

KNOWLEDGE MANAGEMENT IN KNOWLEDGE-INTENSIVE
ORGANIZATIONS: AN INVESTIGATION OF FACTORS INFLUENCING CHOICES
OF KNOWLEDGE MANAGEMENT SYSTEMS

by

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Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

at

Dalhousie University
Halifax, Nova Scotia
May 2012

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DALHOUSIE UNIVERSITY

INTERDISCIPLINARY PhD PROGRAM

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DALHOUSIE UNIVERSITY

DATE: May 25, 2012

AUTHOR: Joyline Musimwa-Makani

TITLE: KNOWLEDGE MANAGEMENT IN KNOWLEDGE-INTENSIVE
ORGANIZATIONS: AN INVESTIGATION OF FACTORS
INFLUENCING CHOICES OF KNOWLEDGE MANAGEMENT
SYSTEMS

DEPARTMENT OR SCHOOL: Interdisciplinary PhD Program

DEGREE: Ph.D. CONVOCATION: October YEAR: 2012

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DEDICATION PAGE

I dedicate this dissertation to the memory of my beloved parents, Simon Kwadzanai Musimwa and Rose Irikidzai Musimwa, who worked hard despite economic and political hardships to send their four children to school, and have always been my source of inspiration, encouragement, and love.

And to my supervisor and mentor Dr. Sunny Marche, who strongly believed in me, will dearly be missed and will remain forever my conscience.

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ABSTRACT

In today's economy the importance of knowledge in organizations is well underscored. The management of an organization's knowledge has become one of the most important strategic vehicles to an organization's sustainable competitive advantage. The design and success of knowledge management systems (KMS) is viewed as the next evolutionary step in the management of knowledge processes and activities. The debate over the efficacy of these systems draws attention to the differences in approach to KMS that may develop among organizations whose employees' work involves primarily the execution of procedural routines and those who are involved in primarily creative, problem solving work. This study explored empirically the factors defining Knowledge-intensive Organizations (KIOs) and related these factors to the choices of KMS deployed in these organizations. The study was conducted in two phases and employed both quantitative and qualitative methodologies for data collection. Survey and document analysis techniques were used in the first phase of the study which examined KIO defining factors, how they relate to each other, and how they contribute to knowledge intensity in KIOs. In the second phase semi-structured, in-depth interviews and survey techniques were employed. Grounded theory method (Glaser & Strauss, 1967) was then utilized to uncover how knowledge-intensive defining factors interlace with the choice of KMS deployed in KIOs. The interviews were analyzed using QSR NVivo 9 qualitative data analysis software. Quantitative computations were carried out using the PASW Statistics 17.0 package. The study found that KIOs are described by unique knowledge-intense attributes and these attributes inform the design and choices of KMS implemented in KIOs. This research contributes to the literature on factors that describe knowledge intensity in organizations. It provides the research community with a new articulation of the underpinnings of KIOs and KMS, an important step in advancing subsequent theoretical developments. The study might also have practical value for sellers and systems designers who are looking at assessing user demand for new KMS design ideas and for decision makers within KIOs who would like to evaluate the offerings of sellers.

LIST OF ABBREVIATIONS USED

CCA	Canonical Correlation Analysis
CoPs	Communities of Practice
ICKM	International Conference on Knowledge Management
ICT	Information and communication technology
IM	Information management
KBOs	Knowledge-based Organizations
KIFs	Knowledge-intensive Firms
KIOs	Knowledge-intensive Organizations
KM	Knowledge Management
KMS	Knowledge Management Systems
KROs	Knowledge Rich Organizations
MBA	Master of Business Administration
MLIS	Master of Library and Information Studies
MVA	Missing values analysis
SECI	Socialization, externalization, combination, and internalization model

ACKNOWLEDGEMENTS

I will forever be thankful to my PhD supervisor, Dr. Sunny Marche. I thank Dr. Marche dearly for the insightful discussions about the research and for selflessly providing me with helpful advice many times on academics, and life in general, advice that I will forever cherish. Sunny was the funniest advisor and one of the smartest people I know. It was a real honour to be his PhD student. I still think fondly of my time as a PhD student in his office. He was and will always remain my best role model for an academic, business professional, mentor, and teacher. His enthusiasm and love for research, writing and teaching was truly contagious. I will dearly miss him.

I am also very grateful to Dr. Jack Duffy (my MBA professor and the first Keeper of the Interdisciplinary PhD program) for his advice and knowledge on statistics and many insightful discussions and suggestions. Jack was my primary resource for getting my quantitative analysis questions answered and was instrumental in helping me, during the saddest of saddest times, to crank out the revisions to this dissertation, and making sure it is all done within the stated dead line. Thank you Jack!

The good advice, support, and friendship of Dr. Raza Abidi (my thesis co-supervisor) and Dr Louise Spiteri (committee member), has been invaluable on both an academic and a personal level, for which I am deeply grateful. From my dissertation journey outset, they provided very practical suggestions on my proposal and responded rapidly to the twists and turns. I am also extremely grateful to the other two members of my oral defense committee, Dr. Dawn Jutla (Reader) and Dr. Darren Meister (External Examiner) for their time, interest, insightful questions, and helpful comments.

A good support system is key to surviving and staying sane as a graduate student. I was lucky to have the support system of my work colleagues and numerous friends. I thank my work colleagues and friends (too many to list here but you know who you are!) for providing friendship and support that I needed. I also thank Dr. Marina Pluzhenskaya (ID PhD Graduate Coordinator) who smoothed the way for many of my adventures in academia. I thank her for her valuable advice and friendly help.

I especially lovingly thank my family for giving me unequivocal support throughout. Special thanks go to my beloved husband, Ferdinand Rungano, and my dear son, Munyaradzi, without whom I would be a different person today, and it would certainly have been difficult for me to finish a PhD. I was kept sane by your unselfish love, as practical as it was heartfelt. My sister, Peace Mvududu, has been my best friend all my life and I thank her for all her love, advice and support. To my niece, Ruvimbo, and cousin Tecler, thanks for being there for me. Rue, thanks for cooking nourishing food and help with household chores when I was too tired and too sleepy from burning the midnight candle. To my two brothers, and all my in-laws, thank you for being my cheerleaders throughout this journey. I know I always have my family to count on when times are rough. I love you all dearly. Thank you!

