freedom can assist personnel to absorb knowledge (Nonaka, 1997) and can enhance organizational performance through use of ICT to support knowledge management (George, 2005), this result might suggest otherwise.

There are several possible explanations for this result. First, as was explained by the interviewees, bureaucracy practices impinged on their freedom. This factor is also confirmed by Isaksen and Akkermans (2007), who outline probable causes for excessively low levels of freedom. It might be that procedures and processes were not clearly explained, or that the need for individual initiative was unclear.

Surprisingly, the qualitative interviews show exactly the same percentage of 64% for both challenge/involvement and freedom dimensions. The explanation here might, with caution, be found in Nonaka's (1994) suggestion that individual commitment is generated through autonomy. In other words, there is a strong relationship between challenge/involvement and freedom. This relation is further manifested in the findings in Chapter 5, which show a positive relationship between these two dimensions (see Table 5.4).

On the other hand, the findings of this study contradict the claim of Knell (2000), who characterizes knowledge workers as 'free workers'. These findings accord instead with those of Donnelly (2006), who investigated the working arrangements available to knowledge workers. He found that many knowledge workers were not able to exercise more control over their working arrangements than traditional employees, as flexibility was restricted by the needs of their employer(s). Although the data seem to disagree with Parther's (1996) findings that freedom was in good shape in the R&D organizations he studied, they do show higher scores than those found in Bakkar (2003) and Parrish (2004), 127.51 and 113 respectively, showing some kind of consistency.

6.2.1.3 Trust and openness

Trust and openness refers to the degree of emotional safety in relationships between colleagues (Isaksen and Akkermans, 2007). Trust and openness are the key to creating greater commitment to the organization (Puusa and Tolvanen, 2006). Jaichand, in his

PhD thesis (2008), which explores the relationship between knowledge sharing and employee performance, found trust to be a strong factor enhancing knowledge sharing.

In the given data the SOQ results show, however, a low level of trust, scoring 153 points, 25 and 7 points lower than the innovative and average organizations respectively. The R&D centre did, however, score 25 points higher than the stagnated one. In other words, it is half-way between the innovative and stagnated cases.

Low levels of trust and openness were evidenced as respondents to the three trust and openness statements failed to reach 30% on the scale of 'applicable to a high degree'. Nonetheless, the SOQ seems to concur with the findings of Parther (1996) that much improvement was needed in this dimension. The findings of this study indicate lower levels of trust and openness than those in Bakkar (2003), who recorded a score of 160, but higher than those in Parish (2004), who recorded a score of 127. The results might be due to the features that distinguish each organization and make them differ from each other. The SOQ was contradicted by the qualitative interviews, which show 82% of the respondents reported that they felt they could be genuinely open and frank with one another.

Surprisingly, although trust is an important element of effective knowledge management, it seems to be less relevant in the case of Chow and Chan (2008) or Wei He et al. (2009) as their findings suggest no direct effect of trust on knowledge sharing. These studies do not seem to agree with those of Nygaard and Russo (2008), who sampled 85 organizations involving 17 European research and development projects, suggesting that organizations should take care of trust as the mechanism supporting internal knowledge flows. Nor with those of Gupta (2008), which showed knowledge sharing depends on an organizational climate in which trust is high and employees feel that sharing knowledge is rewarding and vice versa, which might explain the low level of knowledge sharing in the R&D centre.

6.2.1.4 Idea time

Idea time refers to the time people take to produce new ideas or consider the merits of existing ideas and opportunities (Isaksen and Akkermans, 2007). In the *Knowledge*

Management Yearbook 2000–2001, Comeau-Kirschner and Wah (2000) title their article 'Who has time to think?' They emphasize that 'the corporate world is experiencing the greatest calamity of its history as millions of corporate souls suffer from a phenomenon known as "time famine". It is not about having too little time to manage what you have to do on a daily basis; it is about not having time to think strategically' (p.22).

It is somewhat surprising that the R&D centre scored even higher than the innovative organization. Its score was 171, compared with the innovative 148, the average 111, or that stagnated one of 97 points. The SOQ findings seem to contradict the study of Parther (1996) and Comeau-Kirschner and Wah (2000) that reveal a lack of idea time in the organizations surveyed. The data also seem to disagree with those of Parther (1996), who suggests the greatest improvement is needed in the dimension of idea time.

It is also encouraging to compare this finding with those of Bakkar (2003), scored at 144.5, or of Parrish (2004), at 95, which is even lower than the stagnated case mentioned above. The SOQ was further supported by the qualitative interviews which show more than three-quarters (77%) believed they had time to think of alternatives when using ICT to support knowledge management.

This raises the question of whether this greater score actually contributes to effective knowledge management or not. The data, as shown later, suggest the contrary, as time was one of the barriers to knowledge management. Although the SOQ shows that the R&D centre allowed time to think, it does not show how much time was saved. The literature states 'if one of the benefits of knowledge sharing is time saving, it would be difficult to measure; we could only account for time spent but not for time saved' (Rao, 2005, p.157). What should be noted when interpreting the current result is what Dalkir (2005, p.110) warns about: that '1000 knowledge workers lose a minimum of 6 million dollars per year in time spent just searching for information' (2004, p.110). This would suggest further investigation is needed into the time saved using information communication technology to support knowledge management.

6.2.1.5 Playfulness and humour

Playfulness and humour refers to the amount of spontaneity and levity displayed within the organization (Isaksen and Akkermans, 2007). The SOQ shows fairly low levels of playfulness and humour as the R&D centre scored 154 points, 5 points lower than the average and 76 points lower than the innovative organization. In fact the R&D scored only 14 points higher than the stagnated organization.

Although the SOQ shows a low overall level of playfulness and humour, responses to the six statements used to test this dimension illustrate a different story. Responses to the following five out of six statements scored higher than 40% on the scale of fairly applicable: 1) 'People here exhibit a sense of humour', 2) 'People here have fun when they work', 3) 'The atmosphere is easy-going and light-hearted', 4) 'Good-natured joking and teasing occur frequently here', and 5) 'A playful atmosphere prevails here'.

This outcome was further explored by the qualitative interview which indicated that two-thirds of participants believed the climate was easy-going and that people enjoyed jokes and laughter amongst themselves. The SOQ results seem to disagree with those of Parther (1996), who found playfulness and humour to be less in need of improvement, whereas in our case much improvement was needed in this dimension. On the other hand, the findings in this study appear to be lower than those in Bakkar (2003) where playfulness and humour scored 160, but higher than those in Parrish (2004) where they scored 118.

Since the SOQ scored the R&D at a lower level of playfulness and humour, the implication might be a contradiction of Ashby's (1956, cited in Malhorta, 2001, p.124) statement that 'playfulness enables internal diversity that can match the variety and complexity of the dynamically changing environment', or the idea that 'sharing humour was another way virtual team members established a personal bond. Even for teams that never met face to face humour helped to build a sense of community' (Nermio, 2000, p.115). Ashby's and Nermio's suggestions are, however, supported by the fact that two-thirds of participants believed that significant knowledge was not regularly shared or managed.

Furthermore, Landry (2000), in his paper titled 'Playing at Learning: Why Knowledge Creation Needs Fun', points out the importance of playfulness. Exploring one element of Nonaka and Takeuchi's (1995) theory of knowledge sharing –the 'enabling condition ' of intention - and suggests some limitations to their approach that can be overcome by recognizing play as an enabler of (the Japanese word) 'ba', and consequently an enabler for knowledge creation. He also proposes that playfulness has the potential to create conditions to improve sharing of tacit knowledge and increase the bond between organizational members.

6.2.1.6 Conflict

Conflict means the presence of personal and emotional tension (Isaksen and Akkermans, 2007). The SOQ shows higher scores of conflict at 118 points, which is deemed a negative aspect. It was higher than in the innovative and average organizations, which scored 78 and 88 respectively, but better than in the stagnated one, scored at 140. This is also contradicted by the interview data, which show that 82% of the participants had no emotional tension regarding the use of ICT to support knowledge management. Just one statement on the SOQ confirms the qualitative results: 40% believed that 'It is common here to have people plot against each other' was not at all applicable.

The SOQ result seems to disagree with those of Parther (1996) who found conflict to be less in need of improvement as it was not a problem in his studies. However, in our case much improvement was needed in this dimension. The SOQ produced results which seem to be better than those of Parrish (2004) in which conflict scores 136, but those of Bakkar (2003) show lower conflict at 96 points. Again this difference might be due to the fact that each organization has its own circumstances and hence is somewhat different from others.

The high degree of conflict found in the R&D centre might be explained by the fact that knowledge can generate conflict and uncertainty over what solution to follow (Swan, in Holsapple, 2003, p.288). Moreover, it has been found that, in the case of large organizations, such as the one at hand, full of individuals with different mindsets, thoughts and experiences, there are always struggles to find shared

understanding and commitment, and this is both the source of internal conflict and the engine for creativity and innovation (Groff and Jones, 2003, p.157).

Surprisingly, the R&D scored high on debate (section 6.2.1.8). According to Nonaka (2005), this dialogue or debate can – indeed, should – involve considerable conflict and disagreement. It is precisely such conflict that pushes employees to question existing assumptions and make sense of their experience in a new way. In any organization there are considerable overlaps in responsibilities and functions, and for good reason no individual person or function can possibly understand all the requirements or perspectives needed in a complex environment. These issues are particularly relevant for the management of tacit knowledge. As a result, coordination of these activities becomes a necessity for effective knowledge management with minimum conflict (Liebowitz, 1999). KM efforts support the overall mission to the greatest extent possible and with a minimum of conflict, friction, and loss of energy. In their book, *Management of Research and Development Organizations: Managing the Unmanageable* (1997), Jain and Triandis point out that conflict arises from the fact that research is dictated by the questions that scientists ask. It is due to the conflict between the need to discover and the requirements of the organization.

Some successful organizations, for example 3M, have developed procedures that allow their scientists a certain amount of time to work on the topics that are of interest to them. What percentage of the scientists' time will be spent on such topics, and when such activities should take place, are matters of negotiation between scientists and their supervisors (Jain and Triandis, 1997, p.17). Although the R&D scored high in conflict at 118, 40 points higher than the innovative one (a significant difference being around 25 points), this is still less than half out of a possible 300 points. In my opinion, this needs to be investigated in relation to knowledge management to see how much conflict can be deemed acceptable in this regard.

One of the most common sources of discord to arise as knowledge management initiatives proliferate is the struggle for control over specific types of knowledge, as De Long and Seemann (2000) point out. The example of Buckman Labs shows that conflict resulting from attempts to put people together from different units to leverage knowledge is largely a tactical problem. For example, when Buckman Labs

implemented a system in which its customers could share knowledge to solve complex problems, this system was felt to be threatening. As a result, they tended to hoard their valuable expertise.

Another kind of conflict is found between those with a content/practice perspective and those with a strategy/leadership view of knowledge management. In the Buckman Labs case, the CEO believed that sharing knowledge was a crucial element of the business strategy, whereas the firm's salespeople had a more individualistic vision of knowledge, shaped by the existing culture and by how knowledge served them in their particular roles (De Long and Seemann, 2000). However, what is missing from this analysis is any quantification of the degree of conflict that Buckman Labs experienced. This is something that was not discussed in the literature I reviewed, or at least was not examined through the use of the SOQ.

6.2.1.7 Idea support

Idea support refers to the ways new ideas are considered, taken up, or advocated (Isaksen and Akkermans, 2007). Knowledge is created through bringing together partners and shareholders in the organization around issues and practices to produce new ideas, perspectives, and insights (Dalkir, 2005, p.129). Ekvall points out that where the organization's climate is one in which a new idea is more likely to be met with a 'no' than a 'yes', or even a 'maybe', innovation is poor and collaboration weak. Parallels can be drawn with knowledge transfer and collaborative environments in which there are few or no signs of the necessary reciprocity (Cross et al., 2002, cited in O'Sullivan, 2009, p.185). An active exchange of information and ideas in an atmosphere of openness and trust enables employees at all levels to understand what is happening in the company (Davenport and Prusak, 1998).

The SOQ showed a high degree of idea support, 9 points higher than even the innovative organization. Idea support was at the top of the scale shown in Figure 5.2. The SOQ thus seems to disagree with Parther's (1996) finding that much improvement was needed in this dimension, as in our case there was no problem and no need for improvement. Similarly, our study case seemed to be doing fine compared to those of Bakkar (2003), who recorded a score for idea support of 146 points, and

Parrish (2004), who recorded a score of 113 points. Again an explanation of this might be the fundamental differences in nature between these organizations. The SOQ, however, was contradicted by the interviews data, which show that as many as 77 per cent of the participants indicated that the amount of time they had for elaborating on new ideas was insufficient.

The top ranking the R&D achieved on this among all other dimensions might be due to the fact it had high-tech equipment, namely idea management support and other state-of-the-art technology, already in place. However, information communication technology that supports ideas is not in itself sufficient. There is a corresponding need for social support, especially peer support (Sosik, 2004). This was also found to be the case at the R&D centre, as challenge and involvement, debate, and idea time appeared to be heavily weighted among all the dimensions and these can be seen as supportive factors in knowledge management activities. These supportive factors might provide an explanation for why idea support scored so highly.

It is worth mentioning that when looking at the items related to idea support, all of which involve sharing, receiving, presenting, accepting, and the like, what is missing is Mumford and Licuanan's (2004) important distinction between idea generation and idea implementation. This study appears to deal with the generation of ideas and not their implementation, as described by Mumford and Licuanan. The question here is whether or not the high-scoring idea support is conducive to effective knowledge management.

However, what can be seen from the data set, as discussed later in section 6.2.3, is that almost two-thirds of the participants believed that knowledge sharing was insignificant and done irregularly, as mentioned earlier.

6.2.1.8 Debate

Debate here refers to the occurrence of encounters and disagreement between viewpoints, idea, and differing experiences and knowledge (Isaksen and Akkermans, 2007, p.14). The different backgrounds and mindsets which employees bring to an organization can be extremely creative, but the inevitable conflict, debate, negotiation and compromise which are involved in reaching such creative solutions must also be

acknowledged (Shum, 1997). The SOQ shows the R&D centre scored 179 points, that is, 21 points higher than the innovative organization and 51 and 74 points higher than the average and the stagnated organizations respectively. This finding of the SOQ seems to agree with that of Parther (1996), who found in his studies on R&D originations that debate was less in need of improvement. On the other hand, these results appear to contradict those of Bakkar (2003) and Parrish (2004), who scored debate at 156 and 138 respectively. Again this dissimilarity may be due to differences in nature between these organizations.

The qualitative interview, on the other hand, appears to be in some agreement with the SOQ outcome, in that as many as 64% of the people studied admitted to putting their ideas and thoughts up for consideration. Based on a significant difference being around 25 points, and since the difference between the R&D and the innovative organization was 21 points, it can be argued that the R&D is affected by the debate taking place in its organization. But is this a negative or a positive impact? This, as mentioned before, can be answered by the participants themselves (almost two-thirds) when they point out the absence of significant knowledge sharing in the R&D centre.

It can be said that there was more talk than action, or that individualistic rather than organizational goals and visions became the focus of such debate (Isaksen and Akkermans, 2007). It can be argued that more individualistic behaviour was taking place in the R&D. This in turn contradicts the view of Hofstede (1997) on the Arab world, including of course Saudi Arabia , where individualism (in which the ties between individuals are loose and everyone is expected to look after him- or herself and his or her immediate family, as opposed to collectivism in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty) is ranked at 38, compared to a world average ranking of 64 (Hofstede, 1997).

However, both extremes of the 'individualism–collectivism' dimension appear somewhat problematic for the implementation of knowledge management. Individualists typically act according to their self-interest, whereas KM-facilitated collaboration is seen as less important. Collectivists on the other hand might prefer in-groups that more closely resemble family relationships to communities of practice

that are mainly task-oriented. (Heier and Borgman, 2002). The implication is that this high-debate climate might be caused either by unclear direction and lack of listening or by too great a diversity of differing values.

6.2.1.9 Risk-taking

Risk-taking refers to the degree to which people can tolerate ambiguity and make decisions with some uncertainty (Isaksen and Akkermans, 2007, p.14). However, most risks are not possible to transfer or to hedge, because they depend on human actions (Rodriguez and Edwards, 2009). Knowledge management and risk management are intimately linked, as they deal with managing intangible factors. Acquisition of knowledge is a way to reduce risk or to manage risks, as these can be mitigated if one knows what to do (Milton, 2005, p.142). Milton suggests that many risk areas are precisely those where knowledge needs to be acquired (2005, p.142).

Encouraging risk-taking is necessary as business-setting decisions often need to be made quickly and if there is no support for risk-taking, managers and others will be foiled by the fear of being punished for making the wrong decision. For Shaw, 'high trust organisations give people the freedom to fail and then deal effectively with the failure when it occurs. The ability to get through difficult times to support people when they are vulnerable can build trust as much as anything else does' (Shaw, 1997, p.149), and trust can come through having an environment that tolerates and encourages risk taking (McInerney and Day, 2007). This view echoes the positive relationship that exists between trust, freedom and risk taking (see section 5.2.2 and Table 5.4).

The SOQ shows the R&D scored at 142 points, 53 points lower than the innovative one but 30 and 89 points higher than the average and stagnated organizations respectively. Based on the significance being around 25 points, it can be said that risk-taking is at a pretty low level. The SOQ seems to concur with the study of Parther (1996) that much improvement is needed in the risk-taking dimension. Also the results of this study seem to be higher compared to those of Bakkar (2003) or Parrish (2004), which scored 133 and 97 respectively.

The SOQ outcome is contradicted by the qualitative interview, which illustrates that almost a hundred per cent of the people studied (n=17) believed that they could take a risk and the environment was tolerant (see section 5.3.2.9). Based on the result of the interviews, it can be argued that people were confused with many ideas and yet few were sanctioned, or that they were frustrated because nothing was getting done, or that there were many loners and no sign of teamwork (Isaksen and Akkermans, 2007). On the other hand, the SOQ result, which demonstrates a pretty low level of risk-taking, might be explained by the fact that they had a bureaucratic regime and hence were frustrated by the tedious processes needed to get ideas implemented.

The implication of the SOQ is that the R&D did not value new ideas or that ideas were generally rejected, and as a result the bureaucratic system prevailed. The SOQ results appeared to concur with the view of Hofstede (1997) on the Arab world, that it has a high uncertainty-avoidance ranking of 68, which indicates low levels of tolerance for uncertainty. As suggested by Hofstede, to minimize or reduce this level of uncertainty, strict rules, laws, policies, and regulations are adopted and implemented. However, it can be argued that, since the R&D scored higher than average organizations, which included some American and European firms, and since the interview results show high levels of risk-taking, a further investigation might be needed to determine risk-taking levels since the current study lacked a representative sample and this might bias the result.

6.2.2 Discussion of perceptions of information communication technology support for knowledge management

Previous research (e.g. O'Dell, 1997, Alavi and Leidner, 1999; Zack 1999; Skyrme and Amidon, 1999; Swan et al. 1999; Davenport and Prusak 2000; Bhat, 2001; Hendriks 2001; Nongkran, 2004; Freck, 2005; Song, 2006; Ichijō and Nonaka, 2007; Butler and Murphy, 2007; Loos et al , 2008; Goh and Hooper, 2009; Hislop, 2009) has extensively studied the phenomenon of information technology support for knowledge management. The goal of the study was to explore the participants' perceptions of the participation of the information technology in knowledge management activities. This section discusses the implication of the findings for each of the themes related to question two of the study. This includes four themes that emerged from the data which are: 1) Perceptions of information technology, 2)

Methods used to support knowledge management, 3) Tools used to support knowledge management, and 4) Current situation.

6.2.2.1 Theme: Perceptions of information communication technology

6.2.2.1.1 Information communication technology is essential

At the R&D centre where the researcher conducted the study, the participants seemed to have a positive perception of the role of information technology to support knowledge management. This finding concurs with the suggestion by Carr (2004), who states that 'information technology's power and presence have expanded, [and] companies have come to view it as a resource ever more critical to their success' (Carr, 2004, p.4), as it enables employees to share knowledge and insights (McDermott, 1999).

Furthermore, information communication technology has been perhaps the single most important intervention in managing knowledge (Davenport, 2007, p.97). The findings of this study are similar to those of an investigation conducted by the American Productivity and Quality Center (APQC), which spent three years working with 27 companies to understand the practices and principles of information technology support for knowledge management and found information technology to be critical for widespread access and use of knowledge management (O'Dell, 1997, p.8). In line with this and the study at hand was the work of Song (2007), who found that the use of ICT was vital to the support of knowledge management.

However, most companies soon discover that leveraging knowledge is actually very hard to achieve (McDermott, 1999) and this was expressed by the participants of this study, as they repeatedly mentioned the word '*vehicle*' to mean that other important elements had to be integrated, as this typical comment shows: '*IT is only one element of three* [people, process, and technology] *needed if we are to succeed in managing knowledge*'. This way of looking at knowledge management is common (Edwards, 2009).