1.1 BACKGROUND

Although knowledge management (KM) as a discipline is still evolving (McElroy & Firestone, 2003) its importance as a topic of interest among academicians and practitioners is well underscored. Recently Hislop (2010) carried out a systematic evaluation of the level of interest in the topic of knowledge management for the past fifteen years, from which he concluded that “knowledge management has evolved into a legitimate academic discipline in its own right” (p. 787). This viewpoint has been affirmed by a number of scholars who acknowledge the advent of a knowledge-based economy in which knowledge has become an asset, i.e., a means for creating value through innovation of products and services sustainable over time (Hislop, 2009; Mehrizi & Bontis, 2009; Marquart, 2006; Gold, Maholtra, & Segars, 2001). As Ikujiro Nonaka (1994) observed “in an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge”. Not surprisingly, there is substantial agreement in the literature that the management of an organization’s knowledge has become one of the most important strategic vehicles to an organization's sustainable competitive advantage. Back in 1999, for instance, the American Management Association, as cited by Sasson and Douglas (2006), reported that more than one-third of major US companies had formal KM programs in place. More recently a study by researchers at the Conference Board of Canada concluded that “American businesses, as a whole, invest more in their own intangible assets than in tangible assets like plants and equipment, indicating a major shift toward a knowledge-based economy” (Hao, et al., 2011).

Nevertheless, explicitly recognizing knowledge as a corporate asset is new, and so is understanding the need to “manage and invest it with the same care paid to getting value from other, more tangible assets” (Davenport & Prusak, 1998). One of the responses of modern organizations to the current KM evolution and pressures is to introduce systems and tools that can help them manage knowledge as an asset. A number of companies have acknowledged putting in place a new class of application systems, referred to as

knowledge management systems (KMS), which support KM activities (Lee & Van den Steen, 2010; Goel & Mousavidin, 2008; Alavi & Leidner, 2001; Benbya, 2008; Ruiz-Mercader et al., 2006). KMS are the type of systems specifically designed to manage organizational knowledge intended to facilitate organizational learning and enable users to assign meaning to information and to capture some of their knowledge in information and data (Goel & Mousavidin, 2008; Alavi & Leidner, 2001; Damodaran & Olphert, 2000). But research into the efficacy of KMS reveals that many of these systems have been unsuccessful (Schultze & Boland, 2000; Ruiz-Mercader et al., 2006, Stenmark, & Lindgren, 2004). Some scholars have argued that KMS' low success rates are, in part, attributable to the systems' failure to address sufficiently the needs of the knowledge workers and their situated work practices (Storey & Barnett, 2000; Schultze & Boland, 2000). Some have ascribed KMS failure to an imbalance between additional workload and accurate content "resulting in systems of little use for organizations in their knowledge application processes" (Stenmark & Lindgren, 2004, p. 1). More importantly consideration of KMS effectiveness cannot be fully understood outside its organizational context.

The question about the efficacy of KMS becomes more urgent when knowledge is used to define the distinct activities and attributes of organizations. The literature reveals that for some organizations knowledge is the key to success and the differentiating element, i.e., knowledge is used as "the means of production". In other words, when the focus is on innovation and growth, knowledge as an intangible asset is an indispensable part of the picture. Hence, phrases such as "knowledge-intensive organizations" (KIOs), "knowledge-intensive firms" (KIFs), and "knowledge-based organizations" (KBOs) have found common usage in the literature, describing the distinct activities and attributes of these organizations (Makani & Marche, 2010). Starbuck (1992), for instance, who is credited with having introduced the concept of KIOs, describes KIOs as organizations in which knowledge is more important than other inputs. Unlike traditional organizations, KIOs use knowledge as their raw material to produce products and services and thus, their competitive advantage is based largely on innovation and knowledge workers' creativity. The question, therefore, is what type of systems should be employed with the

intent to manage knowledge in organizations in this new economy and should the choice of these systems be determined by organization type as defined by its level of knowledge-intensity?

Investments in KMS cannot be fully understood in isolation from the organizational context of managerial decision-making. The literature notes that traditional management systems and tools stifle the progress of innovation fundamental to organizations in the new economy (Amar, 2002; Jelinek & Litterer, 1995). There is also a general acknowledgement among academics and practitioners that systems or applications that work best in traditional organizations are different from those in KIOs (Amar, 2002; Nurmi, 1999; Levin, 1999). Levin (1999) affirms this and pointed out that the choice of the management systems and tools employed in organizations is fundamental to the organization's success. Thus, "it would be a mistake to regard the new generation of information and communication technologies, as neutral tools that can merely be grafted onto existing work systems" (Blackler, 1995, p. 1031). Consistent with this viewpoint, one would therefore, expect to find successful KMS in KIOs in which the need for special KM tools to support innovative growth opportunities is strongly pronounced. One might also expect that one of the key drivers to competitive success in KIOs is their choice of knowledge management systems (KMS). It is therefore also prudent for one to question whether the level of the organization's knowledge-intensity have an impact on KMS choice.

However, as Alavi and Leidner (1999) observed little research and insight exist to guide the successful development and implementation of KMS, or to frame expectations of the costs and benefits of such systems. The debate on the knowledge-intensity of organizations, as reviewed in the next chapter, draws attention to the differences in approach to KMS that may develop among organizations whose employees' work involves primarily the execution of procedural routines and those who are involved in primarily creative, problem-solving work. Little is presented in the existing academic literature on the ways in which organizations' understanding of their activities and the contexts in which their workers work influence the organizations' choice and application

of KMS. Very few studies empirically explore the management of knowledge and the accompanying KMS in specific organization types. Furthermore, specific to KIOs, research and analysis on the efficacy of KMS is in its infancy. Beyond case studies and anecdotes, empirical research exploring knowledge management and KMS in knowledge-intensive organizations is limited. Of particular interest to this research, therefore, is the way in which factors that differentiate KIOs from other traditional organizations interlace with managerial decisions, and specifically managerial choice of KMS in KIOs.

For my research, in order to understand fully KM and the accompanying KMS in KIOs, I view organizational knowledge as existing in activity systems (Blackler, 1993) in which knowledge workers create, use, and share knowledge in context (Blackler, 1995; Spender, 1996). Business processes or KIO knowledge processes “ultimately break down to activities” (Firestone & McElroy, 2003, p. 49). The theory of organizations as activity systems, as presented by Blackler (1993), is useful for exploring the nature of knowledge work, organizational competencies, and organizational learning as factors that differentiate KIOs from traditional organizations. Blackler’s (1993) modeling of organizations as settings for activity provides a good theoretical foundation for the empirical investigation of KM, and the accompanying KMS, in KIOs. Most importantly to this study are the relations between workers, the community of which they are members and the conceptions people have of their activities. As Blackler (1995) noted, such relations are mediated by other factors, including technologies, implicit and explicit rules, system roles, and the division of labour adopted by the community. In essence, the theory of organizations as activity systems reinforces the relational view to knowledge management (Tsoukas, 2001; Hayes & Walsham, 2003) and social constructionist themes explained below, by presenting organizations as activity systems that are “embedded within, and maintained and restricted by, a broad external network of activity systems” (Blackler, 1993, p. 18). The activity systems theoretical concept, therefore, provides an organizational framework for analyzing the interrelatedness of the KIO defining factors and how they define knowledge-intensity in KIOs.

Within KIOs knowledge is regarded as the most important asset and a “balance sheet item to preserve’ improve, develop, acquire and guard” (Sveiby, 1999). The choice of effective knowledge management systems to support the management of knowledge, thus, plays an important role in overall organizational success. In general, there are many approaches to the management of knowledge in organizations, demanding different supportive systems. In other words when choosing knowledge management systems there is no one size fits all. Effective knowledge management in KIOs requires that decision makers in these organizations understand the different knowledge processes underlying use and production of knowledge and choose appropriate knowledge management systems to support these processes. In this study I subscribe to the two-phased approach to the management of knowledge in KIOs, as advanced by Desouza & Awazu (2005), i.e., knowledge creation and knowledge commercialization phases. Important here is the observation that the two phases require different management approaches and that the systems that are put in place to manage knowledge in these two environments might therefore be different. In KIOs, for example, knowledge creation requires an environment that is fluid and nurtures creativity, debate and the creation of new ideas. Thus, a clear understanding of how knowledge is shared, stored, transferred, and applied, as well as an understanding of the innovative processes surrounding the transformation of an idea to an innovative product is important for choosing effective KMS. Desouza & Awazu (2005)’s two phased approach, therefore, provides an important platform for me to explore knowledge-intensive factors as they relate to the two different environments’ processes and activities and to the choices of KMS deployed.

However, before one can explore KM and KMS in KIOs one needs to define factors that differentiate KIOs from other organizations. A review of the literature reveals a lack of consensus among scholars and practitioners on the definition of a KIO. There is no widely used or agreed definition of the concept “knowledge-intensive organization” or “knowledge-intensive firm”. Although the term knowledge-intensive is used extensively to describe certain organizations, such as consulting firms and law firms (Starbuck 1992; Blackler, (1995); Alvesson 2004; Ichijo and Nonaka 2007; Sveiby and Lloyd 1988; Nurmi 1999; Sheehan 2002), the literature reveals discrepancies in the characterization of

these organizations. Clarifying this is one of the main purposes of this dissertation. From an organizational KM perspective, the varying conceptions of KIOs presented in the literature might imply that each perspective requires a different organizational strategy for KM and a different perspective of the choice of KMS in support of KM activities. Hence this study is conducted in two phases. First, I explore the factors that might define these organizations as KIOs. In other words this study first empirically tests the prevailing theoretical propositions on the factors that differentiate KIOs from other traditional organizations. The focus is on trying to understand what a KIO is, and defining KIO typologies. On the basis of the evidence drawn from the first phase of the study, the second phase assesses the relationship between KIOs' most salient defining factors and the choice of KMS.

1.2 RESEARCH GOAL

The goal of this research study is to contribute to the theory of KM and knowledge translation through KMS success within KIOs. The literature asserts that knowledge is a defining factor for KIOs and a critical asset for promoting the organization's future performance; it is therefore vital that indicators and metrics be developed to advance our theoretical understanding of the success vectors for KMS. The general purpose of this study is to empirically explore and relate KIOs as an organization type to the choice of KMS employed in these organizations. But in order to advance any theory about the relationship between choice of KMS and knowledge intensity in the organization, one question is fundamental: "what differentiates a KIO from a non-KIO"? The study therefore first explores the limited prevailing theoretical propositions on the factors that differentiate KIOs from other traditional organizations. The following specific objectives guide the study:

1. To identify, with the help of the professional and theoretical communities, the knowledge-intense factors that differentiates knowledge-intensive from non-knowledge-intensive organizations.
2. To examine whether the knowledge-intense defining factors inform the choices of KMS in KIOs.

3. To specify a correlation model of the knowledge-intensive defining factors and an organization's choice of KMS.
4. To develop a framework that allows a proactive examination of possible KMS choices and KM activities and process outcomes based on the correlation model under different KIOs scenarios.

In keeping with these objectives the research questions of the study are:

1. What factors distinguish KIOs from non-KIOs?
2. How do these defining factors relate to each other and contribute to knowledge intensity in KIOs?
3. How do KIOs' defining factors relate to the choice of KMS?
4. In what way do the KIO organizational knowledge attributes and knowledge worker activities inform the choice and application of KMS?

1.3 RESEARCH SIGNIFICANCE

Since the early 1990s the field of knowledge management (KM) has developed a large body of research regarding the management of knowledge in organizations. However, with regard to knowledge-intensive organizations, a major limitation of the KM literature is that most of the body of knowledge on these organizations has been limited to conceptual work, or in the case of dissertations that have recently been produced, an exploration of individual case studies (Keyes, 2008). This study, therefore, goes beyond the prevailing knowledge management anecdotes and case studies by collecting data from a population with diverse organizational experience, and empirically explore, using a mixed methods approach, whether the factors that differentiate KIOs from traditional organizations are an important ingredient in the choice of KMS. The study is based on an understanding of the prevailing knowledge-intense factors defining KIOs. Such factors represent valuable considerations informing knowledge management decisions in KIOs, specifically decisions pertaining to the choices KMS deployed in these organizations. Furthermore, the analysis of the study is modeled on the concept of organizations as activity systems, which provides a more wholistic and general perspective of knowledge management system choices in KIOs.

This study will, therefore, make several contributions to the existing theory of knowledge management in organizations. It will make available to the research community a new articulation of the underpinnings of KIOs and thus contribute to the literature on factors that define knowledge intensity in organizations; this is an important step in advancing subsequent theoretical developments. Second, the study will go beyond the prevailing knowledge management anecdotes and case studies by presenting empirical research exploring knowledge management systems in knowledge-intensive organizations. Third, the study will contribute to the knowledge management literature, where limited attention has been paid to the various ways knowledge-intense organizational and worker-related factors may influence KMS choices and adoption and ultimately organizational KM effectiveness. In summary, my study will seek to determine the factors associated with the decision to adopt and implement knowledge management systems in knowledge-intensive organizations.