In reviewing the literature, many researchers and practitioners have been found to question the role of IT in the support of knowledge management (Zack, 1998b;

McDermott, 1999; Walsham, 2001) unless the social and organizational issues surrounding its use receive adequate attention (Butler and Murphy, 2007).

The results of this study emphasize three major components, namely people, process and technology (Butler and Murphy, 2007; Edwards, 2009). Butler and Murphy cite the example of the United Nations Population Fund (UNFPA), showing that its primary emphasis was not on the KM technology artefact, but on the people and processes encompassed by the KMS.

The implication here appears to be that technical artefacts are, at best, enablers to organize data into information: only people are endowed with interpretative capabilities. That would suggest more emphasis on people and less on technology (Edwards et al., 2005). This is not meant to underestimate technology rather to prioritize what comes first. Having said that, to manage knowledge an organization will need to shape and redefine interactions between its people, technology and techniques (Bhat, 2001).

6.2.2.2 Theme: Methods used to support knowledge management

6.2.2.2.1 Face-to-face interaction with ICT support

The method preferred by the participants to share and manage knowledge was face-to-face interaction with IT support. Almost two-thirds of those interviewed (65%) suggested that face-to-face contact was the primary social resource and once this is established, information communication technology can aid their continued knowledge activities. This was in agreement with previous studies (Swan et al., 1999; Loos et al , 2008), which found that face-to-face interaction with IT was significant for knowledge sharing. The underlying reason for the importance of face-to-face interaction with IT support for knowledge management is that 'knowledge is intimately joined to the person who developed it; therefore sharing knowledge is mainly through direct person-to-person contact face-to-face, over the telephone, by e-mail, and via video conferences' (Morten, 1999).

In the present study, 29% of participants indicated that they would prefer (only) face-to-face interaction. This was in line with the findings of Brazelton and Gorry (2003),

who found face-to-face contact to be a very important factor in catalysing the development of knowledge management. This view is also in line with the conclusion of the Massachusetts Institute of Technology (MIT) researcher Thomas Allen, who found that knowledge sharing happened mostly through face-to-face contact (Davenport et al., 1999, p.112; Allen and Henn, 2007, p.32). Thomas Allen and Gunter Henn, in their book *The Organization and Architecture of Innovation: Managing the flow of technology*, stress the importance of face-to-face communication. They further comment on this: 'a limitation that may seem absurd in the twenty-first century ... [is that] modern media seldom substitutes for face to face communication. Rather the use of different media (including face to face) is more likely to be positively correlated, and they augment, not substitute, for one another' (2007, p.26).

Similarly, the finding appears to concur with those of Cohen (2007), who found that in the largest companies with the most sophisticated technology (like the one at hand) people meet in person for discussion and to make the decisions that matter most: to convince leaders to support projects, or to explain or analyse ambiguous information. The preference for face-to-face contact may suggest more effective mechanisms for knowledge sharing, as suggested by Robertson et al. (2001), who claimed that verbal communication, social interaction and hard-copy project documentation are more effective mechanisms for knowledge creation.

A further 6% of the interviewees reported that they preferred the use of IT when the participants are geographically and temporally dispersed. One implication which may seem irrelevant is the need, as Cohen (2007) suggests, to build trust in a world of high-speed global companies where widely dispersed virtual teams are more common than scenarios of face-to-face discussion with colleagues. Cohen goes on to suggest that twenty-first-century managers might responsibly ask whether and how electronic relationships can enhance social capital (Cohen, 2007, p.249). This low percentage of 6% was in line with the result of the SOQ, which, as discussed previously, revealed a relatively low trust score, at 153 points, compared to the average organization, let alone the innovative one. As illustrated earlier, trust scored lower in the R&D centre under study, and this result seems to explain this dimension.

This tiny percentage of 6% may explain in some way the suggestion of Mintzberg (1994, p.16), who underestimates the impact of IT developments when he states that, 'information capable of being processed in a computer does not play a particular role here'. The small percentage also triggers the question of why the relationship between ICT and knowledge is no less problematic (Hendriks, 2001) and suggests that the challenge for the IT platform is to maintain openness and flexibility so that the loss of knowledge can be prevented (Maier, 2007, p.121).

The implication here may suggest that when trust is absent or low and suspicion is present, those norms just as powerfully inhibit the flow of knowledge (Cohen, 2007, p.242). Therefore, other methods to capture tacit knowledge and transfer, communicate, disseminate and store it to be used at a later time are crucial if the R&D is to be able to best use the accumulated knowledge that resides in people's minds (Bednar, 1999, p.212).

6.2.2.3 Theme: Tools used to support knowledge management

6.2.2.3.1 ICT tools for supporting KM

The technologies that were being used in managing knowledge at the R&D were mostly email, telephone and ShareK. They appeared to be the primary means of displaying and distributing knowledge in the organization, with 100% of the employees using at least some of these technologies. These findings are similar to those of Alavi and Leidner (1999), but the current study shows an increase in the percentage of personnel using these technologies. For example, Alavi and Leidner's study showed the percentage of people using video-conferencing was 23%, whereas in the current study, almost double this number (65%) use video-conferencing. The explanation of this might be obvious given the rapid spread of technology in the last decade: virtually all companies are using IT extensively and firms can seldom work without its help. In support of this, the findings of Robertson et al. (2001) and the recent research of Götzenbrucker and Durmuşoğlu (2009) appear to concur with the data here.

Email, for example, has gained greater acceptance as a means of sharing knowledge at the R&D centre. This was also observed by Mutch (2008), who found widespread

acceptance of email for internal and external communication alike. An explanation for this may relate to the familiarity of email as well as its ability to transmit messages in a variety of formats, plus the capacity it has for multiple copies and storage of messages (Mutch, 2008, p.110–11). Similarly, Robertson et al. (2001) reported in their study that email usage was extensive and crucial for project working despite its relatively lean characteristics, as it served as an effective tool for the articulation and coordination of low-level knowledge.

Another explanation for the increase in popularity of email and telephone comes from Allen and Henn (2007): as they put it, 'we may phone or send an email but this is usually to arrange the meeting at which real communication takes place', but even when the telephone was used for less complex communication, and face-to-face was used for more complex information (Hauptman, cited in Allen and Henn, 2007, p. 60).

ShareK was another method for managing knowledge in the R&D centre, as illustrated in the previous chapter. The 'ShareK' system was customized by the R&D centre and tailored to their needs; the original software is the so-called Microsoft SharePoint programme (SharePoint® is a tool used to create team-oriented web sites for sharing information and fostering collaboration among team users). In Arabic, however, the word '*Sharek*' means to share, as indicated earlier in 5.3.4.2.1. The R&D centre found the tool to be of use to share and manage knowledge. Interviewees explained that the R&D centre evaluated the capabilities of ShareK and found it to provide a comprehensive and efficient solution to capture, disseminate and share knowledge among R&D employees and between the company's departments. ShareK's features were reported to at least somewhat satisfy their requirements in its present from. This finding about ShareK seems to concur with views of the original version (SharePoint®), which was found to be a useful tool to support knowledge management (Lindvall et al., 2003; Chang-Albitres and Krugler, 2005; Mariano and Casey, 2007).

Amongst other features, ShareK has a link to email from Outlook directly into communities of practice (ShareK will be discussed in more detail later in this chapter). In other words, it connects existing KM tools, providing, in the words of one participant, 'a one-stop technology solution'. This in turn may suggest a reason why

ShareK was used by almost all of the R&D personnel. Nonetheless, with all the 'state-of-the-art technology' being used in the R&D centre, the knowledge contained in emails was estimated to amount to 80 percent (as the data showed). With this in mind, and also given that the data of this study indicated that only one-third of the participants believed that knowledge sharing was regularly performed, the implication here may follow the aforementioned suggestion of Robertson et al. (2001) that email served as an effective tool for the articulation and coordination of low-level knowledge. This is consistent with the majority (70) of participants in the study, who believed that there was no significant knowledge sharing, let alone that it was done regularly.

On the other hand, despite the rapid spread of technology such as email, groupware and instant messaging, which have the capability to handle a wide variety of data types, such as sound and pictures, as well as text - which explains why much of the gossip in organisations is actually through computers (Mutch, 2008, p.32) – this was not the case in the R&D centre. It seemed that the people of the R&D centre were not reluctant to use IT; rather, it was because they often needed to share knowledge that was neither obvious nor easy to document – knowledge which requires a human relationship to think about, to understand, share and apply appropriately (McDermott, 1999).

Caution must be taken when interpreting the high number of personnel using the technology support tools (e.g. email, telephones, ShareK), and since the majority of R&D centre staff are scientists compared to any other groups, it is worth noting Allen and Henn's (2008) observation that managers communicate by telephone far more than do engineers or scientists and hence they tend to believe that the telephone or email will work as well for the engineers and scientists as it does for them. Allen and Henn further suggest that on average, managers deal with less complex information than do the engineers or scientists reporting to them (2007, p.63) and primarily use email or telephone to verify information. This might be consistent with the finding that only 6 per cent of respondents in the present study indicate that they would prefer the use of ICT alone, which suggests the work carried out by scientists was somewhat complex and that while they might phone or send an email, that was usually to arrange the meeting at which real communication takes place.

6.2.2.4 Theme: Current situation

6.2.2.4.1 Technologies are scattered

The relatively small size of the R&D centre, where people appeared to know one another, permitted a reliable grasp of collective organizational knowledge – it is estimated that this is possible in an organization of about two to three hundred people (Davenport and Prusak, 2000, pp.17–18). However, the problem did not lie with the people (this time) but with the technological aids that support knowledge management, which should help with the gathering, sharing and transfer of organizational knowledge and should provide (a) easy access to information that is distributed and scattered within an organization; (b) relevance to users with security access; and (c) access to valuable and strategic information hidden in heterogeneous sources (Detlor, 2000; Dias, 2001; Fernandes et al., 2004, cited in Song, 2007).

However, the technological tools used in the R&D centre appeared not to meet these criteria. The R&D centre suffered from the use of different processes and different interfaces, which in turn served different rationales. Furthermore, several functionalities were duplicated throughout the R&D centre. This might explain why two-thirds of the participants said they had experienced no significant knowledge sharing, and that it was certainly not done regularly. It was difficult for them to communicate knowledge, as well as being time-consuming. Overall, the scattered support technologies appeared to result in misplaced or irrelevant information.

This finding seems to contradict the study of Tsai et al. (2006), who found that people in their case study, carried out in Taiwan, used their browser as a search and retrieve interface so that each member could utilize the system of knowledge sharing, even at a distance. As a result, the overall efficiency of knowledge accumulation and transfer were rapidly increased.

With this in mind, it is worth considering the point made by Davenport and Prusak (2000) that companies install state-of-the-art technology and expect knowledge to flow freely through the electronic pipeline, as the R&D centre had, but when it does not happen, they are likely to blame technology or inadequate training. Although

these factors are important, people continue to make choices based on their self-interests (p.26).

6.2.2.4.2 Search capabilities

Technological improvements, particularly those related to search capabilities, make it easier for employees to quickly determine relevance and quality when searching for knowledge that could help them in their jobs (Prusak and Weiss, 2007, p.38). Information technology can play an important role in the support of knowledge management when it is appropriately applied (Zack, 1999, p.369) as it allows an organization's knowledge, which is often dispersed among a variety of retention facilities, to be effectively stored and made accessible (Stein and Zwass, 1995, cited in Alavi and Leidner, 2001). In other words, IT engines must be accessible and easy to use (Skyrme and Amidon, 1999, p.118; Detlor, 2000; Dias, 2001; Fernandes et al., 2004, cited in Song, 2007), and it has also to be easy to remember retrieval mechanisms (e.g. search and retrieval commands) for the captured knowledge. The creation of easy-to-use search capabilities is an important aspect of organizational KM (Alavi and Leidner, 2001).

The R&D centre, however, had several different unrelated search engines and search procedures, which were used to access the various knowledge bases. Common standards for information technology to support knowledge management are critical for common access and use (APQC, 1997, p.81). The knowledge-search capabilities found in the R&D centre appeared to be somewhat time-consuming and difficult to use and seemed to make the people of the R&D centre frustrated, as they could not find the information they needed or access more knowledge about the subject matter.

The finding concurred with those of Freck (2005), who found that the search-engine capabilities were 'cumbersome'. The researcher's findings and those of Freck appear to contradict the advice of knowledge management expert Tom Davenport, who suggests that there are two basic criteria to consider in the selection of any technology that is intended to support knowledge management: (a) time – the amount of time you have to find an answer to a given query, and (b) knowledge – the amount of knowledge that the user has with regard to the area in question (APQC, 1997, pp.28–

29). The R&D centre appeared to meet neither of these criteria. Based on the findings here, one may argue that this is part of the reason why the knowledge sharing was insignificant and was only performed irregularly.

6.2.2.4.3 Email communication

Electronic mails have been shown to increase the number of weak ties in organizations. This in turn can accelerate the growth of knowledge creation (Nonaka, 1994, cited in Alavi and Leidner, 2001). The use of email was found to enable ubiquitous communication between R&D centre employees, and 100 percent of the R&D employees said that they used email to communicate knowledge and email was estimated to amount to 80% of the communicated knowledge. This estimation was in line with the suggestion of Zuboff (1988, cited in Mutch, 2008, p.34) that 'much of the flow of information is seen very clearly in the trails left by email discussion'. This study's results are similar to the findings of McCole and Ramsey (2004), Kitchens (2005), Edwards et al. (2005), Song (2007) and Goh and Hooper (2009).

It was also found that the use of email had a positive impact on the employees. Email was widely accepted as a technique for sharing, retrieving and storing knowledge. Likewise, Bhatt (2001) and Mariano and Casey (2007) found that the use of email was significantly associated with knowledge distribution. Similarly Hislop (2009) cited the work of Robertson et al. (2001) and commented with surprise on the significance of the extent to which email was used and the lack of use of Lotus Notes, even though it had been implemented across the organization and offers richer communication than email. Robertson et al. explained this by citing a number of social and contextual factors which account for this communication pattern. First, people had become adept email users and were able to make innovative use of this medium. Secondly, few people had invested the time to learn how to use Lotus Notes, which created a vicious circle where people did not feel encouraged to make the use of it, as they were unsure whether others would be adept at it. Finally, the organizational culture, for a variety of historical reasons, also encouraged and reinforced the use of email as one of the main methods of communication (Hislop, 2009, p.232). This might explain why, in the R&D centre, the use of email was so extensive compared to any other technique. Personnel were first somewhat skilled in

using email, and second, time was a concern in the R&D centre as regards why they did not manage knowledge as they should.

Training was another concern in terms of why IT did not participate in effective knowledge management, a typical comment being that they lacked training on IT support. Finally, the climate in which the R&D centre operated lacked trust and openness, and there was also unwillingness to share knowledge, and one might well argue that in the absence of these important elements, poor knowledge sharing was partly because of the extensive use of email that carried only a low level of knowledge (Robertson et al., 2001). Another factor that might explain the low level of knowledge sharing is the lack of trust, in that knowledge is most credible when it comes from a trusted person or source (Leonard, 2007, 62).

However, at the R&D centre, concerns about the blunt storing of all communication remained and created strong resistance against the capturing of all email communication. Unlike information, knowledge is not always detectable: it is created spontaneously, often unpredictably. Therefore, storing knowledge and transferring it electronically from one part to another is difficult (Ichijo and Nonaka, 2007). Furthermore, discussing anything that is complex or abstract by telephone or electronic mail is very difficult. Moreover, electronic mail suffers an additional difficulty in that it is asynchronous, so any feedback at all on understanding is delayed in time (Allen and Henn, 2007, p.60–61). The R&D centre was not immune from the issues Allen and Henn argue about.

With this in mind, and since 80 per cent of the R&D knowledge was stored in emails, and since, as we discussed earlier, email serves as an effective tool for the articulation and coordination of low-level knowledge (Robertson et al., 2001), one might well argue that this figure of 80 per cent was consistent with the statement that two-thirds of the R&D centre had experienced no significant knowledge sharing and considered that it was not done regularly.

6.2.3 Knowledge management themes

In this sub-section, the author will examine the knowledge management themes that emerged from research question three – 'How can knowledge management be

improved?' – as well as those that emerged from the responses to Part B of the questionnaire, which were in a text format. Before we proceed any further, it is worth recalling that, as discussed in section 5.4, the question posed to the participants was 'Is there significant knowledge sharing between people here [the R&D] and, if yes, is it done regularly?' In response, almost two-thirds of respondents believed that knowledge was not shared and almost the same percentage thought it was not done regularly. Only about 30 per cent believed that significant knowledge was shared and that this was done regularly. Nonetheless, the following themes emerged as barriers to effective knowledge management, and to improve knowledge, it will be necessary to remove them, as the interviewees suggested.

1) Why bother with KM? (willingness); 2) Awareness programme (*what's in it for me?*); 3) Training; 4) Time to think; 5) Support from senior management; 6) Trust; 7) Changing habits (making knowledge part of daily work); 8) Creating a good climate; 9) A dedicated R&D library; 10) Easier access (*like Google*); 11) Intellectual property; 12) Concerns for managing knowledge.

6.2.3.1 Why bother with KM? (willingness)

People at the R&D centre showed a low level of willingness. They seemed somewhat unconcerned about knowledge management and did not take it seriously, even though each employee's willingness to share knowledge is critical to effective knowledge management (Fisher and Fisher, 1999, p.356). This result, however, appeared to concur with those of Empson (2001b), Flood et al. (2001), Kim and Mauborgne (1998), Morris (2001), Robertson and O'Malley (2000), Hammersley (2000, cited in Hislop, 2009), and Goldsby and Martichenko (2005) that reluctance by workers to share their knowledge was not uncommon (p.147).

The present findings come as no surprise, since the data show a low level of trust, which in turn can negatively influence willingness to share knowledge, according to Maier (2007). Willingness is positively influenced by trust (Maier, 2007). Trust, and in turn, commitment and cooperation, including willingness to share knowledge, which were somewhat low at the R&D centre, require a reasonable assurance that people

will get credit for their contribution (Cohen, 2007, p.248): that is why one participant cried out '*What's in it for me?*'

In contrast to the present findings, in a study conducted by Cook et al. (2002), approximately 73% of the people studied were willing to share knowledge. Although the researcher's data did not provide an exact percentage, this unwillingness was evidenced by the fact that 70% of respondents believed that people did not share knowledge or that it was done irregularly, and the fact that 80% of knowledge was shared through emails even though knowledge transmitted through emails tends to be of a low level (Robertson et al., 2001).

The reasons why the R&D personnel were unwilling to share knowledge might be explained by a number of factors, such as the view that knowledge is power and the fact that their value and therefore job security was inextricably tied to their personal expertise (Davenport et al., 1998). The lack of incentives was also significant, although as noted by Stevens (2000, cited in Goh and Hooper, 2009), while rewards are not essential, they often act as a catalyst to improve sharing. Another reason is that people were reluctant to share knowledge because they held the belief that making mistakes or being awkward might lead to them being laid off (Davenport et al., 1998).

Similar to the finding here was the report from the General Accounting Office, cited in Lunney (2002), that fear of openly discussing past mistakes could put people's careers at risk. Another reason is that there was insufficient time to communicate knowledge. Similarly, managers at NASA seemed to be too busy to submit data into the system (Lunney, 2002).

Time was another concern for not sharing knowledge, as discussed later: this was one of the most common knowledge management interventions, as so many knowledge projects run on this point (Prusak, 1999, p.6), and still more important (Goh and Hooper, 2009) is the organizational climate and the climate of trust in particular, which can facilitate the effective implementation and utilization of knowledge management (Zack, 1999). However, the R&D centre appeared to lack such a climate. Another reason for the general unwillingness to share knowledge at the R&D centre is, as stated above, that willingness is influenced by trust: where there is trust people

are likely to share knowledge and vice versa (Cook et al., 2002, cited in Khosrowpour, 2003).

6.2.3.2 Awareness programme (*what's in it for me?*)

Awareness of the value of knowledge management is of crucial importance (Davenport, 1999, p.94). Awareness makes knowledge more immediate for more people and so a lack of it underlies much of the poor communication and inefficiency in organizations (Allen and Henn, 2007, p.85). In his study of successful knowledge management projects, Davenport (1999) noticed that successful projects were trying to build awareness of knowledge management and attempting to change behaviour relating to knowledge, which is conducive to effective knowledge management.

British Petroleum (BP), for example, started its knowledge effort in late 1994, and building on the success of this programme, in 1997 Kent Greenes, head of knowledge management at BP, set up a team of 10 staff to create enterprise-wide awareness of the benefit of knowledge management, backed by a showcase of best practice to identify critical knowledge assets and gaps to make knowledge easily accessible via a corporate directory and distilled and packaged knowledge on the company's intranet. Greenes states, 'knowledge management is not a fad for BP it is high on the operational and strategic agenda of our company because it leads to knowledge that is reusable anywhere else in the organization at no extra cost' (Wakin, 1999, p 290).