This research will also have important practical implications for knowledge management managers and administrators who will be involved in selecting, adopting, and implementing KMS in KIOs. The research aims to advance the understanding of KM processes in KIOs. While KM has captured the interest of many researchers and practitioners, the evaluation of its success has remained problematic. The evidence shows that most organizations have been investing significant resources in KMS but have been disappointed with the results (Sasson and Douglas, 2006; Malhotra, 2000). As Benbya (2008) observed the majority of these organizations “have learned the hard way that investing in a KMS alone does not lead to sustainable improvement”, and that these investments have been shown to have little effect on the efficiency and effectiveness of knowledge workers. Instead most practitioners are realizing that they need to pay closer attention to the factors underlying knowledge workers’ activities and their subsequent use of KMS in order to optimize use and effectiveness.

By exploring the relationship between knowledge-intensive determining factors and adoption of KMS, this study will help KIO managers and practitioners to map out where and how best to apply scarce organizational resources. This study will also inform the

KM systems managers of the existence of different types of KMS and provide guidelines on which factors to consider when implementing a certain KMS type. The framework that allows proactive examination of possible KMS choices and KM process outcomes will provide valuable insight into how KM managers in organizations might improve the outcomes, efficiency, and effectiveness of their KM programs. In sum, the theoretical and empirical evidence of this study will have important implications for knowledge management theory. The management strategies for knowledge in organizations should be driven by the organization's underlying business processes, and the success of KMS in organizations is dependent on managing the integration of these business processes (Hansen, Nohria, & Tierney, 1999).

1.4 DISSERTATION OVERVIEW

Chapter 2 provides a review of the literature pertinent to the study of KMS in knowledge-intensive organizations. Included is a discussion of the extant literature on knowledge, knowledge management, knowledge worker, knowledge-intensive organizations, and knowledge management systems. By exploring the current state of the theoretical underpinnings of knowledge in general, knowledge management, knowledge workers, KIOs, and the management of knowledge in KIOs, I can determine areas that deserve further enquiry. Chapter 3 presents a conceptual model developed through a review of the literature. Also presented in chapter 3 is a proposed typology of KIOs which will be used as a basis for Phase 1 of this research. The research methodology will be presented in chapter 4, including the details of the research design and protocol. Chapter 5 provides a discussion of the research findings of Phases 1 and Phase 2 findings and discussion are presented in Chapter 6. Chapter 7 presents conclusions, recommendations and reflections.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The purpose of this chapter is to examine the scholarly contributions and the body of knowledge relevant to our understanding of knowledge-intensive organizations, and the factors underpinning the choice of knowledge management systems in these organizations.

2.2 UNDERSTANDING KNOWLEDGE

Many authors have identified confusion over terminology, demonstrated by the various ways that authors use the same word, as the core problem surrounding the successful development of appropriate expectations for system development or assessment.

Consequently, for this study the way we present and understand knowledge and its various associations has major implications for the choice and adoption of KMS in organizations. In order to understand managerial KM decisions and ways that KMS can support organizational KM activities, due consideration should be given to the discourses and theoretical views of knowledge as a concept and knowledge organizations.

Knowledge is not an easy concept to define and thus has been the subject of much study. A survey of the extensive literature in KM reveals varying definitions of knowledge as a concept; for instance, knowledge is defined as; “justified true belief” (Nonaka & Takeuchi, 1995, p. 58), “experience or information that can be communicated” (Allee, 1997, p. 27), “truths and beliefs, perspectives and concepts, judgements and expectations, methodologies and know-how” (Wiig, 1998), “a fluid mix of framed experience, values, contextual information, and expert insight” (Davenport & Prusak, 1998), and “actionable information” (Tiwana, 2001, p. 315).

Common in most of these definitions of knowledge is the reference to information. It is evident from the literature that a discursive relationship exists between knowledge and information. Some scholars, notably in information science and computer science, distinguish between knowledge and information. A few authors, however, do not differentiate between the two concepts, but use them interchangeably. Differentiating

between information and knowledge, however, is core to our understanding of the management of knowledge in KIOs, especially the choice of tools that are used. As Davenport and Prusak (1998) emphasized “data, information and knowledge are not interchangeable concepts” and confusion on how they differ and what they mean, can determine organizational success or failure. Tiwana (2001) concluded that equating information with knowledge is one of the fundamental mistakes that companies repeatedly make. It is thus worth exploring at this juncture the distinction between information and knowledge.

2.2.1 The Information and Knowledge Discourse

The first question to be answered is “What is the nature of the relationship between information and knowledge?” In order to clarify this relationship I will critically review the contemporary KM literature and explore the common and implicit assumptions within the information science, computer science, organizational theory, and strategic management communities.

We will start with Einstein’s famous affirmation, as cited by Zack (2002) that “Knowledge is experience. Everything else is just information.” For Einstein therefore, knowledge is not information. A number of scholars agree that information is not knowledge, making Einstein’s view of knowledge one of the foundational assertions underlying most scholars’ distinction between information and knowledge. There is also a common agreement among scholars that knowledge is more valuable than information and that there is a value added transformation from information to knowledge (Douglas, 2006; McNabb, 2007; Patnayakuni, Rai, & Tiwana, 2007; Alavi & Leidner, 2001; Carlisle, 2007; Stenmark, 2000; Tiwana, 2001). Knowledge is as a result defined as “information combined with experience, context, interpretation, and reflection” (Davenport, De Long, & Beers, 1998, p. 43). But one of the fundamental questions is can we assume that information is a form of knowledge?

Table 1 Contrasting views on data, information, & knowledge

Author(s)	Data	Information	Knowledge
Wiig	-	Facts organised to describe a situation or condition	Truths and beliefs, perspectives and concepts, judgements and expectations, methodologies and know-how.
Nonaka & Takeuchi	-	A flow of meaningful messages	Commitments and beliefs created from these messages
Spek & Spijkervet	Not yet interpreted symbols	Data with meaning	The ability to assign meaning
Davenport	Simple observations	Data with relevance and purpose	Valuable information from the human mind
Davenport & Prusak	A set of discrete facts	A message meant to change the receiver's perception	Experiences, values, expert insights, and contextual information
Quigley & Debons	Text that does not answer questions to a particular problem	Text that answers the questions who, when, what, or where	Text that answers the questions why and how
Choo et al.	Facts and messages	Data vested with meaning	Justified, true beliefs
Firestone & McElroy	Observable, measurable or calculable attributes	Data plus conceptual commitments & interpretations	Information that has been subjected to and that has passed tests and evaluations aimed at eliminating errors and seeking the truth.

(Stenmark, 2002)

Table 1, slightly modified from Dick Stenmark (2002), presents a variety of viewpoints from renowned scholars on some of the contrasting factors between the concepts, information and knowledge. Data is added as a third unique element that helps our understanding of knowledge in relation to information. It is clear that different authors define these terms in slightly different ways. From Table 1 Nonaka and Takeuchi can be singled out for presenting knowledge and information as “similar in some aspects, but

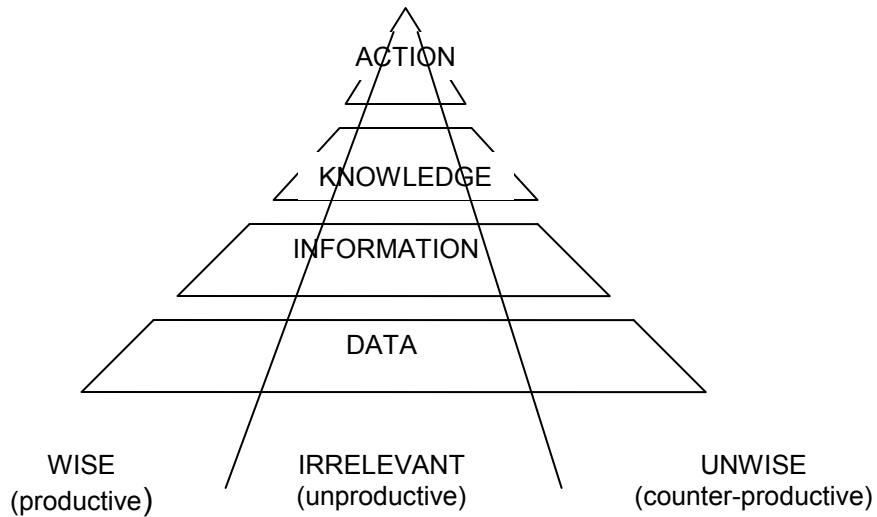
different in some: while information is more factual, knowledge is about beliefs and commitment” (Stenmark, 2002, p. 930). Information can be summarized as processed data that has been equipped with meaning while knowledge, simply put, is “actionable information” that emerges in people’s minds through their experiences (Tiwana, 2001, p. 315).

A number of scholars (Douglas, 2006; McNabb, 2007; Patnayakuni, Rai, and Tiwana, 2007; Alavi & Leidner, 2001; Carlisle, 2007; Stenmark, 2000; Tiwana, 2001), advancing on the observation by Davenport and Prusak (1998) that “knowledge is neither data nor information, though it is related to both,” have suggested that a hierarchical relationship exists among data, information, and knowledge. They place knowledge one step higher than information and two steps higher than data (Rowley, 2006). In this sequential view of data, information, and knowledge, knowledge is presented as “broader, deeper, and richer than data or information” (Davenport & Prusak, 1998). But as Allee observed, “any framework of knowledge that doesn't include wisdom requires us to operate blind” (cited in Rowley, 2006, p. 251). As a result a number of authors (e.g. Tuomi, 1999; Rowley, 2006) have included wisdom in what they call the “knowledge pyramid”, placing it at the top of the hierarchy.

However, for this study I question the inclusion of wisdom in the “knowledge pyramid”. Wisdom as presented in the KM literature is not conclusive. In fact very few of the numerous scholars on knowledge management even mention wisdom and those that do, mention it in the context of information and knowledge but rarely develop the argument further. Interestingly, as Rowley (2006) observed, an exploration of the variety of definitions and writings on wisdom reveals a preponderance of the word action and its contextualization relative to knowledge and wisdom. For instance Beck, (cited in Bierly et al., 2000) explores the position of wisdom in relation to both knowledge and action. Beck presents wisdom as consisting of both knowledge (understanding the truth) and action (doing what is good). Firestone and McElroy (2003) present wisdom as ambiguous as either “(a) a form of knowledge (i.e., also information) about doing what is right or (b) a kind of decision (in which case it’s not information, but a type of action in a business

process” (p. 19). More recently, Jashapara as well as Awad and Ghaziri, (cited in Rowley, 2006), define wisdom as “the ability to act critically or practically in a given situation” and “vision with action” respectively. Drawing from the various discussions and perspectives on wisdom, Rowley defines wisdom as the “capacity to put into action the most appropriate behaviour, taking into consideration what is known (knowledge) ...” (Rowley, 2006, p. 257). Rowley also noted that “wisdom is embedded in, or exhibited in action.” In line with this view, organizational wisdom is regarded as concerned with making decisions (judgements) intended to change the conduct of organizational actors, again emphasizing wisdom as an “action-oriented construct” (Bierly, Kessler, & Christensen, 2000, p. 3).

From a knowledge management viewpoint this is a useful presentation, for it can easily be adapted to the practice of achieving and sustaining competitive advantage as propounded in the knowledge-based theory of the firm. As Pfeffer and Sutton (2000) advanced, competitive advantage goes not to those who *have* the best knowledge, but to those who *use* knowledge best. This view is echoed by Bierly et al. (2000) who concluded that “success does not necessarily go to the firms that know the most, but to the firms that can make the best use of what they know ...” (p. 596). Grant (1996) concluded that the source of a firm’s competitive advantage resides in its ability to turn knowledge into action and less on knowledge itself. From these discussions therefore, the “action-based nature” of wisdom is underscored. One can thus conclude that for organizations, it is action that counts; not being wise but acting in a wise fashion. Instead of wisdom, I therefore would like to propose a new element to the knowledge discourse, i.e., action, as presented in Figure 1, which would greatly contribute to our understanding of knowledge and knowledge management in KIOs. The transformations or relationships between knowledge and action bear some consideration.



(Source: Marche, personal communication, February 7, 2011)

Figure 1 Data, Information, Knowledge, & Action Pyramid

As depicted in Figure 1 at the bottom of the “data, information, knowledge and action pyramid” is data, which is seen as raw values or content or objective facts; when these raw facts and values are put in context, and put into meaningful or interpreted messages they emerge as information. A step higher from information is knowledge defined as cognitive understanding, an ability to interpret and assign meaning to information, or the ability to explain why. Action, the ability to respond, project and predict consequences, and thereby make the best use of what we know is then placed at the top of the pyramid. From a KMS perspective it is important to note that at the bottom of each pyramid stage there is what one can describe as unwise, irrelevant and wise data, information or knowledge depending on one’s values and one’s judgment. The application of the action can only be called wise when data, information and knowledge are applied effectively in a situation. Incorrect application is at worst unwise, and at best irrelevant. Moreover, how knowledge is actually used in the organization depends on the organizational values. Also to a KM manager in the process of choosing a KMS, it is important to know the factors driving the value of the KMS in order to determine its fit in the organization. For effective KM it is critical that one employs KMS that act on wise data, information or knowledge that can then be put into useful action ensuring organizational success. As Lee

and Van den Steen (2010) concluded “a firm’s strategy in recording know-how may have an unexpected influence on its future ability to generate new knowledge” (p. 271).