In the literature (e.g. Desouza, 2003; Lin et al., 2005; Goldsby and Martichenko, 2005; Mazenvski and Athanassiou, 2007), where there is better knowledge management, awareness of it is often highlighted and the importance and benefits of KM and IT skills for the KM process are fully addressed, as are issues regarding what knowledge should be shared. However, the R&D centre seemed to lack awareness of the benefit of knowledge management, as the typical comment of '*what's in it for me?*' seemed to prevail. This finding seems to concur with previous research (Goh and Hooper, 2009; Zoubi, 2009).

6.2.3.3 Training

In reviewing the literature, the aim of training is to enhance the individual's abilities at all levels with regard to the use of technological support for knowledge management (Jashapara, 2004, p.150) to create processes facilitating group and organizational knowledge exchange and creation. Most of the suggested programmes ensure that the employees have up-to-date explicit knowledge in their respective areas of specialization (Nonaka, 2005, p.16).

Rob Buckman realized that informal training, intensive training and ongoing training help with the transaction at Beckman Laboratories (APQC, 1997, p.73). Some projects have showed participants how to use technology to support knowledge management and helped them to understand how it could further their work. Project leaders referred to 'coaching' rather than 'training' to emphasize that the process would be a personal interaction: a 'coach' working with players, not a trainer presenting information to a passive recipients (Davenport and Prusak, 2000, p.20).

Although training as well as 'coaching' has certain drawbacks, such as information and coordination loss arising from subsequent member turnover, it can increase members' commitment, which can have a positive impact on group performance (Griffith, 1989; Guzzo et al., 1993; Moreland, 1987; Mullen and Copper, 1994, cited in Levine and Moreland, 2005, p.250). Based on this, one might argue that lack of training on emerging technology might have had a negative influence on the commitment of the R&D staff, which was somewhat low, as shown in the SOQ results discussed in the preceding chapter.

This finding was in agreement with the work of Freck (2005), Goldsby and Martichenko (2005) and Grouard et al. (1999, cited in Goh and Hooper, 2009), in which lack of training was often cited as one of the barriers to knowledge management. This was also in agreement with the findings of Davenport (2007, p.112) that some organizations did not provide individuals with the training needed and therefore they made little use of emerging technology support for knowledge management.

Without training, any knowledge programme is dubious at best (Bengston and Lesser, 1999, p.373). Nonetheless, skills or training have been found to be of low significance to the technology support for knowledge management, given that web technology, search tools and supporting equipment were common and easy to use (Song, 2007). However, these findings about the lack of training seemed to contradict those of Wiig and Jooste (2003) and Deli and Grayson (1998), who found that most enterprises have provided employees with training to acquire the skills needed to perform and communicate knowledge activities.

6.2.3.4 Time to think

James Ballard, author of 'What's the Rush?' (1999), cited in Comeau-Kirschner and Wah (1999, p.25), states that today's working people are metaphorically running all the time. 'People are so used to always running that they lose their balance'. He goes on, 'they sort of tip forward all the time. Poised for what's next'. Ironically, he states, rather than feeling a sense of control and getting everything done, the feel like victims of time – they never have enough time to do what they want. This, says Ballard, is 'because people's attention is not in the present'.

Furthermore, Comeau-Kirschner and Wah wrote an article in the *Knowledge Management Yearbook* (2000–01) titled 'Who Has Time to Think?' In this article they argued that the corporate world was experiencing the greatest calamity of its history as millions of corporate souls suffer from a phenomenon known as 'time famine', as they did not feel they have enough of either space or time to focus on the big picture and were losing their ability to think strategically (1999, p.22). In line with this is the suggestion by Holtham et al. (2001), who highlighted that the value of the 'slow company' lies in a search for the meaning of things, not in slowness for its own sake. They go on to suggest that we all can work faster, as we all have access to the same technology, but the need lies in a search for the meaning of things, which in turn can allow us to absorb information and turn it into knowledge.

A similar view has been expressed by Linda Stone, who spent almost twenty years as an executive in high technology, including Apple Computers, before she became a Microsoft vice president in 2000. In her blog, a line reads 'I believe attention

(sustained attention) is the most powerful tool of the human spirit', which can turn ideas, information and the like into effective knowledge.

These views sum up the story of the R&D centre regarding the issue of time to think. This not to say that a healthy climate requires long stretches of time devoted to social chatter, but organizational knowledge can be developed best in the course of daily work provided that there is enough room and time for people to exchange the little stories that communicate understanding to work together and watch each other work to ask for and offer help and values (Cohen, 2007, p.245).

People at the R&D centre were 'begging' for time, as one interviewee expressed, by repeating the word 'time' three times. This would imply that the lack of time that the R&D centre experienced was an obstacle to knowledge sharing. The implication here, which appears to concur with the findings of other researchers (Miller, 2002; Soo et al., 2002; Goldsby and Martichenko, 2005; Ramirez, 2007), is that if the R&D centre does not make knowledge sharing a priority, and the time to share knowledge is not built into the employees' daily work life, it is highly likely that they will not share knowledge.

6.2.3.5 Support from senior management

Knowledge management projects, like any other type of change programme, benefit from senior management support (Davenport, 1999). It has been found that 90 per cent of the time, top management practices have an immediate impact on knowledge management activities (Frappaolo, 2006 p. 123). This was in agreement with the findings of the present study, as it appeared to suggest that the R&D centre lacked top management-level support. These findings are also in line with those of Figallo and Rhine (2002, cited in Goh and Hooper, 2009). These findings contradict the idea of Davenport (1999), who studied 31 knowledge management projects in 24 companies and found that top management support was crucial for knowledge management projects (p.103).

Furthermore, one of the lessons learned from the report by the APQC was about senior management leadership and support: that the most successful efforts were

championed by senior management (1997, p.156). For example, the types of support that were helpful in Davenport's (1999, p.103) study were:

- sending the message that knowledge management is critical to the company success;
- providing funding and other resources for infrastructure;
- clarifying what types of knowledge are most important for the company.

The support from the senior management may not need a strong personal orientation to knowledge, although this would surely help if they were themselves relatively cerebral (Davenport, 1999). Nor do managers need to control or direct the knowledge management process; instead, they can provide resources for individuals to engage in knowledge management activities (Nonaka and Nishinguchi, 2001, pp.285–86).

6.2.3.6 Trust

Building trust is 'the bedrock to enhance knowledge' and therefore sharing knowledge openly is a form of trusting (Cohen, 2007, p.245). Schoorman, Mayer and Davis (2007) argued that trust would lead to risk-taking in relationships. They suggested that trust is the 'willingness to take risks', and the level of trust is an indication of the amount of risk that one is willing to take. If there is a very strong system of controls in an organization, as in the R&D centre, where bureaucracy prevails, it will inhibit the development of trust. This is in line with the suggestion of Cohen (2007) that trust is dominated by autonomy, as it was seen that freedom was very low at the R&D centre.

Cohen argues that if freedom is granted to every worker to define his or her own work and to make decisions that affect it, the vast majority rise to the challenge by being responsible and committed (Cohen, 2007, p.246). These arguments summed up, in a way, the big picture of what the R&D lacked, and what, in turn, affected the use of IT to support knowledge management. If we look back to the SOQ measure and its findings, we find that trust, freedom and risk-taking were all low. This in turn might explain why ICT support for knowledge management is not doing well.

It was found that the lower the level of trust a person has in someone else, the less willing they will be to share knowledge with them. Hislop cites two studies (Johnson and Kalling, 2007; Van Wijk et al., 2008) in which trust has been found to significantly affect knowledge sharing, with the level of knowledge sharing typically being found to be directly related to the level of trust. Specifically, Becerra et al. (2008, cited in Hislop, 2009, p.156) found that trust was more closely related to the sharing of tacit rather than explicit knowledge. One of the main findings of Becerra et al. (2008) was that trust was related to risk-taking, as the perception of trust reduces the risk that people perceive they are taking. This is consistent with the findings of the SOQ related to trust, freedom and risk-taking, as they were all very low, which in turn is likely to have affected the use of information technology to support the knowledge management programs taking place in the R&D centre.

6.2.3.7 Changing habits (making knowledge part of daily work)

The effectiveness and value of knowledge management depends on the active participation of the R&D personnel. They need to make it a habit to contribute their knowledge (Huang, 1999, p.356). One of the lessons learned from the APQC study (1997) is that knowledge management must be embedded in the way people work (p.56). At the R&D centre, knowledge management was not part of the actual work process. As one employee put it, '*We have real work to do ... loads of work ... Knowledge is not a priority here*'. This finding concurs in part with the APQC study, which found that only two participating companies out of 27 indicated that KM was part of their actual work process (1997, p.56). At 3M, storytelling techniques were used: they trained their employees to paint stories through word pictures so their customers would see how using a 3M product could help them succeed. Stories gave workers ways to form ideas and knowledge and became a habit of mind at 3M (Shaw et al., 1999, p.233–34).

Xerox has 'succeeded in its initiatives because of the priority given to people'. They examined how social dynamics shape the pattern of knowledge sharing to create technology that reflects factors such as work habits, the perceived benefit of sharing and the context in which sharing is natural. Instead of forcing employees to either adapt or fail, 'Xerox has gone to great lengths to tailor its knowledge management

initiatives to people by understanding how they do their jobs and the social dynamics behind knowledge sharing'. In other words, they allowed workplace habits, not IT, to drive the process (Hickins, 2000). This point was also illustrated in the present study's interview data: '*changing habits is the hardest part ... it needs time*'. This reflects back on the need for time, which appears to be a problematic issue at the R&D.

6.2.3.8 Creating a good climate

Organizational climate can positively affect creativity, innovation, safety and security, as discussed in the literature (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar; 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007). This case study is an attempt to understand such an impact on information technology support for knowledge management with the help of the SOQ, which is based on Ekvall's work, originating in the 1950s, which provided the foundation for the development of the original climate questionnaire (Ekvall, 1996). When the researcher first conducted the interview sessions back in 2007, the participants seemed to use the words 'culture' and 'climate' interchangeably. It was not only my interviewees who seemed to use them interchangeably: Sveiby does the same in his 2002 study 'Collaborative Climate and Effectiveness of Knowledge Work'. For example, he uses the word 'trust' once in relation to climate, as on page 4 when he mentions a 'climate of trust' and later on the same page refers to 'a culture of trust'.

However, when the participants in the present study spotted the difference between the meanings of the two different terms 'culture' and 'climate', one interviewee said '*We thought they meant the same thing, but we now know the meaning of it and I think that's the problem – why we stand still and don't take further steps towards knowledge management*'. It was obvious from the interviews that such an organizational climate, with its nine dimensions (discussed in the preceding chapter and made clear to the participants at the time), was appreciated by almost everyone in the R&D centre and they liked the idea of climate. As one participant stated, '*One of the big players is climate. If you have a good climate, your knowledge management should be doing well*', while another said, '*"Climate" is the missing word in our organization, so how can we implement it?*'

All of which suggests that lack of good 'climate' can be a major barrier for effective knowledge management, which the R&D centre lacks in one way or another. The implication here is that climate is a very positive factor affecting the R&D centre, and ignoring it could perhaps put knowledge management and its technology support in real danger.

6.2.3.9 A dedicated R&D library

'Libraries have always been essential to knowledge management in R&D centres' (Beriner, 2006). A dedicated library can help employees to select, obtain, store and disseminate knowledge. This in turn will enable scientists within the R&D centre to acquire the knowledge necessary (ibid., 2006). Ernest (2006) argues that 'knowledge management is in the library not database'. Further, Owens et al. (2008) argue that 'People have been lulled into thinking that there are just two places where information exists: somewhere in the enterprise or on the consumer Web'. In many cases, essential insights, facts, and primary research are only available via sources that require subscriptions or license agreements (Owens et al., 2008). This view on the significance of the library reflects the attitude of the R&D participants. However, they seemed to lack a dedicated library that could help them obtain the knowledge necessary for their work and consequently help to share scientific knowledge. As one interviewee expressed it, '*how can anyone can exchange knowledge without a library?*'

A study conducted in Sweden by Nelke (1999) appears to contradict this study as in this research five out of nine organizations had a dedicated library to invest in external information. The Swedish study suggests that because many of the books, reports and the like are still only published in the form of paper, a dedicated library to capture the knowledge is needed. Although the Nelke's is ten years old, it is still valid and would suggest that a dedicated library should be seen as a gate to better knowledge sharing (Beriner, 2006; Ernest, 2006; Owens et al., 2008).

6.2.3.10 Easier access (*like Google*)

One of the lessons learned from the APQC study (1997) comes from Buckman Laboratories Inc., which demonstrated that the search engine should be as easy and user-friendly as possible. This was not the case in the R&D centre, as the search engine was somewhat cumbersome. The participants suggested a search facility that was more like Google. This is in keeping with the work of Freke (2005), in which interviewees proposed that the search facility for the server should be based on the Google search engine. Conversely, Benbya (2008) illustrated the example of Cisco, as it had easy, simple, attractive and intuitive tools, such as Google, Skype, YouTube, MySpace etc. She further suggested that Cisco implement a Google search function with far easier uploading mechanisms to encourage user acceptance and adoption of the repository.

However, although Google is a popular and highly-regarded search engine (Han et al., 2003; Liebowitz, 2008), there is still no ideal tool to handle this problem: even Google has its problems, such as a lack of visualization facilities and poor summary information (Thomas et al., 2005). This view contradicts Walsham (2002) who argues that Google has proved a remarkably effective web search engine in that it can provide a structured database of a huge number of web pages and pointers to a sense-giving effort of other people on a particular topic, in that pages can be prioritized in ways that reflect other users' judgements of their value. He further suggests Google is not foolproof in providing the best pages for a given user. It tends to filter out less valuable sense-giving effort, hence its benefit depend heavily on the deep tacit knowledge of the user.

6.2.3.11 Intellectual property (IP)

'As much as 80 percent of top-performing global companies' market capitalization is driven by intellectual assets', says Gartner IP asset management analyst Debra Logan (Edwards, 2003). Protection of knowledge is protecting assets from competitors by means such as intellectual property laws and hiding corporate knowledge in a 'black box'. Therefore, since knowledge is an important source of a firm's competitive

advantage, it must be protected. Such protection can include intellectual property rights and increasing the complexity of a product or service to make imitation by competitors difficult (Ichijō and Nonaka, 2007).

At the R&D centre intellectual property (IP) is found to be at the heart of knowledge management activities. On one hand, the knowledge residing in the personnel's heads defines how an organization functions. If it can be encoded and shared, it can greatly enhance efficiency. But on the other hand, employees see their personal knowledge as a valuable asset that will help career advancement, and they want to hang on to it. This, however, elicits a degree of conflict, which might explain why conflict was high in the R&D centre, according to the SOQ findings discussed in the preceding chapter. Conflicts between firm expediency and personal interest must be resolved if knowledge management is to work. Snowden (cited in Manchester, 2000) suggests that rather than trying to protect knowledge, you must exploit it as quickly as possible. 'You have to gain an edge by innovating, say, like Intel which sets a pace with product announcements that its rivals find hard to keep up with' (Manchester, 2000).

Many organizations have developed a variety of tools to keep up with the play and established intellectual property divisions: for example, Hewlett-Packard has engineers and lawyers working side-by-side to generate patents and licensing business (Defillippi et al., 2006, p.217). However, the laws that were devised to protect abstract concepts such as copyright and patents need to be recast in the digital age. Knowledge is central to the success of all organizations and is therefore valuable, and the question remains as to how this value might be transformed into an asset with a book value. It is even less clear how that asset might be protected, according to Manchester (2000). Similarly Albino et al. (2004) found that intellectual property is a common concern, especially for research and development (R&D) activities such as the case at hand.

In contrast to the findings of this study, DeFillippi et al. (2006) point out the effort made by Pearson to save its competitive advantage by building the skills required to manage and protect its own intellectual property as well as to challenge that of current patent (pp.215–18). The case of Sharp and its 'black box' knowledge asset, which makes the company's unique knowledge difficult to imitate, is a similar example. This

is done by using a combination of factors such as product customization, complexity and intellectual property protection. Sharp has made this the keystone of its corporate strategy (Chakravarthy et al, 2003, p.256). The implication here is that the R&D centre can learn from similar cases, and while it might struggle to solve this dilemma, it is essential if it is to succeed in its knowledge management programmes.

6.2.3.12 Concerns for managing knowledge

In this section, the researcher attempts to shed light on some cases, most of which have already been discussed. Issues of concern that emerged from the data were roughly consistent with the literature (e.g. Hasanali, 2002; Koenig 2004; Goldsby and Martichenko, 2005; Freck, 2005; Nongkran, 2005; Song, 2007; Goh and Hooper, 2009).

The number one barrier to knowledge management at the R&D centre was time. The goal of time is not to encourage people to work more hours or allocate some time to manage knowledge, but rather to work more effectively: therefore, time is pivotal to knowledge management in terms of the processes, technologies and roles that must work in harmony to save employees time (Hasanali, 2002).

These findings are consistent with numerous other studies (Cranfield University, 1998; KPMG, 1998b, cited in Alavi and Leidner, 2001; Hasanali, 2002; Koenig, 2004; Goldsby and Martichenko, 2005; Freck, 2005; Nongkran, 2005; Song 2007; Goh and Hooper 2009). However, the lack of time found in the R&D centre contravenes the point stressed by Nonaka and Takeuchi (1995) that time must be allowed for employees to engage in the processes of socialization, internalization, externalization and combination (Nonaka and Takeuchi, 1995; Dorfman, 2001; Goh and Hooper, 2009).

On the other hand, lack of training was cited as the second major barrier to knowledge management. Although my study did not differentiate between formal training (e.g. seminars, classes, conventions and private lessons) and informal training (on-the-job training received from co-workers and supervisors as the need arises), training and coaching on emerging issues and technology in its all forms, such as training between an expert and a novice where the expert knows the content and the novice asks

questions, has been found to be helpful in explicating the expert's tacit knowledge (Mukhtar, 2007; Rintala and Hyttinen, 2006; Gottschalk, 2005). This is perhaps one of the most important enablers of effective knowledge management and is of high significance in that it can ease the difficulty of trust and risk-taking and build confidence in oneself as well as encouraging a sense of challenge, involvement and commitment to the use of information technology to support knowledge management.

Neglect of training and coaching was found in a study conducted by KPMG Consulting (2000), which investigated more than 400 firms and their status in implementing knowledge management. It was reported that of the 288, 137 cases failed for a number of reasons, one of which was lack of training, which caused some cases to fail to employ effective knowledge management programmes (Koenig, 2004).

Sharing knowledge may jeopardize security, and it has been suggested that knowledge management should invest more in better and more secure technology (Goh and Hooper 2009). But surprisingly, this was the issue of least concern to the people of the R&D centre. This is inconsistent with the findings of Gottschalk (2005), who points out that some knowledge initiatives in a law firm raised issues of security and confidentiality. This might be due to the fact that there is a marked difference in nature between research and development and law firms.

User-friendly technology can encourage users to communicate knowledge. Information technology aids should be as easy to use as possible (Gottschalk, 2005; Goldsby and Martichenko, 2005), but this was not the case in the R&D centre. A further concern hindering the flow of knowledge management is the lack of freedom. This goes against the advice of Ruggles and Holtshous (1999), who suggest that knowledge workers must be managed as volunteers, not as employees, since the unskilled need the employer more than the employer needs them, and therefore giving them the freedom to develop their own standards would make the job more effective. However, this was not applicable in the R&D centre, and findings seem to concur with those of Goh and Hooper (2009), unlike the case study of Lee and Hong (2002), which presents some cases to show that freedom is appreciated as a value where people can freely express their ideas.

6.3 Concluding remarks

The current study has endeavoured to gain an insight into the role of ICT to support knowledge management with regard to organizational climate. This was accomplished by employing a mixed research method, relating the findings to the existing literature, and considering the implications of these results. The case study outcome indicates that ICT can play an enabling role in knowledge management practices providing better climate conditions are in place to promote effective use of ICT to aid knowledge management. Without due attention to the nine dimensions of climate, it is unlikely knowledge management will succeed. There follows the final chapter in this thesis, the conclusion, which summarizes and brings together the main findings and contributions, limitations and recommendations, and strengths and weakness of this study.

Chapter 7

Conclusion

7.1 Introduction

The present study was designed to determine the effect of organizational climate on ICT support for KM. The research began by identifying the background problem and setting. It then surveyed the related literature, which helped to identify the gap that this study would try to fill. It then discussed the research methodology utilized to undertake the investigation. Thereafter, the researcher proceeded to analyse the findings and discuss them in the light of existing literature. The present chapter includes a summary of the findings and a discussion of the limitations and recommendations of the study. Towards the end, some main strengths and weakness associated with the study are set out.

This chapter begins by outlining the overall findings of the study as related to its objectives, outlined in Chapter 1. The results obtained reflect on the objectives and the reviewed literature. The researcher provides a synopsis of the findings and concludes in terms of the research objectives as outlined in Chapter 4. This synopsis deliberately summarises and simplifies the quantitative and qualitative findings from earlier chapters 5 and 6. This is done in order to provide more of a narrative about the findings.

7.2 Main conclusions drawn from research findings

Neither the organizational climate nor information communication technologies were the answer to 'the 5000-year old questions surrounding knowledge. They can certainly facilitate the implementations of the knowledge processes... Still, they must be taken in context'(Ruggles, 1997: 8). Thus the study largely confirms what other commentators have suggested about the use of ICT to support knowledge management, as reported and summarized in the literature (e.g. Riege, 2005, 2007; Serenko et al., 2007) and partly confirmed what was reported by the R&D centre in 2007 (section 2.3.2.4), discussed further below). Nonetheless, this study was an

attempt to shed light on knowledge management practices and in particular the organizational climate and its impact on the use of ICT to support knowledge management.

Knowledge, as mentioned on many occasions throughout the research, is a key to gaining and sustaining potential competitive advantage. ICT can contribute as a tool which might help or hinder the implementation of knowledge management and seems in turn to be affected by the organizational climate in which these activities are taking place. To achieve the aims and objectives of this research, three research questions (RQ1, RQ2 and RQ3) were defined in Chapter 1 (see section 1.3) and three objectives (A, B and C) (see section 1.4) were outlined in connection with the research questions. The first objective of the study was:

A- to gain a better understanding of how information and communication technology support for knowledge management is influenced by organizational climate.

The corresponding research question related to this objective was:

RQ1 How is information communication technology support for knowledge management influenced by organizational climate? This question has a subsidiary question: what does the organizational climate look like?

The second objective of the study was:

B- to identify how information communication technology is used or not used within knowledge management.

The corresponding research question related to this objective was:

RQ2 How is information communication technology used or not used within knowledge management?

The third objective of the study was:

C- to ascertain ways in which knowledge management can be developed and improved from the participants' perspective.

The corresponding research question related to this objective was:

RQ3 How can knowledge management be developed and improved?

In the following three sub-sections the research questions corresponding to the three objectives of the study are answered explicitly.

7.2 1 Objective A and research question 1

This study is distinctive because it uses an organizational climate instrument (the Situational Outlook Questionnaire, SOQ) to examine the organizational climate within the R&D centre in which ICTs were used to support knowledge management activities. As discussed in 3.4.1, organizational climate as an intervening variable can affect individual and organizational performance due to its modifying effect on organizational and psychological processes. The climate also can be influenced by many factors but of all the things that have an effect on climate, leadership behaviour, both formal and informal, is the most important (Isaksen and Akkermans, 2007). However, this study did not look into this matter further. Other factors in the organization such as resources and technology can also impact the feeling and attitudes of people in the R&D centre by either facilitating or inhibiting appropriate behaviours. A lack of key resources can often frustrate and provide barriers to knowledge management activities (Ekvall, 1996; Isaksen, et al., 2001).

In this study, the organizational climate with its nine dimensions, namely Challenge and involvement, Freedom, Trust/openness, Idea time, Playfulness/humour, Conflict, Idea support, Debate, and Risk-taking, were found to be of importance as perceived by the participants of the study. As illustrated in the preceding Chapter 6, explanations of potential causes pertaining to these dimensions are based on the literature of organizational climate (Isaksen and Akkermans, 2007). These likely behaviours were also based on my own interpretation and judgement since, as illustrated in 2.3, I 'earned their trust' to a certain extent. This perhaps gave me

greater awareness of this particular site with regard to knowledge management practices, as did access to an internal report about knowledge management programmes within the R&D centre that helped enlighten my understanding of the topic under scrutiny. Again, as previously described in 4.3.7.2, Stake points out '[a] case study is subjective, relying heavily on our previous experience and our sense of worth of things. Our interpretive and our descriptive report is laced with and followed by interpretation, but we offer ours too ... Yet no amount of caring for the case will assure its worth' (Stake, 1999, pp.134–36).

The study found that (a) two-thirds of the employees believed there was not significant knowledge sharing (see sections 5.4 and 6.2.3) and (b) the 'knowledge' contained in emails was estimated to amount to 80 per cent of the communicated 'knowledge' within the R&D centre (see sections 5.3.5.3 and 6.2.2.3.1), indicating an extensive use of email, correspondence which usually acts as a conduit for 'low level' knowledge (Robertson et al., 2001). Support for these findings came in the internal report (2007), which identified the following reasons for not sharing knowledge (see section 2.3.2.4):

- knowledge was not relevant or not current;
- cultural barriers were identified as the maker or breaker of any knowledge management improvement efforts;
- lack of management support;
- lack of training and awareness;
- technological barriers – tools were scattered and not easy to use;
- lack of clear written procedures;
- lack of trust;
- lack of acceptance of honest mistakes;
- lack of recognition of knowledge sharing.

The SOQ outcome shows that the prevailing atmosphere within the R&D organization was, to a degree, hindering the use of information communication technology support for knowledge management (see sections 5.2 and 6.2.1). The result of this investigation shows that idea support, debate and idea time scored higher than in

innovative organizations. These factors failed to help the utilization of ICT to support knowledge management, as evidenced by two-thirds of the employees estimating that there was not significant knowledge sharing.

While these factors may appear to be positive, the contrary might also be the case. For example, idea support suggests that there were many ideas to evaluate (see sections 5.2.10 and 6.2.1.7) and much time to explore them in (see sections 5.2.7 and 6.2.1.4). That would in turn indicate that there was more talk than implementation (see sections 5.2.11 and 6.2.1.8). Such talk can cause conflict, which was found to be the case (see sections 5.2.9 and 6.2.1.6). The prevailing conflict climate that characterized the atmosphere in the R&D centre was a factor hindering knowledge management. Conflict, on the other hand, affected the degree of challenge and involvement (commitment), and much conflict rendered people apathetic and uninterested in the development of knowledge management.

The relevance of what might be called 'absence of trust' was clearly supported by the current findings, which suggest that people tend to avoid getting feedback on new ideas (see section 5.2.6), fearing awkward outcomes or that their ideas might not be protected (see section 6.2.1.3). Trust as a pivotal factor in effective knowledge management (Shaw, 1997; Cohen, 2007; McInerney and Day, 2007) was pretty low, which would indicate that suspicion was rife. Furthermore, trust was also found to affect both risk-taking (see sections 5.2.12 and 6.2.1.9) and freedom to take initiative (see sections 5.2.5 and 6.2.1.2), as the scores for these dimensions were fairly low.

When risk-taking is low, as in the case of the R&D centre, people offer few new ideas. Based on this result, attitude to risk would mean that employees had little control over their jobs, since bureaucracy prevailed in the R&D centre. Within such a climate people did not seem to have the fun that is needed for creation of knowledge; playfulness and humour might potentially help in the sharing of tacit knowledge.

Moving on, the qualitative study brings out that one-third said there was significant knowledge sharing and this was conducted regularly (see sections 5.3.2 and 6.2.1). Surprisingly enough, trust and conflict had identical scores of 82% (17 people interviewed in 2008). Also, the remaining seven dimensions seemed to work well

with the exception of idea time, which showed only 23% had 'time to think about knowledge management'. For those one-third, trust scored very high (82%) and, as discussed earlier, this seems to positively affect both risk-taking and freedom. This was also the case in the qualitative study.

In such a high-trust climate, relationships seemed to be very strong. (I found the same groups congregated together physically most of the time when conducting my fieldwork both in 2007 and 2008.) Ninety-nine per cent believed that these relationships somewhat inclined people to take risks, even when the outcomes were unknown (see section 5.3.2.9). In too high a risk-taking environment, people were resultantly confused because of the circulation of too many ideas. This is supported by the SOQ (idea support was high, see section 5.2.10) and also by the qualitative data. This strong relationship might be the reason why knowledge sharing was taking place despite the ICT barriers that were identified by the participants. This brings to mind what was discussed in section 3.3, that 'knowledge can only be surrendered voluntarily, and that many organisations stress the significance of viewing knowledge management in human brains', not in technologies (APQC, 1997, p.71). Nonetheless, this claim needs further investigation.

On the other hand, climate can influence and be influenced by many factors such as resources and technologies, as illustrated earlier: resources such as people, processes, and technology (see section 3.4.1). For example people's values and beliefs (culture barrier, as shown in the report above) may also be the reason why some people did not share knowledge. Although the study was not concerned with culture or ethnicity but climate, the R&D was composed of a number of different ethnic background groups. The differences in values and beliefs impacted on the sharing of knowledge. Foremost among these differences was the variable proficiency with regards to the use of a common language (mother tongue barrier, see section 3.3.2.1; Riege, 2005, 2007; Serenko et al., 2007). Intellectual property (IP) was of concern to people in the R&D due to fear of not receiving just recognition and accreditation from managers and colleagues (see sections 5.4.11 and 6.2.3.11; Riege, 2005, 2007; Serenko et al., 2007).

The lack of resources and technologies that was revealed by means of the qualitative method that are listed below:

- lack of time to think of knowledge (see sections 5.4.4 and 6.2.3.4),
- lack of training (sections 5.4.3 and 6.2.3.3),
- lack of support from top management (sections 5.4.5 and 6.2.3.5),
- lack of habits to enhance knowledge (sections 5.4.7 and 6.2.3.7),
- lack of good climate (sections 5.4.8 and 6.2.3.8),
- lack of user-friendly technology (sections 5.4.10 and 6.2.3.10), and
- lack of intellectual property protection (sections 5.4.11 and 6.2.3.11)

These will be discussed later. In the R&D these difficulties could affect the attitude of people in question towards the climate they worked in, and hence could frustrate and provide barriers to the capacity of ICTs to support knowledge management.

7.2.2 Objective B and research question 2

Much of the recent literature on knowledge management is sceptical about the contribution of ICT (e.g. Mintzberg, 1994); however, the study found that the employees of the R&D centre perceived information communication technology as essential, which was an encouraging enabler of many knowledge management activities (see sections 5.3.3 and 6.2.2.1). However, the leveraging of knowledge through the use of ICTs was somewhat hard to achieve (e.g. McDermott, 1999; Walsham, 2002; Huysman and Wulf, 2006).

Participants consequently strongly believed that ICT should be considered only as a vehicle and that equal importance should be given to the three major components: people, process and technology (e.g. Butler and Murphy, 2007; Edwards, 2009). This study found that the main method used to carry out knowledge management activities in the R&D was face-to-face interaction (with ICT support as the primary social resource). This finding suggests that, once this was established, ICTs could then enhance their ongoing knowledge activities (e.g. Swan et al., 1999; Loos, 2008).

The study shows that the most prolific tools were email, telephone and ShareK (see sections 5.3.4 and 6.2.2.2). Surprisingly, email was said to contain almost 80% of the communicated knowledge at the R&D centre. This proportion would suggest that the knowledge stored in this tool was of a low level and explicit in nature (Zuboff, 1988,

cited in Mutch, 2008; Robertson et al., 2001). This was further supported by the finding that only 6% of respondents indicated that they would prefer the use of ICTs alone. Similarly, the literature shows that in the knowledge management 'best practices' conducted by the APQC (2000, p.34), tacit knowledge was best shared through people, not machines (as is the case for explicit knowledge). According to APQC, 'the more tacit the knowledge, the less high-tech the solution'. Further evidence from this study suggests email or telephone may be used primarily to verify information (e.g. Allen and Henn, 2007), which would suggest that face-to-face interaction is apparently the main source for tacit knowledge.

It would appear from the interviewees that the 'ShareK' tool was the main resource for the knowledge used on a daily basis (see sections 5.3.4.2.1 and 6.2.2.3.1). This seems to be the case, since ShareK linked email to the knowledge base by forwarding emails from Outlook directly into the community of practice. Furthermore, ShareK was a collaborative development of Microsoft and the R&D centre; it represented a customized version of MS SharePoint 2007™, and was tailored specifically for the requirements of the R&D. Although ShareK was designed to be an all-inclusive technological medium, or as one interviewee named it, a 'one-stop technology solution', nonetheless this study has shown that the current situation at the R&D centre seems to suggest that technologies were scattered, amplifying the difficulty of accessing knowledge and the time to do so. This was apparently due to the lack of good search engine capability: in other words, lack of easy access and user-friendly resources (in parallel with the report mentioned earlier). The case of the R&D centre seems to suggest that people had to sift through a great deal of information in order to fuel knowledge. In the literature (e.g. O'Dell, 2000), it is emphasized that ICT has 'got to be good and easy to use'; however, since knowledge is in people's heads, (e.g. McDermott 1999; Davenport and Prusak, 2000; Nonaka, 2001; Walsham, 2002) the behavioural aspects that constitute the climate or atmosphere are more important than its architecture (APQC, 2000, p.33).

7.2.3 Objective C and research question 3

This study has shifted the focus from what many studies appear to investigate, that is, what barriers exist to knowledge management implementation. Of course, such research is amply justified, but the current study took another approach to explore the development and improvements as perceived from the perspective of the people involved in this research (see sections 5.4 and 6.2.3). Nonetheless, many of the recommendations were much the same as in the extant literature (e.g. as reported in Riege, 2005, 2007; Serenko et al., 2007). For example, a key issue in the success of knowledge management is its dependence on people's willingness. It is gaining people's hearts and minds and instilling a willingness to share knowledge that tends to present such a challenge for the R&D centre. This brings to mind the comment made by a Pacific Bell manager, cited in Davenport (1997, p.83), that '*We have spent a great deal of time and money bringing water to the horse, but we don't even know if he's thirsty, and we have no idea how to get him to drink*'. This was very much what the researcher found.

The common question of '*what's in it for us?*' was heard unprompted all too frequently from the employees of the R&D centre (see sections 5.4.2 and 6.2.3.2). Answering such a question is critical for any KM implementation. They might know why the R&D needs knowledge management, but in many respects they might be unable to answer how KM will support their work as individuals (e.g. McGovern, 2002; Efimova, 2003; Kerbs, 2009).

The study has found that willingness had a strong correlation to trust (see sections 5.4.2 and 6.2.3.2); where trust was low, so was willingness (e.g. Davenport and Prusak, 1998, p.143; Fisher and Fisher, 1999, p.356; Cohen, 2007). The study found that awareness of the importance of knowledge management was not sufficient. Awareness of the value of knowledge management is of crucial importance to its successful implementation (e.g. Desouza, 2003; Lin et al., 2005; Goldsby and Martichenko, 2005; Mazenvski and Athanassiou, 2007; Allen and Henn, 2007). However, results showed that people were somewhat indifferent to the concept of knowledge management.

The results stress the need for training (see sections 5.4.3 and 6.2.3.3). In order to enhance the individual's abilities to share knowledge with regard to the use of ICTs, there is a need for training on how to use them (Griffith, 1989; Guzzo et al., 1993; Moreland, 1987; Mullen and Copper, 1994, cited in Levine and Moreland, 2005; Jashapara, 2004; Nonaka, 2005). According to Nonaka (2005) most knowledge management programmes ensure that the employees have up-to-date, explicit expert knowledge in their respective areas of specialization, this was not the case at the R&D centre, as training was cited as one of the biggest barriers to the implementation of knowledge management through the use of ICTs. To create processes facilitating group and organizational exchange and creation of knowledge, training is of central importance.

One of the reasons the R&D people proffered for not sharing knowledge was that they were too busy with 'real work' and suffered from what is called 'time famine' (Comeau-Kirschner and Wah 1999; Holtham et al., 2001). However, from the organization's viewpoint, knowledge needs to be recognized as 'real work', so that organizational knowledge can be developed in the course of daily work (e.g. Riege, 2005, 2007; Serenko et al., 2007).

The study also found that leadership was perceived to be of importance to the implementation of knowledge management (see sections 5.4.5 and 6.2.3.5; APQC, 1997; Davenport, 1999; Nonaka and Nishinguchi, 2001; Frappaolo, 2006). In other words, 'nobody likes to be told to change their behaviour by someone who does not exhibit identikit behaviour' (Robertson, 2005).

Trust, 'the bedrock to enhancing knowledge' (Johnson and Kalling, 2007; Van Wijk et al., 2008, cited in Hislop 2009; Cohen, 2007; Schoorman, Mayer and Davis, 2007), and a key to creating greater commitment to the organization (Puusa and Tolvanen, 2006), was, however, missing (see sections 5.4.6 and 6.2.3.6).

The literature suggests that trust includes the 'willingness to take risks' (see section 6.2.3.6); if there is a very strong system of controls in an organization, as was the case in the R&D centre, where bureaucracy prevails, this might inhibit the development of

trust (Isaksen and Akermans, 2007). Willingness to share knowledge is also affected by the degree of freedom (Adam, 1998), which to some extent was absent too.

The study emphasizes that the success and value of knowledge management requires a change in the habits of the R&D personnel (see section 6.2.3.7). Aristotle (384–322 BC) once said, 'We are what we repeatedly do. Excellence, then, is not an act, but a habit ... It is easy to perform a good action, but not easy to acquire a settled habit of performing such actions'. Or, as Johann Wolfgang von Goethe (1749–1832) put it: 'Knowledge is not enough, it must be used; will is not enough, we also must act'.

At the R&D centre, people did not seem to regard the sharing of explicit knowledge as 'real work', let alone as a habit. It appeared that KM was not an integral part of their daily jobs. 'The effectiveness of knowledge management must be encouraged to be embedded in the way people work' (e.g. APQC, 1997; Huang, 1999; Shaw et al., 1999; Hickins, 2000), and also incorporated into performance appraisal processes, which will lay the foundation for a real knowledge climate as perceived by the participants.

The study also found that climate is of crucial importance for knowledge management (see sections 5.4.8 and 6.2.3.8). Organizational climate (e.g. Amabile et al., 1996; Oldham, 2003; Tesluk et al., 1997, in Hunter et al., 2005; Hunter et al., 2007; Isaksen et al., 2001; Bakkar; 2003; Parrish, 2004; Isaksen and Akkermans, 2007; Isaksen and Ekvall, 2007), with its nine dimensions, has been found to be a key factor in helping organizations to manage knowledge. It can, however, be an enabler or a barrier, a maker or breaker for the use of ICT support for knowledge management.

Easy access to ICTs can enhance the use of knowledge management, according to the interviewees (see sections 5.4.10 and 6.2.3.10). Easy access might not be anticipated when implementing knowledge management programmes within the R&D, but what was apparently anticipated was that 'if we build it they will come' (Markus, 1994). It is critical to build such a system in a way that it is integrated with how people actually work, and closely aligned with their needs; otherwise, even with the best technology, one will end up right back at square one (e.g. Robertson, 2005).

As the research shows, however, ICT has to be simple and easy to use. 'Best practices', as identified by the extensive study conducted by the APQC (2000, p.34), show that the more 'valuable' the knowledge, the less sophisticated the technology that supports it: 'databases and data mining tools are, for example, high on the technological sophistication scale, as they contain data; in contrast, help desks equipped with nothing more than humans and telephones are low-tech but offer high knowledge value'.

The literature (e.g. Manchester, 2000; Edwards, 2003; Albino et al., 2004; Ichijō and Nonaka, 2007) places great emphasis on the importance of intellectual property (IP), which was also a concern for the participants from the R&D centre (see sections 5.4.11 and 6.2.3.11). These people saw their personal knowledge as a valuable asset that was helping their career advancement and they wanted to hang on to it. In other words, if not protected, knowledge will not be shared. Many of the concerns about managing knowledge were of different importance to the participants.

The most obvious finding to emerge concerned the time to manage knowledge (see sections 5.4.4, 5.4.12, 6.2.3.4 and 6.2.3.12). This has also been observed by very many studies (e.g. Nonaka and Takeuchi, 1995; Dorfman, 2001; Goh and Hooper, 2009; Alavi and Leidner, 2001; Koenig, 2004; Hasanali, 2002). Lack of time dedicated to managing knowledge is one of the biggest impediments to KM. To work more effectively, therefore, time is pivotal to knowledge management in terms of the processes, technologies and roles that must work in harmony to save employees' time with the help of training (Hasanali, 2002). Equally important is the trust and openness shared between employees. This can form the foundation for open communication, retention and motivation (e.g. Isaksen and Akkermans, 2007).

7.3 Main contributions of the research

This study has gone some way towards enhancing our understanding of the importance of the impact of organizational climate on information communication technology support for knowledge management. The quantitative SOQ survey method used to diagnose the climate enabled the researcher to gain an overall picture of the organization under study. This helped him, when interpreting the results, to lean

towards the SOQ outcomes as more precise and accurate in assessing this particular issue. Taken together, these findings suggest a role for organizational climate in promoting or hindering the use of ICT support for knowledge management.