Nevertheless, another question still needs an answer, i.e., is the relationship among these elements necessarily hierarchical? Some scholars dispute this hierarchical view of data, information, knowledge, and wisdom as it is presented. For instance, Tuomi (1999) posits an inverse hierarchical relationship: Data emerges as a result of adding value to information, while on the other hand information is knowledge that has been articulated and structured. In other words data emerges only after we have information, and information emerges only after we already have knowledge. Therefore knowledge should be the first step on the pyramid, a reverse hierarchy showing that knowledge “articulated, verbalized, and structured becomes information which, when assigned a fixed representation and standard interpretation, becomes data” (Alavi & Leidner, 2001, p. 3).

Stenmark (2002) observed that some inherent false assumptions underlie the hierarchical view to knowledge. First, the pyramid image presents the relationship as asymmetrical, “suggesting that data may be transformed into information, which may be transformed into knowledge, but it does not seem to be possible to go the other way”; it is too unidirectional. To Stenmark this presentation is incorrect “since we all on several occasions have used our knowledge to derive information and to create data out of information” (Stenmark, 2002, p. 4). He also noted that this hierarchical view of information and knowledge presents knowledge as more valuable and superior to information, a contention that he strongly refutes. Furthermore, underlying the hierarchical model is the conceptual assumption of “sequentiality; a process model where something simple is converted into something more complex and valuable” (Tuomi, 1999, p. 12). Davenport and Prusak (1998), for instance, ascribe to the sequential view of data, information, and knowledge by stating that data is transformed into information by adding value and that, “knowledge is broader, deeper, and richer than data or information.”

From a KMS perspective, critical to this hierarchical view of knowledge as a “higher form of information” is the underlying notion that knowledge has to be extracted from information. This underscores the input-output approach to knowledge management emanating from a systems perspective. For this study I partially subscribe to Judith Pinn Carlisle’s (2007) argument regarding the relationship among data, information, knowledge, and action. Although, as Carlisle acknowledges, a relationship does exist, I do not believe this relationship to be hierarchical. With regard to the management of knowledge activities and processes in KIOs it is not just a matter of transforming data into information, information into knowledge, and knowledge into action. In order to ensure successful choices of KMS to support effective KM in KIOs a more thorough understanding of the relationships among data, information, knowledge, and action is required. As Carlisle (2007) argues the hierarchy models can be criticized for presenting knowledge management under the purview of systems science, thereby emphasizing the “input-process-output view of data processing.” With this approach, according to Carlisle, the research agenda is predefined, that is, how to take information and transform it into knowledge. For the study of KMS choices in KIOs, therefore, I agree with Carlisle’s (2007) proposal that consideration should be given to the implication of the cognitive processes or the enabling of thoughtful action on the development and choices of KM systems. Carlisle credits cognitive processes for providing us with an indirect understanding of knowledge. As she concluded, since “hierarchies have become a troublesome concept that KM struggles under” more research needs to be done pertaining to cognitive processing models (Carlisle, 2007, p. 10). In this study data, information, knowledge, and action relationships are conceptualized in the context of knowledge worker processes and activities embedded within the organizational routines and established culture resulting in thoughtful action.

It is important to note that the hierarchical distinction among data, information, knowledge, and action does not fully represent this study’s view regarding these concepts. For the purpose of my study I posit that the relationship among data, information, knowledge, and action is not as simple as presented by the hierarchical model: It is not the one way or the other. As Stenmark pointed out data, information,

knowledge, and action are interwoven and interrelated in more complicated ways than the hierarchical view suggests. These entities “influence each other and the value of any of them, depends on the purpose for which it is to be used” (Stenmark, 2002, p. 3). For instance, depending on one’s imbedded knowledge, what one might consider information another person might view as data. Thus no matter which way we look at it, underlying the hierarchical approach to knowledge is the cognitive effort that underscores knowledge articulation; this has implications for KMS choices and adoption in organizations. In order for KM to be successful, supporting systems should be implemented that “enable users to assign meaning to information and to capture some of their knowledge in information and/or data” (Alavi & Leidner, 2001, p. 3). Figure 2 below presents a new picture on how I view the relationships among data, information, knowledge and action, namely as a continuous sequence of activities or tasks, with the circle of activities going either way, clockwise or anticlockwise, thereby ascribing to Stenmark’s assertion that “data, information, and knowledge are interwoven and interrelated. In other words the parts in Figure 2 underscore the “active, dynamic, and human-based traits of knowledge” (DiPasquale & McInerney, 2010, p. 342) critical to our comprehension of knowledge creation and commercialization in KIOs.