Although the current study was not comparative in nature, its findings add materials to our understanding that knowledge management practices in Saudi Arabia, as part of the Arab world, are to some extent no different from the Western experience. However, the researcher hopes that this study will increase and contribute to the awareness of the case of the R&D, towards the benefits of facilitating knowledge management via climate. The case study and the survey tool (the SOQ) both are potentially useful additions to theory. The findings of this study will make a contribution to knowledge management theory concerning the impact of organizational climate on ICT support for knowledge management, as this aspect has received little discussion to date.

All in all, this study has (a) paved the way to provide a broader perspective on the ways in which ICTs can be used in support of knowledge management, which can be affected by the organizational climate; (b) investigated nine dimensions relating to climate that have not previously been applied in relation to creativity, innovation, safety or security; (c) clarified the role of ICTs in the support of knowledge management as both an enabler and a facilitator; (d) identified the areas where technologies are available and/or need improvements to support knowledge management; and (d) identified critical success factors for improving and developing knowledge management practices and activities. The successful implementation of knowledge management requires careful attention to all of the above factors: organizational climate, ICTs and knowledge management.

7.4 Main implications for practice

The literature (e.g. McDermott 1999; Hendriks, 2001; Walsham, 2001) has suggested that successful use of ICTs to support knowledge management 'is anything but an easy task' nor is it 'as simple as adopting a product or group of products'. An implication of these findings is that organizational climate has its influences on knowledge management activities either as a maker or breaker. The complexity of

knowledge management cannot be undermined by the processes of ICTs. In other words, ICT is necessary but not sufficient to make the use of knowledge happen (e.g. Davenport, Long and Beers, 1999). Davenport uses the 'stay under one third of resources' litmus test to ensure that IT does not become the be-all and end-all (O'Dell, 2000, p.33).

Within the R&D centre, knowledge management situations were identified, as well as the participation of ICTs that supported knowledge management. If knowledge management is to be effective and efficient within an organization, the organizational climate with its nine dimensions should be taken into consideration; these dimensions are of crucial importance to the implementation of knowledge management. Within the R&D centre, there exist a number of supportive factors, such as idea time, challenge and involvement and debate. On the other hand, there also exist non-supportive factors such as lack of trust, freedom and risk taking. Moreover, conflict was relatively high, which in turn jeopardized the knowledge management project. These findings would suggest that the R&D centre should build upon its strengths for the future development of the use of ICT to support KM. Equally, there is a need for improvements in the areas that demonstrate weakness.

For example, to remedy the lack of trust (an important component in the practice of KM), there is a need for (a) promoting a sense of community and process to resolve tensions related to the protection of ideas; (b) developing a formal recognition process; and (c) doing justice to all employees. Equally, freedom needs to be improved through (a) elimination of bureaucratic practice; (b) explaining the goals of process procedures; and (c) making clear the need for individuals' initiative. Risk-taking can be enhanced by (a) giving sufficient training, feedback and coaching needed to use ICTs; (b) encouraging people to put forward ideas that would improve the use of ICTs to support KM; (c) developing a plan for the treatment of ideas; (d) allowing dedicated time during the working day, separate from daily tasks, so that employees can test ideas; and (e) providing training and activities that are needed for knowledge management (Isaksen and Akkermans, 2007).

7.5 Limitations and recommendations of the research

This research, like any other study, has a number of limitations, but nonetheless has certain strengths. The following limitations are acknowledged:

- This research was based on a single case study and was limited by the extent to which the company under investigation provided a satisfactory amount of information for the case study. 'Single or a few cases are a poor representation of a population of cases and questionable grounds for advancing grand generalisations' (Stake, 2002, p.448). Therefore a multiple case study is required when it becomes available, as the R&D centre was the only case that implemented knowledge management in the located area at the time when the data collection was carried out (2007).
- The SOQ utilized by this study is a commercial analytical tool which requires funding and this is likely to limit its use in academic research.
- Since the current study did not use an existing theoretical framework, the thematic analysis employed in it has limited interpretative power beyond mere description (Braun and Clarke, 2006). This may result in a lack of transparency due to a failure to distinguish between 'data-driven' or 'theory-driven' approaches (Dixon-Woods et al., 2005, cited in Thomas and Hardin, 2007).
- The scope of this study focused solely on knowledge management as a whole without considering much of the typology of knowledge management, tacit and explicit. The idea was to get the 'overall picture' of knowledge building and sharing behaviour without restricting the research to some taxonomy of knowledge management. There is therefore considerable scope for a detailed study to understand what type of knowledge is mostly shared and managed within the R&D and why.
- Although the study took place in the R&D centre, it did not concern the R&D centre as a special case in itself, but treated it as a normal case. Therefore, there remains considerable scope for further research into the R&D centre as a special case.
- A stratified purposeful sampling technique (Patton, 2002) was employed to identify potential interviewees and to ensure that wide ranges of viewpoints in

the organisation were explored. Because sample members are not selected from a sample frame, this type of sample is subject to numerous biases. This was also the case for the questionnaires. Therefore, there is considerable scope for further study to confirm the findings and increase the credibility of the outcome.

- Some literature specific to knowledge management has not been examined, given the great volume of published work in this field.
- It is important to acknowledge that the subject of knowledge itself has been viewed from many perspectives for thousands of years. As a result, there is little possibility that a single-case study can be expected to answer broad questions concerning the nature of knowledge and its management (Villalba, 2006).

Despite the weaknesses outlined above, this study has raised important questions for further exploration.

7.6 Main strengths and weaknesses

This research, as described in section 3.4.1.1, employed the Situational Outlook Questionnaire (SOQ) to examine the organizational climate in which information communication technologies are employed to manage knowledge. To the best of the researcher's knowledge, and also according to the SOQ representative in the UK, this is the first time the SOQ has been used in relation to the employment of ICTs to support KM.

The SOQ assessment has been utilized by over 100 organizations, many of which are Fortune 500 companies (Isaksen et al., 2007; Isaksen and Akkermans, 2007). The diagnosis of the organizational climate conducted by the SOQ helped provide an overview of the climate. This in turn helped the researcher to capture the daily activities of the employees with regard to knowledge management under a certain organizational climate.

The fact that the study had access to a respected company in Saudi Arabia adds credence to the findings. The researcher also mostly accessed key informants in terms

of the interviewees' seniority, qualifications and years of experience. However, the research underwent some challenges regarding access to documentation and databases beyond what was revealed by the coordinator and what was afforded with regard to the internal report as discussed in section 2.3, which was considered confidential. It was nonetheless helpful to enhance my understanding of the case organization.

The data gathered during the questionnaires were without demographic information. This was deliberate, since it was believed that requesting personal information would affect the input – the researcher wanted the respondents to fill in the questionnaire freely. However, had the researcher gathered voluntary demographic data, he would have been able to provide a more detailed picture of the demographic situation. Also, the data gathered during the interviews were somewhat sensitive; therefore, the research could not use some of the material due to a previously signed non-disclosure agreement. Considering the extensive topic researched, there is some literature specific to knowledge management that has not been examined, given the great volume of published work in this field.

7.7 Final note

Due to practical constraints, this study cannot provide a comprehensive review of the topic concerned, but rather sets out to pave the way and hopes to shed light on a subject of crucial importance, which has received little attention from researchers, at least in the Arab world and particularly in Saudi Arabia. Furthermore, the concept of knowledge management is still a relatively new field of study and experience in Saudi. Hence there remains the potential for researchers and practitioners alike to explore more fully the broader issues of knowledge management practices in Saudi Arabia, a country which, as we saw in section 2.2, can arguably be described as 'an ultraconservative part of the world'

References

Alavi, M. & Leidner, D. E. (1999) Knowledge management systems: Issues, challenges, and benefits. *Communications of the AIS, 1*(7), 1-27.

Alavi, M. & Leidner, D. (2001) Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107-136.

Alavi, M., Kayworth, T. & Leidner, D. (2005/6) An Empirical Examination of the Influence of Organizational Culture on Knowledge Management. *Journal of Management Information Systems, 22*(3), 191-224.

Albino, V., Carbonara, N., Messeni Petruzzelli, A. (2007) Proximity as a communication resource for competitiveness: a rationale for technology clusters. *International Journal of Learning and Intellectual Capital, 4*(4), 430-452.

Al-Gharbi, K. N. & Naqvi, S. J. (2008) The use of Intranet by Omani organizations in knowledge management. *International Journal of Education and Development using ICT, 4*(1).

Al-Hawari, M. & Hasan, H. (2002) Evaluating the knowledge assets of innovative companies. *Australian Journal of Information Systems, 10*(1), 88-99.

Allen, T. J. & Henn, G. W. (2007) *The Organization and Architecture of Innovation: Managing the Flow of Technology*. New York: Elsevier.

Al-Shoaibi, A. (1998) The Impact of Information Technology on Organisations: The case of Saudi Private Sector, Unpublished Ph.D. Thesis, University of St Andrews.

Alvesson, M. & Kärreman, D. (2001) Odd couple: making sense of the curious concept of knowledge management, *Journal of Management Studies, 38*(7), 995-1018.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J. & Herron, M. (1996) Assessing the work environment for creativity. *Academy of Management Journal, 39*(5), 1154-1184.

Amaratunga, D. & Baldry, D. (2001) Case study methodology as a means of theory building: performance measurement in facilities management organisations. *Work Study, 50*(3), 95-104.

APQC (1997) Using information technology to support knowledge management. Consortium benchmarking study. Best-practice report. Houston.

Armstrong, K. (2005) The label of Catholic terror was never used about the IRA, *The Guardian*, Monday 11 July 2005 00.03 BST. Accessed on 20 December 2009 http://www.guardian.co.uk/politics/2005/jul/11/northernireland.july7

Armstrong, K. (2006) *Muhammad: A Prophet for Our Time*. Eminent Lives.

Aronson, J. (1994) A pragmatic view of thematic analysis. *Qualitative Report* 2,1.

Attewell, P. and Rule, J. (1984) Computing and organizations: what we know and what we don't know. *Communications of the ACM, 27*(12), 1184-1192.

Babbie, E. R. (2004) *The basics of social research* (3rd ed.). Australia: Thomson Wadsworth.

Bakkar, A. (2003) Creativity-enhancement in media organizations: a study of the perception of journalists and media managers in Saudi Arabia. PhD thesis, Oklahoma University.

BBC News, Thursday, 24 September 2009 17:16 UK, G20: Economic summit snapshot. Available at http://news.bbc.co.uk/2/hi/in_depth/business/2009/g20/7897719.stm.

BBC News, Friday, 20 November 2009. UK couple kidnapped by Somali pirates fear for lives. Available at http://news.bbc.co.uk/2/hi/uk_news/england/kent/8371446.stm.

Benbasat, I., Goldstein, D. & Mead, M. (1987) The Use of Case Research in Studies of Information Systems. *MIS Quarterly, 11*, 368-386.

Benbya, H. (2008). *Knowledge management systems implementation: Lessons from Silicon Valley*. Oxford: Chandos.

Bertels, T. & Savage, C. M. (1999) A Research Agenda for the Knowledge Era: The Tough Questions. *Knowledge and Process Management, 6*(4), 205-212.

Bhatt, G. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques and people. *Journal of Knowledge Management, 5*(1), 68-75.

Blackmon, K. & Maylor, H. (2005) *Researching Business and Management: A Roadmap For Success*. Palgrave Macmillan.

Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage.

Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77-101.

Brazelton, J. & Gorry, G. A. (2003) Creating a knowledge-sharing community: if you build it, will they come? *Communications of the ACM, 46*, 23-25.

Breiner, D. A. (2005) Knowledge Management at Cytec Industries: Building the Library of the Future. American Chemical Society Meeting, August 28, 2005.

Brown, J. S., Denning, S., Groh, K. & Prusak, L. (2005) *Storytelling in organisations: why storytelling is transforming the 21st century organisations and management*. Oxford: Butterworth-Heinemann.

Brown, J. S. & Duguid, P. (2000). Balancing act: how to capture knowledge without killing it. *Harvard Business Review, 78*(3), 73-80.

Brown, J. S. & Duguid, P. (2001) Knowledge and Organization: A Social-Practice Perspective. *Organization Science, 12*(2).

Brown, J. S. & Duguid, P. (2002) *The social life of information*. Boston: Harvard Business School Press.

Brown, L. (2004) *The First & Final Commandment: A Search for Truth in Revelation Within the Abrahamic Religion*.

Bryman, A. (2004) *Social Research Methods* .Oxford University Press.

Bryman, A. (2008) *Social Research Methods. (3rd ed)*.Oxford University Press.

Bryman, A. and Bell, E.(2007) *Business Research Methods*. Oxford University Press.

Bryman, A. and Cramer, D.(2005) *Quantitative Data Analysis with SPSS 12 and 13: A Guide for Social Scientists*.Routledge.

Buckman, R. H. (1998) Knowledge sharing at Buckman Labs. *Journal of Business Strategy, 19*, 11-15.

Butler, T., Feller, J., Pope, A., Barry, P. and Murphy, C. (2004) 'Promoting Knowledge Sharing in Government and Non-Government Organizations Using Open Source Software: The pKADS Story', *Electronic Journal of E-Government*, 2, 2, 81-94.

Butler, T. & Murphy, C. (2007) Understanding the design of information technologies for knowledge management in organisations: a pragmatic perspective. *Information Systems Journal, 17*(2), 143-163.

Calabrese, A. (2004) The Evaluation of Quality of Organizational Communications: A Quantitative Model. *Knowledge and Process Management, 11*(1), 47-67.

Carr , N.G.(2004) *Does It Matter?: Information Technology and the Corrosion of Competitive Advantage.* Harvard Business School Press. Boston.

Cavaye, A. L. M. (1996) Case study research: a multi-faceted research approach for IS. *Information Systems Journal, 6*, 227-242.

Chakravarthy, B., McEvily, S., Doz, Y. & Rau, D. (2003). 'Knowledge Management and Competitive Advantage.' In Easterby-Smith, M. and M. A. Lyles, editors, *The Blackwell Handbook of Organizational Learning and Knowledge Management.* Oxford: Blackwell Publishing (205-323).

Chang-Albitres C.M, and Krugler P.E.(2005) *A Summary of Knowledge Management Information Gathered from Literature, Web Sites, and State Departments of Transportation.* Research Report. 0-4505-P1. Texas Transportation Institute, College Station.

Chow, W.S. & Chan, L.S. (2008) Social network, social trust and shared goals in organizational knowledge. *Information and Management, 45*, 458-465.

Cloete, M. & Snyman, R. (2003) The enterprise portal – is it knowledge management? *Aslib Proceedings, 55*(4).

Coffey, C. and Atkinson, P. 1996. *Making Sense of Qualitative Data.* Sage Publications. Thousand Oaks.

Cohen, D. (2007) 'Enhancing social capital for knowledge effectiveness'. In: Ichijo, K. & Nonaka, I. (Eds.) *Knowledge creation and management.* New York: Oxford University Press (240-253).

Comeau-Kirschner, C. & Wah, L. (2000) 'Who has time to think?' In Cortada, J. and J. Woods (eds.), *The Knowledge Management Yearbook, 2000-2001.* Butterworth-Heinemann.

Cook, J., Hunt, C., McCullor & Szymanski, A. (2003) 'An Organizational Approach to Knowledge Sharing'. In Khosrowpour, M. *Information Technology and Organizations: Trends, Issues, Challenges and Solutions.* Idea Group Inc.

Cooper, A. S. (2008) Showdown at Doha: The Secret Oil Deal That Helped Sink the Shah of Iran. *Middle East Journal, 62*(4), 567-591.

Creswell, J. (2008) *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed). Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2009) Research Design: *Qualitative, Quantitative, and Mixed Methods Approaches* (3rd ed). Los Angeles: Sage.

Dalkir, K. (2005) *Knowledge management in theory and practice.* Elsevier Inc.

Daniels , N.C (1994) *Information Technology The Management Challenge*, Pearson Higher Education, Addison-Wesley.

Darke, P., Shanks, G. & Broadbent, M. (1998). Successfully completing case study research: combining rigour, relevance and pragmatism. *Information Systems Journal, 8*, 279-289.

Davenport , T.H, (2005) *Thinking for a Living: How to Get Better Performance and Results from Knowledge Workers*, Harvard Business Press.

Davenport, T. H., De Long, D. W. & Beers, M. C. (1999) 'Successful knowledge management projects'. In Cortada, J. W. & J. A. Woods (Eds.), *The knowledge management yearbook, 1999-2000.* Boston: Butterworth-Heinemann (89-107).

Davenport, T. H. & Prusak, L. (1998). *Working Knowledge: How Organizations Manage What They Know.* Boston, MA: Harvard Business School Press.

Davenport, T. & Prusak, L. (2000) *The Pragmatics of Knowledge Management. Working Knowledge: How Organisations Manage What They Know.* Harvard Business School Press.

Davenport. T. H. & Prusak, L. (2000) *Working Knowledge: How Organizations Manage What They Know.* Paperback edition. Boston: Harvard Business School Press.

Day, J. (2007) Systems Engineering Practice Lectures. *Creating Manageability, 20* September, University of Cape Town, Cape Town.

DeFillipi, R. J., Arthur, M. B. & Lindsay, V. J. (2006) *Knowledge at Work: Creative Collaboration in the Global Economy.* Blackwell Publishing.

De Long, D. W. & Fahey, L. (2000) Diagnosing cultural barriers to knowledge management. *Academy of Management Executive, 14*(4), 113-27.

De Long, D. & Seemann, P. (2000) Confronting conceptual confusion and conflict in knowledge management, *Organizational Dynamics, 29*(1), 33-44.

Delong-Bas, N. J. (2004) *Wahhabi Islam: From Revival and Reform to Global Jihad.* Oxford University Press.

Denison, D. R. (1996) What is the difference between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars, *Academy of Management Review, 21*, 619-54.

Denscombe, M. (2007) *The good research guide for small-scale social research projects* (3rd ed). Maidenhead: Open University Press.

Desouza, K. C. (2003) Barriers to Effective Use of Knowledge Management Systems in Software Engineering. *Communication Of The ACM, 46*(1), 99-101.

Detlor B. (2000) The corporate portal as information infrastructure: towards a framework for portal design. *International Journal of Information Management, 20*(2), 91-101.

Dias, C. (2001) Corporate portals: A literature review of a new concept in information management. *International Journal of Information Management, 21*, 269-287.

Dixon, N. M. (2000) *Common knowledge: How companies thrive by sharing what they know.* Boston: Harvard Business School Press.

Dixon-Woods, M., Agarwal, S., Jones, D., Young, B. & Sutton, A. (2005) Synthesising qualitative and quantitative evidence: a review of possible methods. *Journal of Health Services Research and Policy, 10*, 45-53.

Donnelly, R. (2006). How "free" is the free worker? An investigation into the working arrangements available to knowledge workers. *Personnel Review, 35*(1), 78-97.

Dorfman, P. (2001) The accidental knowledge manager. *Knowledge Management, 4*(2), 36-41.

Dougherty, V. (1999) Knowledge is about people, not databases. *Industrial and Commercial Training, 31*(7), 262-266.

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

Drucker, P. F. (ed.) (1998) *Harvard Business Review on Knowledge Management.* Boston: Harvard Business School Press.

Drucker, P. F. (2003) *Peter Drucker on the Profession of Management.* Harvard Business Press.

Drucker, P. F. & Garvin, D. A. (1998) *Harvard business review on knowledge management.* Harvard Business Press.

Durmuşoğlu, S. S. (2009) The role of top management team's information technology (IT) infrastructure view on new product development. *European Journal of Innovation Management, 12*(3).

Durrance, B. (1999) 'Some explicit thoughts on tacit learning'. In Cortada, J. W. & J. A. Woods (Eds.), *The knowledge management yearbook 1999-2000.* Boston: Butterworth: Heinemann (pp.28-36).

Earl, M. J. (2001) Knowledge management strategies: Toward a taxonomy, *Journal of Management Information Systems, 18*(1), 215-233.

Earl, M. & Scott, I. (1998) *What on earth is CKO?* London: London Business School.

Edwards, J. (2003) Creative Management: Intellectual property asset management tools help businesses get a handle on mind-based products. CIO 06/01/2003. http://www.cio.com/archive/060103/et_article.html.

Edwards , J. Shaw , D. & Collier ,P.M. (2005) Knowledge management systems: finding a way with technology. *Journal of Knowledge Managemet.*9,1, 113-125

Edwards, J. S. (2009). Business processes and knowledge management. In M. Khosrow-Pour (Ed.), Encyclopedia of Information Science and Technology. 2ed, I, I, 471-476. *Hershey, PA: IGI Global.*

Efimova, L. (in progress). What's in it for me? Using weblogs to understand knowledge workers. Work in progress for the OKLC04 conference, abstract. Retrieved from https://doc.telin.nl/dscgi/ds.py/Get/File-34786.

Ekvall, G. (1996) Organizational climate for creativity and innovation. *European Journal of Work and Organizational Psychology, 5*(1), 105-123.