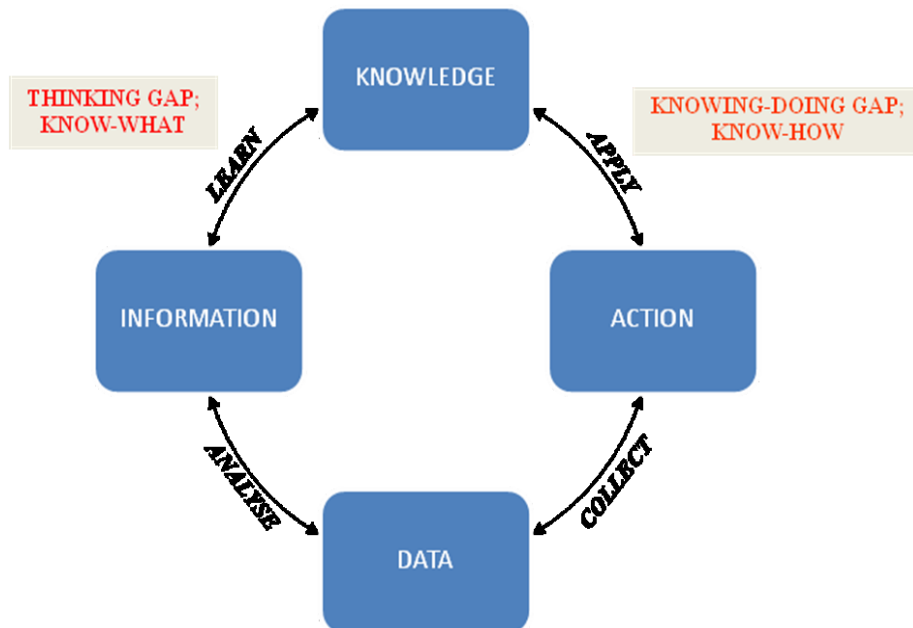


Figure 2 The knowledge, data, information and action cycle

As depicted in Figure 2 the gap between knowledge and action is what Pfeffer and Sutton (2000) referred to as the “knowing-doing gap”, an organization’s ability or inability to transform existing knowledge into meaningful action, a characteristic which, I consider core to the definition of KIOs. As Pfeffer and Sutton (2000) stated, the problem “is not that organizations do not have enough knowledge; it is that organizations do not do anything, or at least not enough, with the knowledge they have” (p. 6). Thus, they recommended that organizations spend less time contemplating on, and talking about, organizational problems and engage more frequently in thoughtful action. In a similar view Brown and Duguid (1998) referred to what they called “know-how that embraces the ability to put know-what into practice.” According to Brown and Duguid “know-how is critical in making knowledge actionable and operational.” It is critical therefore, that organizations invest more into action management, since taking action generates experience from which organizations can learn, grow and prosper.

Another critical observation to this study, underlying the knowledge views as presented in the literature is that knowledge does not exist outside a “knower”, i.e., a human mind, and is contextually bounded. Knowledge is presented as originating and applied in the “minds of knowers,” and in this regard, “values and beliefs are integral to knowledge, determining in large part what the knower sees, absorbs, and concludes from his observations” (Davenport & Prusak, 1998, p. 199). In other words knowledge is personal (Polanyi, 1966) and requires a knower (Brown & Duguid, 2000). Similarly, Nonaka and Konno (1998), present knowledge as embedded in ba (space), “where it is then acquired through one's own experience or reflections on the experiences of others.” “Ba as they pointed out is characterized by love, connection, trust, commitment, and care” (Nonaka & Konno, 1998, p. 7). Therefore, knowledge, in contrast to information, cannot be separated from context and if “knowledge is separated from ba, it turns into information, since information can be communicated independently from ba.”

I believe that the inextricable association of knowledge with “ba” and the “knower” discussed above has implications to knowledge management processes and systems

design, especially in knowledge-intensive organizations. In this research I assert that a richer perspective of KMS is required which acknowledges that KMS are socially constructed in design and use. Values and beliefs, as will be discussed fully in the next sections, are important characteristics for knowledge-intensive organizations. This understanding emphasizes the essential element of knowledge that relates to human action. As noted above, one of the key knowledge management challenges is the transformation of information to knowledge. One has to ensure that during this transformation the resulting knowledge is captured, stored and disseminated within context, a hard feat to successfully manage and achieve. In other words considerable effort should be placed on the articulation of organizational knowledge with the development of “well-developed stocks of socially shared knowledge as prerequisites” (Tuomi, 1999, p. 12). The underlying organizational knowledge management strategy and choice of KMS could be focused on creating intellectual capital and building core competencies. Moreover in order for individuals within an organization to arrive at the same understanding of the information, data, or knowledge stored in a KM system a common knowledge base should be in existence (Alavi & Leidner, 2001). Thus an empirical investigation of the knowledge-intense factors defining KIOs can help identify the facilitation of a common organizational knowledge base in KIOs.

2.2.2 Organizational Knowledge Creation and Knowledge Commercialization

A key distinguishing feature of knowledge-intensive organizations highlighted in the literature is that knowledge is both an input and an output product, and thus a critical resource for the organization. From a knowledge management perspective this underscores the underlying importance of identifying and capturing the type of knowledge that is based in the “cognitive skills” of the workers as well as in their work culture as shared collective understandings. But the literature shows that in KIOs the process of knowledge creation is “widely viewed as an idiosyncratic, ‘black box’ activity that is difficult if not impossible to manage as a process” (Davenport, 2005, p. 67). In other words it is difficult to discern patterns and assign structure, i.e., process flowcharts, to the knowledge creation processes in these knowledge-intensive organizations.

More important to KM and the choice of KMS in KIOs therefore, is the fact that we have to be aware that there is “also a practice side to knowledge work which has to be balanced with the process perspective” (Davenport, 2005, p. 226). The practice perspective of knowledge demands the analysis of knowledge as it is generated, maintained, shared, and accumulated through action in a specific context. This entails looking at how work is actually done in KIOs by those who actually do it. For instance we need to consider whether there are communities of practice in play, so as to understand the choice of and design of KM systems without a strong engineering / science discipline bias, i.e. systems that focus less on the modeling language used to describe the business process, and heavily on what really happens in it. For instance some systems designers tend to model a process too quickly, and then automatically generate a program code from the model to build the KM system to support the process. Successful KM system should therefore have a “delicate interplay of process and practice” (Davenport 2005, 76). Also effective KM involves acknowledging the actors or communities and giving them freedom of action rather than making everyone conform to canonical processes as expressed in the workflow plans, procedures, handbooks, etc. (Brown and Duguid 1998, 90).

As stated in the KMS discussion below in choosing knowledge management systems, it is unlikely one size fits all. Effective knowledge management in KIOs requires that decision makers in these organizations understand the different knowledge processes underscoring the manipulation and production of knowledge and choose appropriate knowledge management systems to support these processes. In other words business processes underlie the choices and design of KMS deployed in KIOs. For this study, therefore, I focus on two main scenarios of business processes drawn from the literature. As stated above I ascribe to Desouza & Awazu (2005)’s two-phased approach to knowledge management i.e., the knowledge creation phase and the knowledge commercialization phase. The knowledge creation phase denotes all the processes included in the generation of knowledge and “consists of knowledge sharing, storage, transfer, and application” while the knowledge commercialization phase represents the practice perspective, i.e., the innovation processes, where an invention is transformed into an innovation (Desouza &

Awazu, 2005, pp. 9-10). As Desouza & Awazu (2005) pointed out knowledge creation and knowledge commercialization feed into one another but require different management approaches. Knowledge creation in KIOs requires an environment that is fluid and nurtures creativity, debate and the creation of new ideas, whilst knowledge commercialization demands well regulated and systematic processes, i.e., a centralized and controlled space. The systems that are put in place to manage knowledge in these two environments might therefore be different. “Knowledge creation and knowledge commercialization units are managed using different principles and are allowed to be successful by recognizing the difference in decentralized and centralized control regimens” (Desouza & Awazu, 2005, p. 14). For instance in contrast to the management of knowledge commercialization, it is harder to manage knowledge creation using a top-down approach in KIOs. A top-down approach environment is too rigid and controlling to nurture effective creativity and debate required for the production of new knowledge. Desouza & Awazu (2005)’s two phased approach, therefore, provides an important platform for me to explore knowledge-intense factors as they relate to the two different environments’ processes and activities and to the choices of KMS deployed.