Ekvall, G. (1997) Organizational conditions and levels of creativity. *Creativity and Innovation Management, 6*(4), 195-205.

Eriksson, P. & Kovalainen, A. (2008) *Qualitative Methods in Business Research.* Sage.

Fahey, L. & Prusak, L. (1998) The eleven deadliest sins of knowledge management. *California Management Review, 40*, 265-76.

Fischer G. & Ostwald J. (2001) Knowledge management: problems, promises, realities, and challenges. *IEEE Intelligent Systems*, January/February, 60-72.

Fisher, K. & Fisher, M. D. (1999) 'Shedding light on knowledge work learning'. In Cortada, J. W. & Woods, J. A. (eds.). *The Knowledge Management Yearbook 1999-2000.* Butterworth-Heinemann.

Fischer, M. M. (2001) Innovation, knowledge creation and systems of innovation. *Annals of Regional Science, 35*, 199-216.

Foucault, M. (1999) *Religion and Culture.* Ed. J. R. Carrette. New York: Routledge.

Freke, V. (2005) Definitions, reuse and technology. Thesis, Griffith University.

Fulmer, W. E. (1999) *Buckman Laboratories (A). Harvard Business School Case 9-800-160.* Boston: Harvard Business School Press.

Galliers, R. D. & Baker, B. (1994) *Strategic Information Management: Challenges and Strategies in Managing Information Systems*. Newton: Butterworth-Heinemann.

Glendinning, L. & Sturcke, J. (2008) Pirates take over oil tanker with British crew on board. Available at: guardian.co.uk, Monday 17 November 2008 13.06 GMT Accessed 26 October, 2009.

Glisby, M. & Holden, N. (2003) Contextual constraints in knowledge management theory: the cultural embeddedness of Nonaka's knowledge-creating company, *Knowledge & Process Management, 10*(1), 29-36.

Goetz, J., & LeCompte, M. (1984). *Ethnography and qualitative design in educationalresearch.* New York: Academic Press.

Goh, C. H. T. & Hooper, V. (2009) Knowledge and information sharing in a closed information environment. *Journal of Knowledge Management, 13*(2), 21-34.

Goldsby,T. J. & Martichenko, R. (2005) *Lean Six Sigma logistics: strategic development to operational success*. Ross.

Gottschalk, P. (2000) Predictors of IT support for knowledge management in the professions: an empirical study of law firms in Norway. *Journal of Information Technology, 15*(1), 69-78.

Gottschalk, P. (2005) *Strategic Knowledge Management Technology*. Idea Group.

Grace, T. P. L. (2009) Wikis as a knowledge management tool. *Journal of Knowledge Management, 13*(4). 64-74

Grant, R. (1997) The Knowledge-Based View of the Firm: Implications for Practice. *Long Range Planning, 30*(3), 450-454.

Gray, D. E. (2004) *Doing research in the real world*. London: Sage.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989) Toward a Conceptual Framework for Mixed-method Evaluation Designs. *Educational Evaluation and Policy Analysis*, 11, 3, 255-274.

Groff, T. R. & Jones, T. P. (2003) *Introduction to knowledge management: KM in business*. Butterworth-Heinemann.

Gupta, K. S. (2008) A comparative analysis of knowledge sharing climate. *Knowledge and process management, 15*(3), 186-195.

Guzley, R. M. (1992). Organizational climate and communication climate: predictors of commitment to the organization. *Management Communication Quarterly, 5* (4), 379-402.

Han, E., Karypis, G., Mewhort, D. & Hatchard, K. (2003) 'Intelligent Metasearch engine for Knowledge Management'. In Proceedings of CIKM'03, ACM, Nov. 3-8.

Hancock, D. R. & Algozzine, R. (2006) *Doing case study research: A practical guide for beginning researchers*. NY: Teacher's College Press.

Hansen, M. T., Nohria, N. & Tierney, T. (1999) What's your strategy for managing knowledge? *Harvard Business Review, 77*(2), 109-122.

Hansen, M. T. & von Oetinger, B. (2001) Introducing p-Shaped Managers: Knowledge Management's Next Generation. *Harvard Business Review*, 79,3, 107-116.

Hardy, M. & Bryman, A. (Eds.) (2004) *Handbook of Data Analysis*. London: Sage.

Haq, M. F. and Smithson, S. (2002) The Role of IS in Islamic Banking: A Cultural Perspective. Available at: http://is2.lse.ac.uk/asp/aspecis/20030058.pdf, Accessed 14 October 2009.

Hasanali, F. (2004) Critical success factors of knowledge management. In Koenig, M. E. D. and Srikantaiah, T. K. (Eds), *Knowledge management lessons learned: what works and what doesn't*. Medford, NJ: Information Today.

Haynes, J. (1999) *Religion, globalization, and political culture in the Third World.* New York: St. Martin's Press.

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

Heier, H. & Borgman, H. (2002) Knowledge Management Systems Spanning Cultures: the Case of Deutsche Bank's HRbase. *Proceedings of the 10th ECIS*, June 6-8, Gdansk, Poland.

Hendriks, P. H. (2001) Many Rivers to cross: from ICT to Knowledge Management Systems, *Journal of Information Technology, 16*(2), 57-72.

Hendriks, P. H. J. & Vriens D. J. (1999) Knowledge-based systems and knowledge management: friends or foes? *Information and Management, 35*, 113-25.

Hickins, M. (1999) Xerox shares its knowledge. *Management Review, 88*(8), 40-5.

Hislop, D. (2009) Knowledge Management in Organizations (2nd Ed). Oxford: OUP.

Hoffmann, M., Loser, K., Walter, T. & Herrmann, T. (1999) A Design Process for Embedding Knowledge Management in Everyday Work. *International ACM SIGGROUP Conference on Supporting Group Work*, Phoenix. pp. 296-305.

Hofstede, G. (1997) *Cultures and organizations: software of the mind.* London: McGraw Hill.

Hofstede, G. (1998) Identifying organizational subcultures: An empirical approach. *Journal of Management Studies, 35*, 11-12.

Holden, N. (2002) *Cross Cultural Management: A knowledge management perspective.* Harlow: Prentice Hall.

Holsapple, C. W. (ed.) (2003) *Handbook of Knowledge Management, Volume 1: Knowledge Matters.* Heidelberg: Springer-Verlag.

Holtham, C., Ward, V. and Bohn, M. (2001) 'Slow knowledge: the importance of tempo in debriefing and in individual learning', *Proceedings of Organisational Knowledge, Learning and Competencies Conference,* Athens.

Hornby, A. S. & Wehmeier, S. (2000) Oxford Advanced Learner's Dictionary Of Current English (6th ed). Oxford: Oxford University Press.

Huber, G. P. (1991) Organizational learning: the contributing process and the literature, *Organization Science, 2*(1), 88-115.

Huemer, L., von Krogh, G. & Ross, J. (1998) 'Knowledge and the Concept of Trust'. In von Krogh, G., J. Ross & D. Kleine (eds) *Knowing in Firms: Understanding, Managing and Measuring Knowledge.* London: Sage (123-145).

Hunter, K., Bedel, I. & Mumford, M. (2005) Dimensions of Creative Climate: A General Taxonomy. *The Korean Journal of Thinking & Problem Solving, 2,* 97-116.

Hutchings, K. & Weir, D. (2006) Guanxi and Wasta: A comparative examination of the impact of internationalisation and modernisation on traditional ways of networking in China and the Arab World. ***Thunderbird International Business Review,*** 48(1): 141-156.

Huysman, M. & De Wit, D. (2002) *Knowledge sharing in practice.* London: Kluwer.

Huysman, M. & Wulf, V. (2006) IT to support knowledge sharing in communities: towards a social capital analysis. *Journal of Information Technology,* 21, 40-51.

Ibrahim, I. A. (1997) *A brief illustrated guide to understanding Islam.* Texas: Darussalam. Available at: www.islam-guide.com/.

Ichijo, K. & Nonaka, I. (Eds.) (2007) *Knowledge Creation and Management: New Challenges for Managers.* New York: Oxford University Press.

Isaksen, S. G. (2007) The Situational Outlook Questionnaire: Assessing the context for change, *Psychological Reports, 100,* 455-466.

Isaksen, S. G. & Akkermans, H. J. (2007) *An Introduction to Climate,* Orchard Park, NY: Creative Problem Solving.

Isaksen, S. G. & Lauer, K. J. (2001) Convergent Validity of the Situational Outlook Questionnaire: Discriminating Levels of Perceived Support for Creativity. *North American Journal of Psychology, 3*(1), 31-40.

Isaksen, S. G., Lauer, K. J. & Ekvall, G. (1999) Situational outlook questionnaire: A measure of the climate for creativity and change. *Psychological Reports, 85,* 665-674.

Jaichand, S. (2008) *Exploring the relationship between knowledge sharing and employee performance.*Capella University.

Jain, R.K. & Triandis, H.C. (1997) *Management of Research and Development Organizations: Managing the Unmanageable.* New York: John Wiley.

Janz, B. D. & Prasarnphanich, P. (2003) Understanding the antecedents of effective knowledge management: The importance of a knowledge-centered culture. *Decision Sciences, 34*(2), 351-384.

Jashapara, A. (2004) *Knowledge management: an integrated approach.* Prentice Hall.

Jennex, M. (2006) 'Knowledge management success factors'. In: Schwartz D. G. (Ed.), *Encyclopedia of Knowledge Management.* Hershey, PA: Idea Group (pp. 436-441).

Jick, T. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24,* 602–611

Johnson, B. and Christensen, L. (2008) *Educational research: Quantitative, qualitative, and mixed approaches* (3rd edn). Thousand Oaks CA: Sage.

Kaleem, A. and Saima, A. (2009) The Quran and Poverty Alleviation: A Theoretical Model for Charity-Based Islamic Microfinance Institutions. *Nonprofit and Voluntary Sector Quarterly,* Sage Publication, USA. DOI:10.1177/0899764009332466.

Kayworth, T. & Leidner, D. (2003) 'Organizational Culture as a Knowledge Resource'. In: Holsapple, C. W. (ed.), *Handbook of Knowledge Management.* Berlin: Springer Verlag (235-252).

Kazi, M. A. (1988) The Concept of Scientific Knowledge in Islam. *Journal of Islamic Academy of Sciences 1*(1), 7-9.

Keyton, J. (2001) *Communication research: Asking questions, finding answers.* Mountain View, CA: Mayfield Publishing Company.

Khosrowpour, M. (2003) *Information technology and organizations: trends, issues, challenges and solutions.* Volume 1.

Klein, H. & Myers, M. (1999) A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly, 23*(1), 67-94.

Knapp, E. & Yu, D. (1999) How culture helps or hinders the flow of knowledge. *Knowledge Management Review, 2*(1), 16-21.

Knell, J. (2000), *Most Wanted: The Quiet Birth of the Free Worker,* The Industrial Society, London.

Knowledge per se mentioned 443 times in the Quran. Accessed 19 November 2009, 12:29. Available at: http://www.quranexplorer.com/Search/?q=KNOWLEDGE%20&Sura=All&t=17.

Koenig, M. E. D. (2004) 'Knowledge management, user education, and librarianship'. In Koenig, M. E. D. and Srikantaiah, T. K. (Eds), *Knowledge management lessons learned: what works and what doesn't.* Medford, NJ: Information Today.

Koenig, M.D. & Srikantaiah, T.K. (2000) 'The evolution of knowledge management'. In Srikantaiah, K. and Koenig, M. E. D. (Eds), *Knowledge Management for the Information Professional.* Medford, NJ: Information Today (pp. 37-61).

Kogut, B. & Zander, U. (1992) Knowledge of the firm, combinative capabilities and the replication of technology. *Organization Science, 3*(3), 383-397.

Krebs, S. A. (2009) "What's in it for me?" Employee Knowledge Sharing on Knowledge Management Systems: Normative and Social Exchange Perspectives. PhD thesis. University of Queensland.

Sahay, S. & Walsham, G. (2004). Managing cross-cultural issues in global software outsourcing. *Communications of the ACM, 47*(4), 62-66.

Kvale, S. (1996) InterViews: An introduction to qualitative research interviewing. London: Sage.

Landry, J. R. (2000) 'Playing at learning: Why knowledge creation needs fun'. In Sprague, R. H. Jr., editor, *Proceedings of the 33rd Annual Hawaii International Conference on Systems Sciences, HICSS-33.* Los Alamitos, CA: IEEE Computer Society (983-989).

Lee, S.M. & S. Hong, (2002). An Enterprise-Wide Knowledge Management System Infrastructure.*Industrial Management & Data Systems,* 102(1): 17-25.

Lehaney, B., Clarke, S., Coakes, E. & Jack, G. (2004) *Beyond Knowledge Management.* Hershey, PA: Idea Group.

Leonard, A., A (1999,) Viable System Model: Consideration of Knowledge Management, *Journal of Knowledge Management Practice*: http://www.tlainc.com/jkmp.htm

Leonard, M. K. (2007.) Trust and the manager-subordinate dyad: Virtual work as a unique context. *Journal of Behavioral and Applied Management*, 8 (3): 197-201.

Leupp, G. (2003) On Terrorism, Methodism, Saudi 'Wahhabism' and the Censored 9-11 Report. Available at: http://www.saudi-american-forum.org/Newsletters/SAF_Item_Of_Interest_2003_08_12.htm.

Levitt, B. & March, J. G. (1988) Organizational learning. *American Review of Sociology, 14*, 319-346.

Lewin, K. (1951) *Field theory in the social sciences*. New York: Harper.

Liebowitz, J. (1999) *Knowledge Management Handbook*. London: CRC Press.

Liebowitz, J. (2001) Knowledge management and its links to artificial intelligence. *Expert Systems with Applications, 20*, 1-6.

Liebowitz, J. & Megbolugbe, I. (2003) A set of frameworks to aid the project manager in conceptualizing and implementing knowledge management. *International Journal of Project Management, 21*(3), 189-198.

Lin, G C. Yeh ,Jong-Mau and Tseng ,Shu-Mei. (2005) Case study on knowledge-management, *Journal of knowledge management*, 9, 3, pp. 36-50.

Lindvall, M., Rus, I. & Suman Sinha, S. (2003) Software systems support for knowledge management, *Journal of Knowledge Management, 7*(5), 137-150.

Lucas, H.C. & Spitler, V.K. (1999) Technology use and performance: A field study of broker workstations. *Decision Sciences, 30*(2), 291-311.

Lugo, L. et al. (2009) Mapping the Global Muslim Population, *Pew Forum on Religion & Public Life*, October.

Lunney, K. (2002) NASA managers not sharing lessons learned, report says. February 11, 2002. Government executive.com.

Magalhães, K. (1998) Organizational knowledge and learning. In G. von Krogh, J. Roos, and D. Kleine (eds.), *Knowing in Firms: Understanding, Managing and Measuring Knowledge*. Thousand Oaks: Sage Publications,pp. 87-122.

Magalhães, R. (2004) *Organizational knowledge and technology: an action-oriented perspective on organization and information systems*. Edward Elgar.

Maier, R. (2007) *Knowledge Management Systems: Information and Communication Technologies for Knowledge Management*. Springer.

Malhotra, Y. (2002) Why do knowledge management systems fail? Enablers and constraints of knowledge management in human enterprises. Available at http://www.yogeshmalhotra.com.

Malhotra, Y. (2004) 'Why Knowledge Management Systems Fail? Enablers and Constraints of Knowledge Management in Human Enterprises'. In Koenig, M. E. D. & Srikantaiah, T. K. (Eds.), *Knowledge Management Lessons Learned: What Works and What Doesn't*. Information Today Inc. (87-112).

Manchester, P. (1999) Intellectual property: Fundamental dilemma over ownership of knowledge. *Financial Times*, 10 Nov. 1999.

Mariano, S. & Casey, A. (2007) The process of knowledge retrieval: A case study of an American high-technology research, engineering and consulting company. *Journal of Information and Knowledge Management Systems, 37*(3), 314-330.

Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organization Science, 5*, 502-527.

Markus, M. L. & Robey, D. (1988) Information Technology and Organizational Change: Causal Structure in Theory and Research. *Management Science, 34*(5), 583-598.

Marshall, C. and Rossman, G. B. (2006) *Designing qualitative research* (4th ed). Sage.

Mason, J. (1996) *Qualitative researching*. London: Sage.

Maxwell, J. A. (2005) *Qualitative Research Design: An Interactive Approach* (2nd ed). Thousand Oaks, CA: Sage.

Mays, N. & Pope, C. P. (2000) 'Quality in qualitative health research'. In Pope, C. P. & Mays, N. (eds) *Qualitative Research in Health Care.* London: BMJ Books (89-101).

Maznevski, M. & Athanassiou, N. (2007) 'Bringing the outside in: Learning and Knowledge Management through External Networks', in Ichijo, K. & Nonaka, I. (Eds), *Knowledge Creation and Management.* New York: Oxford University Press (69-82).

McAdam, R. & McMreedy, S. (1999) A critical review of knowledge management models. *The Learning Organization, 6*(3): 91-100.

McAdam, R. & Reid, R. (2001) SME and Large Organization Perceptions of Knowledge Management: Comparisons and Contrasts. *Journal of Knowledge Management, 5*(3), 231-241.

McCole, P. & Ramsey, E. (2004) Internet-enabled technology in knowledge-intensive business services. *Marketing Intelligence & Planning, 22*(7), 761-779.

McDermott, R. (1999) Why information technology inspired but cannot deliver knowledge management. *California Management Review, 41*(1), 103-117.

McFarlan, F. W. (1981) Portfolio approach to information systems. *Harvard Business Review, 59*, 142-150.

McInerney, C. & LeFevre, D. (2000) 'Knowledge managers: history and challenges'. In Prichard, C., Hull, R., Chumer, M. & Willmott, H. (Eds), *Managing Knowledge: Critical Investigations of Work and Learning.* Basingstoke: Macmillan.

McInerney, C. R. & Day, R. E. (2007) *Rethinking knowledge management: from knowledge artifacts to knowledge processes*. Springer.

McKinlay, A. (2002) The limits of knowledge management, *New Technology, Work and Employment, 17*(2).

McNabb, D. E. (2006) *Knowledge Management in the Public Sector: A Blueprint for Innovation in Government.* Armonk, NY: M.E. Sharpe.

McNeish, J., Mann, Inderjit Singh (2010) IUP. *Journal of Knowledge Management, 8*(1/2), 18-38.

Merriam, S. B. (2001) *Qualitative research and case study applications in education.* San Francisco: Jossey-Bass.

Merriam, S. B. (ed.) (2002) *Qualitative research in practice.* San Francisco, CA: Jossey- Bass.

Mertens, D. M. (1998). *Research methods in education and Psychology: Integrating diversity with quantitative and qualitative approaches.* London: Sage.

Miles, M. B. & Huberman, A. M. (1994) *Qualitative data analysis: An expanded Sourcebook* (2nd ed.). Thousand Oaks: Sage.

Milton, N. (2005) *Knowledge Management for Teams and Projects.* Oxford: Chandos.

Mintzberg, H. (1994) Rounding out the manger's Job. Sloan Mangemenet Review , 36(1) , 11 -26.

Moffett, S., McAdam, R. & Parkinson, S. (2003) Technology and people factors in knowledge management: an empirical analysis. *Total Quality Management, 14*(2), 215-224.

Morgan, D. L. (1998). Practical strategies for combining qualitative and quantitative methods: Applications to health research. *Qualitative Health Research,* 8(3), 362-376.

MSNBC, Oct. 8, 2009, 6:29 p.m. ET. Report: Muslim population hits 1.57 billion. Available at http://www.msnbc.msn.com/id/33226662/. Accessed 20 Oct 2009.

Muhsin Khan, M. (Translator) (n.d.) Translation of Sahih Bukhari. University of Southern California. Available at: http://www.usc.edu/schools/college/crcc/engagement/resources/texts/muslim/hadith/bukhari/.

Mukhtar, R. (2007) Knowledge Management in Nuclear R&D Institutes. IAEA-CN-153/3/P/01. Available at http://www.iaea.or.at/inisnkm/nkm/documents/nkmCon2007/fulltext/FP/IAEA-CN-153-3-P-01fp.pdf.

Mumford, M. D. & Licuanan, B. (2004) Leading for innovation:Conclusions, issues, and directions. *Leadership Quarterly.* Special Issue: Leading for Innovation, *15*(1), 163-171.

Mutch, A. (2008) *Managing Information and Knowledge in Organizations: A Literacy Approach.* Routledge.

Mvungi, M. S. and Jay, I. (2009) Knowledge Management Model for Information Technology Support Service. *Electronic Journal of Knowledge Management, 7*(3).

Myers, M. (1997) Qualitative Research in Information Systems. *MIS Quarterly, 21*(2).

Myers, M. D. & Aviso, D. E. (2002) *Qualitative research in information systems: A reader.* London, UK: Sage Publications.

Nelke, M. (1999) The role of the corporate library in the knowledge management process. *Information Services and Use, 19*(1), 49.

Nemiro, J. E. (2001) Connection in creative virtual teams. *Journal of Behavioral and Applied Management, 3*(2), 92-112.

Neuman, W. L. (2006) *Social research methods: Qualitative and quantitative approaches* (6th ed). Boston, MA: Allyn & Bacon.

Neuman, W. L. (2007) *Social Research Methods: Qualitative and Quantitative Approaches.* London: Allyn & Bacon.

Neuendorf, K. A. (2002) *Content analysis guidebook.* London: Sage.

Ngwenyama, O. & Lee, A. S. (1997) Communication richness in electronic mail: Critical social theory and the contextuality of meaning. *MIS Quarterly, 21,* 145-166.

Nonaka, I. & Nishiguchi, T. (2001) *Knowledge emergence: Social, technical, and evolutionary dimensions of knowledge creation.* New York: Oxford University Press.

Nonaka, I. & Peltokorpi, V. (2006) Objectivity and subjectivity in knowledge management: a review of 20 top articles. *Knowledge and Process Management, 13*(2), 73-82.

Nonaka, I. & Takeuchi, H. (1995) *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation.* New York: OUP.

Nonaka, I. & Teece, D. J. (2001) *Managing Industrial Knowledge: Creation, Transfer and Utilization.* Thousand Oaks: Sage.

Nongkran, L. (2005) An Exploratory Study on Interorganizational Knowledge Sharing in an Information Systems Development Environment. Defended June 2005. Southern Illinois University.

Nygaard, S. and Russo, A. (2008) Trust, Coordination and Knowledge Flows in R&D Projects: The Case of Fuel Cell Technologies. *Business Ethics: A European Journal,17*(1), 23-34.

O'Dell, C. (2000) *Stages of implementation: a guide for your journey to knowledge management.* American Productivity & Quality Center.

Ojha, A. K. (2005) Impact of Team Demography on Knowledge Sharing in Software Project Teams. *South Asian Journal of Management*, July-September.

Oldham, G. R. (2003) 'Stimulating and supporting creativity in organizations'. In Jackson, S. E., Hitt, M.A. & DeNisi, A. S. (Eds) *Managing knowledge for sustained competitive advantage.* San Francisco: Jossey-Bass (243-273).

O'Leary, D. (2002) 'Technologies of knowledge storage and assimilation'. In Holsapple, C.W. (Ed.), *Handbook of Knowledge Management 1: Knowledge Directions*, Heidelberg: Springer-Verlag (29-46).

O'Leary, Z. (2004) *The Essential Guide to Doing Research.* London: Sage.

Oliver, H. J. (2002) *The 'Wahhabi' Myth.* Trafford on Demand Pub.Orlikowski, W. J. (1992) The duality of technology: Rethinking the concept of technology in organizations, *Organization Science, 3*(3), 398-427.

Orlikowski, W. J. (1996) Improvising organizational transformation over time: A situated change perspective. *Information Systems Research, 7*, 63-92.

Orlikowski, W. J. and Robey, D. (1991) Information technology and the structuring of organizations. *Information Systems, 2*(2), 143-169.

Orlikowski, W. J. & Yates, J. (1994) Genre repertoire: The structuring of communicative practices in organizations. *Administrative Science Quarterly, 39*, 541-574.

O'Sullivan, K. J. (2009), *Strategic Intellectual Capital in Multinational Organizations,* Idea Group Publishing.

Outhwaite, W. & Turner, S. P. (2007) *The SAGE handbook of social science methodology*. London: Sage.

Owens, L. (2008) *Best Practices: Reinventing The Corporate Library*. Forrester Research, Inc.

Parrish, E. L. (2004) A comparative study of the organizational climate at the Army Materiel Command regarding creativity and change. PhD thesis, Northcentral University.

Prather, C. 1996. How's Your Climate for Innovation? *R&D Innovator*. 5,5.

Patton, M. Q. (1990) *Qualitative Evaluation and Research Methods*. Thousand Oaks: Sage.

Patton, M. Q. (2002) *Qualitative research and evaluation methods* (3rd ed). Thousand Oaks, CA: Sage Publications.

Perez, E. (2002) A second shot at the knowledge management challenge. *Online, 26*(6), 25-9.

Polanyi, M. (1967) *The tacit dimension*. London: Routledge and Kogan Paul.

Prusak, L. & Weiss, L. (2007) 'Knowledge in organizational settings: How organizations generate, disseminate, and use knowledge for their competitive advantage'. In Ichijo, K. & Nonaka, I. (Eds.), *Knowledge creation and management: New challenges for managers*. New York: Oxford University Press.

Puusa , A. and Tolvanen, U. (2006) Organizational Identity and Trust. *Electronic Journal of Business Ethics and Organization Studies, 11*(2). Available at http://ejbo.jyu.fi/.

Raisinghani, M. (2000) Knowledge management: A cognitive perspective on business and education. *American Business Review, 18*(2), 105-112.

Rao, M. (2005) *KM tools and techniques: practitioners and experts evaluate KM solutions*. Elsevier Butterworth-Heinemann.

Rice, M. F. (2003) Information and Communication Technologies and the Global digital Divide. *Comparative Technology Transfer and Society, 1*, 72-88.

Richards, L. (2005) *Handling qualitative data: A practical guide*. London: Sage.

Riege, A. (2005) Three-dozen knowledge-sharing barriers managers must consider. *Journal of Knowledge Management, 9*(3), 18-35.

Riege, A. (2007) Actions to Overcome Knowledge Transfer Barriers in MNCs. *Journal of Knowledge Management*, 11(1), 48- 67.

Rintala, N. (2008) 'The Impact of ICT Implementations on Social interaction in Work Communities'. In Loos, E., Haddon, L. & Mante-Meijer, E. A., *The social dynamics of information and communication technology*, Ashgate (133-149).

Rintala, N. & Hyttinen, L. (2006) Methods for sharing tacit nuclear knowledge and expertise. *Int. J. Nuclear Knowledge Management, 2*(1), 38-45.

Ritchie, J., & Lewis, J. (2003). *Qualitative Research Practice: A guide for social science students and researchers*. London: Sage

Ritchie, J. & Spencer, E. (1994) 'Qualitative data analysis for applied policy research'. In Bryman, A. & Burgess, R.G. (eds.) *Analyzing Qualitative Data*. London: Routledge.

Robertson, C. (2005) Developing the KM environment. Knowledge Management Specialist Library. Avaiable at http://www.library.nhs.uk/knowledgemanagement/ViewResource.aspx?resID=93780.

Robertson, S. (2002) A Tale of Knowledge-Sharing Systems. *Journal of Knowledge Management*, 6(3), 295-308.

Robey, D. (1977) Computers and management structure: Some empirical findings re-examined. *Hum. Relat., 30*(11), 963-976.

Robey, D. (1979) The Impact of Data Systems on Organizational Management. Unpublished manuscript, Florida International University.

Robey, D. (1981) Computer information systems and organization structure. *Communications of the ACM, 24*(10), 679-687.

Ruggles, R. (1998), The state of the notion: knowledge management in practice. *California Management Review, 40*(3), 80-9.

Ruggles, R. & Holtshouse, D. (1999a) 'Gaining the Knowledge Advantage'. In Ruggles, R. and D. Holtshouse (Eds.), *The Knowledge Advantage*. Capstone.

Ruggles, R. & Holtshouse, D. (1999b) *The Knowledge Advantage: 14 Visionaries Define Marketplace Success in the New Economy.* Oxford: Capstone.

Schoorman, F.D. Mayer,R.C. Davis, J.H. (2007) An integrative model of organizational trust: Past, present and future, *Academy of Management Review*, 32 ,344 - 354.

Schulte, W. D. & Al-Fehaid, A. (2004) National Culture and Knowledge Management in the Middle East: A Cross Cultural Comparison of Saudi Arabia and the United States. Academy of International Business Southeastern United States Annual Meeting, pp. 279-290.

Schultze, U. (1998) 'Investigating the Contradictions in Knowledge Management'. IFIP WG8.2 Joint Working Conference on Information Systems: Current Issues and Future Changes. Helsinki, Finland, pp. 155-174.

Schwarz, H. & Davis, S. M. (1981) Matching corporate culture and business strategy. *Organizational Dynamics, 10*(1), 30-48.

Scott J. E. (1998) Organizational knowledge and the Intranet. *Decision Support Systems, 23*, 3-17.

Serenko, A., Bontis, N. & Hardie, T. (2007) Organizational size and knowledge flow: a proposed theoretical link. *Journal of Intellectual Capital, 8*(4), 610-627.

Shaw, R. B. (1997) *Trust in the balance: building successful organizations on results, integrity, and concern.* Jossey-Bass Business & Management series.

Shaw M. J., Subramaniam, C., Tan, G. W. & Welge, M. E. (2001) Knowledge management and data mining for marketing. *Decision Support Systems*, 31, 127-137.

Shore, B. & Venkatachalam, A. R. (1996) Role of national culture in the transfer of information technology. *Journal of Strategic Information Systems, 5*(1), 19-35.

Shum, S. B. (1997) Negotiating the construction and reconstruction of organisational memories. *Journal of Universal Computer Science, 3*(8), 899-928.

Siverman, D. (2006). *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction* (Third edition), Sage, London.

Simons, H. (2009) *Case Study Research in Practice.* Sage.

Singh, S. K. (2008). Role of leadership in knowledge management : a study. *Journal of Knowledge Management, 12*(4), 3-15.

Skyrme, D. (1999) *Knowledge Networking: Creating the Collaborative Enterprise*, Oxford: Butterworth-Heinemann.

Skyrme, D. J. & Amidon, D. M. (1997) *Creating the Knowledge-Based Business: Key lessons from an international study of best practice.* London: Business Intelligence.

Skyrme, D. J. & Amidon, D. M. (1999) 'The knowledge agenda', in Hermans, J. *The knowledge management yearbook 1999-2000.* USA: Butterworth-Heineman (108-125).

Song, H. (2007) The Role of Information and Communication Technologies in Knowledge Management: From Enabler to Facilitator. PhD Thesis, RMIT University, August 2007.

Sosik, J. J. (2004) *The dream weavers: strategy-focused leadership in technology-driven,* Information Age Publishing, USA

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

Stake, R. E. (1995) *The Art of Case Study Research.* London: Sage Publications.

Stake, R. E. (2000) 'Case Studies'. In N. K. Denzin & Y. S. Lincoln (eds), *Handbook of Qualitative Research.* Thousand Oaks: Sage (435-453).

Stein, E. W. & Zwass, V. (1995) Actualizing organizational memory with information systems. *Information Systems Research, 6*(2), 85-117.

Strauss, A. and Corbin, J. (2007). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed). Thousand Oaks: Sage.

Sveiby, K. E. & Simons, R. (2002) Collaborative climate and effectiveness of knowledge work: an empirical study. *Journal of Knowledge Management, 6*(5), 420-33.

Swan. J. (2001) Knowledge management in action: integrating knowledge across communities. *Proceedings of the 32nd Annual Hawaii International Conference on System Sciences.*

Swan, J., Newell, S. & Robertson, M. (2000) Knowledge Management – When Will People Management Enter the Debate? 33rd Hawaii International Conference on System Sciences, Maui, Hawaii.

Tashakkori, A., and Teddlie, C. (1998). Mixed methodology: Combining the qualitative and quantitative approaches, Sage, Thousand Oaks, CA.

Tasahakori , A. and Teddlie, C. (2002) Handbook of Mixed Methods, Sage, London.

Tashakkori, A., & Teddlie, C. (2003b). The past and future of mixed methods research: From data triangula- tion to mixed model designs. In A. Tashakkori & C. Teddlie (Eds.), Handbook of mixed methods in social & behavioral research (pp. 671-702), Sage ,Thousand Oaks, CA.

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

Tesluk, P. E., Farr, J. L. & Klein, S. R. (1997) Influences of organizational culture and climate on individual creativity. *Journal of Creative Behavior, 31*, 27-41.

Thomas, E., Alani, H., Sleeman, D. & Brewster, C. (2005) 'Searching and Ranking Ontologies on the Semantic Web'. In *Proceedings of Workshop on Ontology Management: Searching, Selection, Ranking, and Segmentation.* 3rd K-CAP, Banff, Canada (57-60).

Thomas, J. and Harden, A. (2007) Methods for the thematic synthesis of qualitative research in systematic reviews. NCRM Working Paper (Unpublished). ESRC National Centre for Research Methods.

Tuomi, I. (1999). Data is More than Knowledge: Implications of the Reversed Knowledge Hierarchy for Knowledge Management and Organisational Memory. 32nd Hawaii International Conference on System Sciences, Maui, HI.

Tuomi, I. (2000) Data is more than knowledge: implications of the reversed hierarchy for knowledge management and organizational memory. *Journal of Management Information Systems. 16*(3), 103-117.

Ulrich, Dave, (1999 Intellectual Capital = Competence x Commitment," in James W.Cortada and JohnA.Woods, eds., *The Knowledge Management Yearbook 1999–2000*, Boston: Butterworth Heinemann, pp. 126–138.

Visser , H. (2009) *Islamic Finance: Principles and Practice*. Edward Elgar.

Von Krogh, G. (1998) Care in knowledge creation. *California Management Review, 40*(3), 133-53.

Von Krogh, G., Roos, J. and Slocum, K. (1996) An Essay on Corporate Epistemology, in *Managing Knowledge: Perspectives on Cooperation and Competition*, (eds). G. von Krogh & J. Roos, Sage, London, pp. 157-183.

Wakin, E. (1999) 'Tapping Intellectual Capital'. In Cortada, J. W. & Woods, J. A. (eds). *The Knowledge Management Yearbook 1999-2000*, Butterworth-Heinemann.

Walsh, J. P. & Ungson, G. R. (1991) Organizational memory, *Academy of Management Review, 16*(1), 57-91.

Walsham, G. (1993) *Interpreting Information Systems in Organisations*. Chichester: Wiley.

Walsham, G. (2001a) Cross-Culture Issues in Global Outsourcing of Software. Working Paper, Judge Institute, Cambridge University.

Walsham, G. (2001b) Knowledge management: the benefits and limitations of computer systems. *European Management Journal, 19*(6), 599-608.

Wei He, Yulin Fang & Kwok-Kee Wei (2009) The role of trust in promoting organizational knowledge seeking using knowledge management systems: An

empirical investigation, *Journal of the American Society for Information Science and Technology, 60*(3).

Weir, D. & Hutchings, K. (2005) *Cultural filtering in the Arab World and China: Exploring the interrelationship of the technological knowledge age, traditional cultural networking and interpersonal connection.* Available at http://www.filternetwork.org/downloads/Middlesex_Symposium_30_November_2005_website_report_version.doc. Accessed Jan 02, 2008.

Wigglesworth, R. (2009c) Scholars: Sharia compliance rulings reverse trend. December 7, 17:33. Available http://www.ft.com/cms/s/0/8ec1abb4-e2be-11de-b028-00144feab49a.html.

Wiig, K. M. (1993) *Knowledge Management Foundations*. Arlington: Schema Press.

Wiig, K. (1997) Integrating Intellectual Capital and Knowledge Management. *Long Range Planning, 30*(3), 399-405.

Wilson, T. D. (2002) The nonsense of 'knowledge management'. *Information Research, 8*(1).

Wu, J. (2000) Business Intelligence: What is Data Mining? *DM Review*, August. Available at http://wdmreview.com.

Yin, R. (1994) *Case Study Research: Design and Methods*. Sage.

Yin R. K. (2003) *Case Study Research: Design and Methods*, 3rd ed. California: Sage.

Yin, R. K. (2009) *Case study research: design and methods*. Sage.

Zack, M. H. (1998a) An architecture for managing explicated knowledge. *Sloan Management Review*, September.

Zack, M. (1998) 'An architecture for managing explicit knowledge'. In *Proceedings of the Association for Information Systems 1998 Americas Conference*, Baltimore, Maryland, August 14-16, 1998.

Zack, M. H. (1999) *Knowledge and Strategy*. Boston: Butterworth Heinemann.

Zack, M. H. & McKenney, J. L. (1995) Social context and interaction in ongoing computer-supported management groups. Organization Science, 6(4), 394-422.

Zuboff, S. (1988) In the Age of the Smart Machine: The future of work and power. Basic Books.

Appendices (A) Organizational Climate Questionnaire: The Situational Outlook Questionnaire (SOQ)

The Situational Outlook Questionnaire (SOQ) examines several aspects of the work environment commonly referred to as "organizational climate". Taking the SOQ will help you, others on your team and in your organization better understand your current work environment and how it supports or limits the release and productive use of creativity, innovation and change. The entire questionnaire is contained below and normally takes 20 to 30 minutes to complete. Please respond to these questions as honestly as possible since your opinions and comments are important.

Thank you for your time and honesty!

هذه الاستبانة تختبر عدد من مجالات بيئة العمل وتسميتها العلمية" مناخ المنظمة" الغرض منها مساعدتك أنت وفريق عملك لفهم أكبر لبيئة العمل الحالية وبالتالي النظر في تلك البيئة على أساس هل هذه البيئة تحد أو تساعد من البيئة الخلاقة ا لإبداعية وتساعد على التغيير . جميع مواد الاستبانة أدناه عادة تأخذ من وقتك من 20 الى 30 دقيقة . من فضلك اجب على الأسئلة بكل صدق ونزاهة لأن رأيك مهم جدا.شكرا لوقتك ونزاهتك. البيانات الشخصية اختياري ماعدا بيانات مدة العمل والمؤهل العلمي .

The SOQ contains two parts. **PART A** consists of 53 statements. Please read each statement and determine how applicable it is to your work environment by **choosing** the number to the right of the statement and 'clicking' on your response. Use the Response Key at the start of Part A to guide your responses. Be sure the number you choose is for the statement you are answering. **Please focus only on YOUR perceptions of the work environment** when responding to the questions.

يحتوي هذا الجزء على 53 بيانا. يرجى منك قراءة كل بيان و اختيار واحد من الأرقام الموجودة على اليمين و ذلك بناءا على مدى التطابق بين محيط عملك و ما يقترحه كل بيان. استعن بلوحة المفاتيح المبينة أعلى أسئلة الجزء الأول لتوجيه أجوبتك.

يرجى التأكد من اختيار الرقم المقابل لنفس البيان محل الإجابة و الاعتماد على مفهومك الشخصي لمحيط العمل عند اختيار الأجوبة.

PART B contains three narrative questions that ask you to comment on aspects of your work environment. Please think about the same work setting, context, or job situation you used in Part A when responding to the questions in Part B. Please note that your responses may be shared with others anonymously. يحتوي هذا الجزء على ثلاثة أسئلة تستوجب الإجابة عليها كتابة تعليقاتك حول أجواء العمل المحيطة بك. و يرجى الأخذ بعين الاعتبار نفس المحيط، السياق و الجو العملي الذي أشير إليه في إجابات الجزء الأول.

نشير الى احتمال تطلع أشخاص أخرين على أجوبتك و لكن دون علن.

You are half way done with the first Part! Remember to use the following Response Key to guide your responses.

أنت الآن قطعت نصف المشوار لا تنسى استخدام المفاتيح أدناه لتوجيه اجاباتك

Please remember to use the work setting, context, or job situation you identified above when responding to the following questions. Please be aware that your responses may be shared anonymously with others in your group. This is done to illustrate common themes, promote individual development or to develop organizational interventions. من فضلك تذكر بيئة العمل المناسبة وسياقها أو مكان الوظيف أعلاه عنداجابتك على الاسئلة أدناه . من فضلك كن على علم أن اجابتك ربما يتم اشراكها مع اشخاص آخرين في فريقك ولكن دون الإشارة إليك أواجابتك وستكون مبهمة . الفائدة من ذلك التعرف على المجال الساند لتطوير الأشخاص في المنشاة وتطير مدخلات العمل

Appendices (B) Interview Questions

- **Organisational Climate Questions (2008):**

- How challenged, how emotionally involved and how committed are you to using ICT to support KM?
- How free are you to decide how to use ICT to support KM?
- Do you have time to think of alternate uses of ICT to support KM before having to take action?
- Do you have resources to give new ideas a try, with regards to using ICT to support KM?
- Do you feel safe in speaking your mind and openly offering different points of view on using ICT to support KM?
- How relaxed is your workplace – is it OK to have fun?
- To what degree is there emotional tension in using ICT to support KM?
- To what degree do people engage in lively debates about the issues of IT to support KM?
- Is it OK to fail when trying to use ICT to support KM?

- **Information Communication Technology Questions (2007):**

- Do you feel that the information communication technology that is available to you in your work assists you in managing knowledge?
- How do you see information communication technology participating in knowledge management activities?
- What barriers/difficulties exist that make using information communication technology within knowledge activities challenging?
- What do you see as factors affecting your information communication technology use?
- What do you see as factors affecting other people's information communication technology use?
- What information communication technology would you like to be provided as part of the KM strategy?

PAGE NUMBERING AS ORIGINAL

- **Knowledge Management Questions (2007):**

- What aspect of your working environment is most helpful in supporting your Knowledge management activities?
- What aspect of your working environment most hinders your knowledge management activities?
- What is the most important action you would take to improve the climate for knowledge management activities in your working environment?
- Do you attempt to store personal (i.e. implicit) knowledge? For example, notes on cases, experience in developing client strategies, personal interpretations. YES/NO If YES, how do you store knowledge? What information communication technology, if any, do you use? Why do you store knowledge? If NO, why don't you attempt to store implicit knowledge?
- What barriers do you think some people might have to managing knowledge? (i.e. lack of confidence with information communication technology , guarding of own work, too much work, organisational barriers etc)
- How would you like to access the knowledge?
- Is there any attempt to change the ways that people store knowledge based on problems with accessing knowledge?

Appendix C the SOQ Analysis

Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation	N
ChallengeInvolvement	77	42.9	300	187.8	56.7	77
Freedom	77	16.7	300	154.5	51.6	77
TrustOpenness	77	40.0	300	153.0	55.4	77
IdeaTime Idea-Time	77	33.3	300	171.2	60.4	77
PlayfulnessHumor	77	0.0	250	154.3	61.0	77
Conflict	77	0.0	266.6667	118.2	73.3	77
IdeaSupport	77	80.0	300	192.5	59.2	77
Debate	77	66.7	300	178.6	54.4	77
RiskTaking	77	20.0	240	141.6	50.3	77

The SOQ Correlations analysis

		Challenge/ involvement	Freedom	Trust/ openness	Idea time	Playfulness/ humour	Conflict	Idea support	Debate	Risk-taking
Challenge/ involvement	Pearson Corr	1								
Freedom	Pearson Corr	.592**	1							
	Sig. (2-tailed)	.000								
Trust/ openness	Pearson Corr	.701**	.559**	1						
	Sig. (2-tailed)	.000	.000							
Idea time	Pearson Corr	.598**	.619**	.529**	1					
	Sig. (2-tailed)	.000	.000	.000						
Playfulness/ humour	Pearson Corr	.487**	.529**	.534**	.549**	1				
	Sig. (2-tailed)	.000	.000	.000	.000					
Conflict	Pearson Corr	−.421**	−.166	−.246*	−.239*	−.046	1			
	Sig. (2-tailed)	.000	.149	.031	.036	.693				
Idea support	Pearson Corr	.713**	.478**	.563**	.666**	.398**	−.486**	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000			
Debate	Pearson Corr	.706**	.622**	.623**	.687**	.672**	−.150	.729**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.192	.000		
Risk-taking	Pearson Corr	.594**	.519**	.513**	.556**	.594**	.014	.468**	.605**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.906	.000	.000	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed). Sample size= N = 77

The SOQ Question items applicable to' 3='applicable to high degree'

	Question items	% of reply for 3='applicable to high degree'
1.	Most people here strive to do a good job	20.8
2.	The work atmosphere here is filled with energy	9.1
3.	One has the opportunity to stop work here in order to test new ideas	18.2
4.	There is great deal of personal tension here	14.3
5.	Many different points of view are shared here during discussion	14.3
6.	People here make their own choices about their daily work	7.8
7.	People here exhibit a sense of humour	13.0
8.	There are quite a few people here who cannot tolerate each other	15.6
9.	People here receive support and encouragement when presenting new ideas	29.9
10.	Differences of opinion are frequently expressed here	16.9
11.	Most people here enjoy contributing to the success of organization	32.5
12.	Flexible time-lines allow people here to consider alternatives	7.8
13.	People here have fun when they work	13.0
14.	People usually feel welcome when presenting new ideas here	29.9
15.	People here can move forward even in the face of uncertainty	9.1
16.	People here feel deeply committed to their jobs	16.9
17.	Most people here usually control their own work	9.1
18.	The atmosphere here is richly stimulating and motivating	11.7
19.	Time is available to explore new ideas here	27.3
20.	People here often engage in laughter	15.6
21.	People here often exchange opposing viewpoints	7.8
22.	People here make decisions on their own to a fairly large extent	3.9
23.	People desire to improve the quality of work here	29.9
24.	It is common here to have people plot against each other	5.2
25.	People here feel they can take bold action even if the outcome is unclear	3.9
26.	People here are usually accepting of new ideas	22.1
27.	People are committed to solving problems here	23.4
28.	People here have enough time to think about their ideas	16.9
29.	A playful atmosphere prevails here	3.9
30.	There is a good deal of tension here due to prestige differences	11.7
31.	A wide variety of viewpoints are expressed here	15.6
32.	People here often venture into unknown fields or areas	9.1
33.	Most people here prioritize their own work to a rather large extent	11.7
34.	People here do not talk behind each others' backs	13.0
35.	The pace of work here allows for the testing of new ideas	14.3
36.	Good-natured joking and teasing occurs frequently here	6.5
37.	People generally share their ideas here because they are listened to and encouraged	11.7
38.	People here often discuss different points of view	11.7
39.	People here take a sincere interest in their work	20.8

40. People here tend to define their own work projects	5.2
41. People here are likely to put forward new or untested ideas	5.2
42. People here feel free to take individual initiatives	18.2
43. The atmosphere is easygoing and lighthearted	13.0
44. There are power and territory struggles here	11.7
45. People here often confide in each other	3.9
46. The atmosphere here is filled with gossip and slander	7.8
47. Initiative often receive a favourable response here so people feel encouraged to generate new ideas	23.4
48. There is no fear of being "stabbed in the back" here	10.4
49. It is possible to discuss different ideas and opinions here	27.3
50. Most people have time to think through new ideas here	19.5
51. People here act in an open and sincere manner	28.6
52. People make changes here even when results are uncertain	1.3
53. People here try to live up to their commitments	19.5

Table 2: Percent distribution of reply (3='applicable to high degree') to Climate dimensions in descending order

Question items	% of reply for 3='applicable to high degree'
Most people here enjoy contributing to the success of organization	32.5
People here receive support and encouragement when presenting new ideas	29.9
People usually feel welcome when presenting new ideas here	29.9
People desire to improve the quality of work here	29.9
People here act in an open and sincere manner	28.6
Time is available to explore new ideas here	27.3
It is possible to discuss different ideas and opinions here	27.3
People are committed to solving problems here	23.4
Initiative often receive a favourable response here so people feel encouraged to generate new ideas	23.4
People here are usually accepting of new ideas	22.1
Most people here strive to do a good job	20.8
People here take a sincere interest in their work	20.8
Most people have time to think through new ideas here	19.5
People here try to live up to their commitments	19.5
One has the opportunity to stop work here in order to test new ideas	18.2
People here feel free to take individual initiatives	18.2
Differences of opinion are frequently expressed here	16.9
People here feel deeply committed to their jobs	16.9
People here have enough time to think about their ideas	16.9
There are quite a few people here who cannot tolerate each other	15.6
People here often engage in laughter	15.6
A wide variety of viewpoints are expressed here	15.6
There is great deal of personal tension here	14.3
Many different points of view are shared here during discussion	14.3
The pace of work here allows for the testing of new ideas	14.3
People here exhibit a sense of humour	13.0
People here have fun when they work	13.0
People here do not talk behind each others' backs	13.0
The atmosphere is easygoing and lighthearted	13.0
The atmosphere here is richly stimulating and motivating	11.7
There is a good deal of tension here due to prestige differences	11.7
Most people here prioritize their own work to a rather large extent	11.7
People generally share their ideas here because they are listened to and encouraged	11.7
People here often discuss different points of view	11.7
There are power and territory struggles here	11.7
There is no fear of being "stabbed in the back" here	10.4
The work atmosphere here is filled with energy	9.1
People here can move forward even in the face of uncertainty	9.1
Most people here usually control their own work	9.1
People here often venture into unknown fields or areas	9.1
People here make their own choices about their daily work	7.8
Flexible time-lines allow people here to consider alternatives	7.8

People here often exchange opposing viewpoints	7.8
The atmosphere here is filled with gossip and slander	7.8
Good-natured joking and teasing occurs frequently here	6.5
It is common here to have people plot against each other	5.2
People here tend to define their own work projects	5.2
People here are likely to put forward new or untested ideas	5.2
People here make decisions on their own to a fairly large extent	3.9
People here feel they can take bold action even if the outcome is unclear	3.9
A playful atmosphere prevails here	3.9
People here often confide in each other	3.9
People make changes here even when results are uncertain	1.3

Correlations

		Challenge Involvement	Freedom	Trust Openness	IdeaTime	Playfulness Humor	Conflict	IdeaSupport	Debate	RiskTak Risk-Tak
ChallengeInvolvement	Pearson Correlation	1								
	N	77								
Freedom	Pearson Correlation	.592	1							
	Sig. (2-tailed)	.000								
	N	77	77							
TrustOpenness	Pearson Correlation	.701	.559	1						
	Sig. (2-tailed)	.000	.000							
	N	77	77	77						
IdeaTime	Pearson Correlation	.598	.619	.529	1					
	Sig. (2-tailed)	.000	.000	.000						
	N	77	77	77	77					
PlayfulnessHumor	Pearson Correlation	.487	.521	.534	.549	1				
	Sig. (2-tailed)	.000	.000	.000	.000					
	N	77	77	77	77	77				
Conflict	Pearson Correlation	-.421	-.166	-.246	-.239	-.046	1			
	Sig. (2-tailed)	.000	.149	.031	.036	.693				
	N	77	77	77	77	77	77			
IdeaSupport Idea-Support	Pearson Correlation	.713	.478	.563	.666	.398	-.486	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000			
	N	77	77	77	77	77	77	77		
Debate	Pearson Correlation	.706	.622	.623	.687	.672	-.150	.729	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.192	.000		
	N	77	77	77	77	77	77	77	77	
RiskTaking	Pearson Correlation	.594	.519	.513	.556	.594	.014	.468	.605	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.906	.000	.000	
	N	77	77	77	77	77	77	77	77	

The SOQ Frequency Tables

goodjob

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.3	1.3	1.3
	1	9	11.7	12.0	13.3
	2	49	63.6	65.3	78.7
	3	16	20.8	21.3	100.0
	Total	75	97.4	100.0	
Missing	System	2	2.6		
Total		77	100.0		

workatmos

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.3	1.3	1.3
	1	23	29.9	29.9	31.2
	2	46	59.7	59.7	90.9
	3	7	9.1	9.1	100.0
	Total	77	100.0	100.0	

testidea

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	6	7.8	7.8	7.8
	1	30	39.0	39.0	46.8
	2	27	35.1	35.1	81.8
	3	14	18.2	18.2	100.0
	Total	77	100.0	100.0	

tension

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	13	16.9	16.9	16.9
	1	27	35.1	35.1	51.9
	2	26	33.8	33.8	85.7
	3	11	14.3	14.3	100.0
	Total	77	100.0	100.0	

viewshare

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	17	22.1	22.1	22.1
	2	49	63.6	63.6	85.7
	3	11	14.3	14.3	100.0
	Total	77	100.0	100.0	

ownchoice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	8	10.4	10.5	10.5
	1	21	27.3	27.6	38.2
	2	41	53.2	53.9	92.1
	3	6	7.8	7.9	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

humour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	6	7.8	7.8	7.8
	1	24	31.2	31.2	39.0
	2	37	48.1	48.1	87.0
	3	10	13.0	13.0	100.0
	Total	77	100.0	100.0	

ntolerate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	21	27.3	27.3	27.3
	1	28	36.4	36.4	63.6
	2	16	20.8	20.8	84.4
	3	12	15.6	15.6	100.0
	Total	77	100.0	100.0	

encourage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.6	2.6
	1	18	23.4	23.4	26.0
	2	34	44.2	44.2	70.1
	3	23	29.9	29.9	100.0
	Total	77	100.0	100.0	

diffopinion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.6	2.6
	1	25	32.5	32.5	35.1
	2	37	48.1	48.1	83.1
	3	13	16.9	16.9	100.0
	Total	77	100.0	100.0	

contribute

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	4	5.2	5.2	5.2
	1	19	24.7	24.7	29.9
	2	29	37.7	37.7	67.5
	3	25	32.5	32.5	100.0
	Total	77	100.0	100.0	

flexibletime

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	10	13.0	13.0	13.0
	1	25	32.5	32.5	45.5
	2	36	46.8	46.8	92.2
	3	6	7.8	7.8	100.0
	Total	77	100.0	100.0	

funatwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	7	9.1	9.2	9.2
	1	25	32.5	32.9	42.1
	2	34	44.2	44.7	86.8
	3	10	13.0	13.2	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

newideas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	18	23.4	23.7	23.7
	2	35	45.5	46.1	69.7
	3	23	29.9	30.3	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

moveon

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	6.5	6.5	6.5
	1	32	41.6	41.6	48.1
	2	33	42.9	42.9	90.9
	3	7	9.1	9.1	100.0
	Total	77	100.0	100.0	

commited

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	3.9	3.9	3.9
	1	18	23.4	23.7	27.6
	2	42	54.5	55.3	82.9
	3	13	16.9	17.1	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

controlwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.3	1.3	1.3
	1	29	37.7	38.2	39.5
	2	39	50.6	51.3	90.8
	3	7	9.1	9.2	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

motivating

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	7	9.1	9.1	9.1
	1	25	32.5	32.5	41.6
	2	36	46.8	46.8	88.3
	3	9	11.7	11.7	100.0
	Total	77	100.0	100.0	

timeavailabl

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	4	5.2	5.2	5.2
	1	26	33.8	33.8	39.0
	2	26	33.8	33.8	72.7
	3	21	27.3	27.3	100.0
	Total	77	100.0	100.0	

laughter

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	7	9.1	9.3	9.3
	1	29	37.7	38.7	48.0
	2	27	35.1	36.0	84.0
	3	12	15.6	16.0	100.0
	Total	75	97.4	100.0	
Missing	System	2	2.6		
Total		77	100.0		

opositview

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.6	2.6
	1	33	42.9	42.9	45.5
	2	36	46.8	46.8	92.2
	3	6	7.8	7.8	100.0
	Total	77	100.0	100.0	

owndicision

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	11	14.3	14.3	14.3
	1	35	45.5	45.5	59.7
	2	28	36.4	36.4	96.1
	3	3	3.9	3.9	100.0
	Total	77	100.0	100.0	

qualitywork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.6	2.6
	1	18	23.4	23.4	26.0
	2	34	44.2	44.2	70.1
	3	23	29.9	29.9	100.0
	Total	77	100.0	100.0	

plotagainst

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	30	39.0	40.5	40.5
	1	23	29.9	31.1	71.6
	2	17	22.1	23.0	94.6
	3	4	5.2	5.4	100.0
	Total	74	96.1	100.0	
Missing	System	3	3.9		
Total		77	100.0		

boldaction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	13	16.9	17.1	17.1
	1	37	48.1	48.7	65.8
	2	23	29.9	30.3	96.1
	3	3	3.9	3.9	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

acceptidea

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.3	1.3	1.3
	1	19	24.7	24.7	26.0
	2	40	51.9	51.9	77.9
	3	17	22.1	22.1	100.0
	Total	77	100.0	100.0	

solveproblm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	18	23.4	23.4	23.4
	2	41	53.2	53.2	76.6
	3	18	23.4	23.4	100.0
	Total	77	100.0	100.0	

thinktime

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	6.5	6.5	6.5
	1	21	27.3	27.3	33.8
	2	38	49.4	49.4	83.1
	3	13	16.9	16.9	100.0
	Total	77	100.0	100.0	

playful

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	11	14.3	14.3	14.3
	1	32	41.6	41.6	55.8
	2	31	40.3	40.3	96.1
	3	3	3.9	3.9	100.0
	Total	77	100.0	100.0	

prestigediff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	23	29.9	29.9	29.9
	1	33	42.9	42.9	72.7
	2	12	15.6	15.6	88.3
	3	9	11.7	11.7	100.0
	Total	77	100.0	100.0	

variedviews

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	6.5	6.6	6.6
	1	24	31.2	31.6	38.2
	2	35	45.5	46.1	84.2
	3	12	15.6	15.8	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

unknownarea

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	13	16.9	17.1	17.1
	1	36	46.8	47.4	64.5
	2	20	26.0	26.3	90.8
	3	7	9.1	9.2	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

prioritizwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	13	16.9	17.6	17.6
	1	29	37.7	39.2	56.8
	2	23	29.9	31.1	87.8
	3	9	11.7	12.2	100.0
	Total	74	96.1	100.0	
Missing	System	3	3.9		
Total		77	100.0		

nobacktalk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	17	22.1	22.4	22.4
	1	34	44.2	44.7	67.1
	2	15	19.5	19.7	86.8
	3	10	13.0	13.2	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

pacework

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	6.5	6.5	6.5
	1	25	32.5	32.5	39.0
	2	36	46.8	46.8	85.7
	3	11	14.3	14.3	100.0
	Total	77	100.0	100.0	

jokentease

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	10	13.0	13.2	13.2
	1	29	37.7	38.2	51.3
	2	32	41.6	42.1	93.4
	3	5	6.5	6.6	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

listenedto

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.6	2.6
	1	25	32.5	32.5	35.1
	2	41	53.2	53.2	88.3
	3	9	11.7	11.7	100.0
	Total	77	100.0	100.0	

discusview

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.7	2.7
	1	29	37.7	38.7	41.3
	2	35	45.5	46.7	88.0
	3	9	11.7	12.0	100.0
	Total	75	97.4	100.0	
Missing	System	2	2.6		
Total		77	100.0		

workinterst

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.6	2.7	2.7
	1	19	24.7	25.3	28.0
	2	38	49.4	50.7	78.7
	3	16	20.8	21.3	100.0
	Total	75	97.4	100.0	
Missing	System	2	2.6		
Total		77	100.0		

ownproject

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	6.5	6.8	6.8
	1	31	40.3	41.9	48.6
	2	34	44.2	45.9	94.6
	3	4	5.2	5.4	100.0
	Total	74	96.1	100.0	
Missing	System	3	3.9		
Total		77	100.0		

untestdidea

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	4	5.2	5.5	5.5
	1	32	41.6	43.8	49.3
	2	33	42.9	45.2	94.5
	3	4	5.2	5.5	100.0
	Total	73	94.8	100.0	
Missing	System	4	5.2		
Total		77	100.0		

indivinitiativ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	6.5	6.6	6.6
	1	22	28.6	28.9	35.5
	2	35	45.5	46.1	81.6
	3	14	18.2	18.4	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

lighthearted

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	10	13.0	13.2	13.2
	1	25	32.5	32.9	46.1
	2	31	40.3	40.8	86.8
	3	10	13.0	13.2	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

powerstrugl

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	14	18.2	18.4	18.4
	1	28	36.4	36.8	55.3
	2	25	32.5	32.9	88.2
	3	9	11.7	11.8	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

confide

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	16	20.8	21.3	21.3
	1	33	42.9	44.0	65.3
	2	23	29.9	30.7	96.0
	3	3	3.9	4.0	100.0
	Total	75	97.4	100.0	
Missing	System	2	2.6		
Total		77	100.0		

gossip

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	26	33.8	34.2	34.2
	1	28	36.4	36.8	71.1
	2	16	20.8	21.1	92.1
	3	6	7.8	7.9	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

favorablresp

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	28	36.4	37.8	37.8
	2	28	36.4	37.8	75.7
	3	18	23.4	24.3	100.0
	Total	74	96.1	100.0	
Missing	System	3	3.9		
Total		77	100.0		

nobackstab

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	14	18.2	18.4	18.4
	1	29	37.7	38.2	56.6
	2	25	32.5	32.9	89.5
	3	8	10.4	10.5	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

discusidea

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	22	28.6	28.9	28.9
	2	33	42.9	43.4	72.4
	3	21	27.3	27.6	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

thinknew

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	3.9	4.1	4.1
	1	26	33.8	35.1	39.2
	2	30	39.0	40.5	79.7
	3	15	19.5	20.3	100.0
	Total	74	96.1	100.0	
Missing	System	3	3.9		
Total		77	100.0		

sincere

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	6	7.8	7.9	7.9
	1	13	16.9	17.1	25.0
	2	35	45.5	46.1	71.1
	3	22	28.6	28.9	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

makechange

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	9	11.7	11.8	11.8
	1	21	27.3	27.6	39.5
	2	45	58.4	59.2	98.7
	3	1	1.3	1.3	100.0
	Total	76	98.7	100.0	
Missing	System	1	1.3		
Total		77	100.0		

comitment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.3	1.3	1.3
	1	21	27.3	28.0	29.3
	2	38	49.4	50.7	80.0
	3	15	19.5	20.0	100.0
	Total	75	97.4	100.0	
Missing	System	2	2.6		
Total		77	100.0		