The other view of knowledge pertinent to our understanding of knowledge creation and knowledge commercialization in organizations classifies knowledge into three basic types, “tacit”, “implicit”, and “explicit”. As Wilson (2003) stated explicit knowledge is knowledge that can be articulated, codified or communicated, while implicit knowledge is “expressible but previously unexpressed” knowledge (Wilson, 2003). Polanyi, as cited by Firestone and McElroy, refers to “implicit beliefs” as beliefs “held in the form of our conceptual framework, as expressed in our language” (Firestone & McElroy, 2003, p. 21). When implicit knowledge is expressed it becomes explicit. Tacit knowledge, on the other hand, cannot be easily articulated and thus resides only in people’s minds, and is manifested through their actions. In other words it denotes a “fluid mix of framed experience, values, contextual information and expert insight that provide a framework for evaluation and incorporating new experiences and information” (Davenport & Prusak, 1997, p. 5). Nonaka and Takeuchi (1995) argue that tacit knowledge is a rich source of

problem signals and ideas about possible solutions and its conversion into explicit knowledge can make valuable knowledge available to others in the organization.

Tacit knowledge is regarded as “a cornerstone in organizational knowledge creation theory” (Nonaka & von Krogh, 2009). The underlying view is that knowledge alternates between tacit knowledge that may give rise to new explicit knowledge and vice versa. A number of scholars maintain that although it is not easily expressible in words, tacit knowledge may be externalized, i.e., made explicit. This notion of externalization was first advanced by Nonaka in 1994 with his introduction of the SECI (socialization, externalization, combination, and internalization) model of knowledge creation. The SECI model defines organizational knowledge creation as the conversion between tacit knowledge and explicit knowledge. Four different modes of knowledge conversion are presented: socialization, from tacit knowledge to tacit knowledge; externalization, from tacit knowledge to explicit knowledge; combination, from explicit knowledge to explicit knowledge; and internalization, from explicit knowledge to tacit knowledge (Nonaka & Takeuchi, 1995, p. 284). Through the process of externalization, and by sharing metaphors, hypothesis, models or analogies during social interaction, tacit knowledge becomes explicit knowledge (Nonaka & Takeuchi, 1995). Simply put, much of what Polanyi referred to as tacit knowledge should be expressible in metaphors which can then be modeled, captured and stored in databases. Choo (1996) supports the externalization viewpoint and advances that through rich modes of discourse including analogies, stories, and metaphors, an individual’s tacit knowledge may be revealed or transmitted. He noted that in organizations the externalization of tacit knowledge is the “quintessential knowledge creation activity and is most often seen during the concept creation phase of new product development” (Choo, 1996, 7).

Some authors dispute Nonaka and Takeuchi's interpretation of tacit knowledge; for instance Tsoukas (2003) refers to it as “erroneous” and criticizes it for ignoring the “essential ineffability of tacit knowledge” (Tsoukas, 2003, p. 410). According to Tsoukas (2003), tacit knowledge cannot be “captured, translated or converted but only displayed, manifested in what we do. New knowledge comes about, not when the tacit becomes

explicit, but when our skilled performance is punctuated in new ways through social interaction” (p. 425). From an organizational knowledge management perspective, especially KM in KIOs, it is important to consider what Stenmark (2002) noted as the major weakness with Nonaka and Takeuchi’s SECI model. Stenmark noted that the model “largely ignores the fact that knowledge is a competitive resource not only on the organizational level but also on individual level. People do not share knowledge without a strong personal motivation, and they would certainly not give it away without concern for what they may gain or lose in the process.” This is in line with Leonard and Sensiper’s observation in 1998 “that our tacit knowledge may be considered a valuable competitive advantage that we would not want to share with others without getting something in return” (Leonard & Sensiper, 1998, p. 113). For instance in “organizations where expertise is highly regarded, but mentoring and assisting others is not, rational people may be unlikely to surrender the power they gain from being an important knowledge source-especially since sharing tacit knowledge requires time devoted to personal contact” (Leonard & Sensiper, 1998, p. 123). Moreover, as Verna Allee observed, not all tacit knowledge that emanates from individuals is of equal value to the organization. For effective KM, the art is in knowing which tacit elements to make explicit and which are worth the effort. It is also important to acknowledge that indeed some dimensions of knowledge are unlikely ever to be wholly explicated, whether embedded in cognition or in physical abilities (Leonard & Sensiper, 1998, p. 112).

It is also rather difficult to see how one could ever make tacit knowledge explicit. Tacit knowledge as explained above cannot be easily articulated and is said to only “exist in people’s hands and minds.” For instance as Stenmark noted, “we know what cinnamon smells like, but we cannot document it in a manual, nor explain it to others. We just use it” (Stenmark, 2000, 2). It has been observed that people in organizations become so entrenched in, and deeply familiar with, their work that if “asked to describe how they do what they do, they often find it hard to express in words” (Tsoukas, 2003, p. 413), or they actually get it wrong. Moreover, as Michael Polanyi (1966) stated, individuals can know more than they can tell. This denotes the innate intelligence, perception, and capacity for reasoning that humans possess which makes it hard for one to simply convert tacit to

explicit knowledge. It is also important to note that there is no “linear progression of knowledge from tacit, to implicit, to explicit.” Tacit, implicit, and explicit knowledge are “mutually dependent and reinforcing qualities of knowledge,” with tacit knowledge forming the background knowledge for assigning the structure needed to interpret implicit and explicit knowledge (Polanyi, 1966, p. 108). Simply put, as Nonaka & von Krogh (2009) illustrated, “to speak a sentence that captures explicit knowledge, we need tacit knowledge to utter it (to pause, shape sounds, find and use rhythm, and so on (p. 638). Tacit knowledge is comprised of both cognitive and technical elements (Nonaka, 1994). The cognitive elements, as Nonaka (1994) reckoned, are defined in an individual’s “mental models consisting of mental maps, beliefs, paradigms, and viewpoints,” whereas technical models are determined by an individual’s know-how, skill, or craft that is evident in a particular context. This poses another element of complexity to the management of tacit knowledge. Thus from a knowledge management perspective, the acquisition or capture of tacit knowledge proves to be a rather challenging task because it demands the capture and structuring of an expert’s mental model, where the mental model may consist of not so easily accessible data of beliefs, assumptions, feelings, biases, intuitions, and memories (Malhotra, 2000; Allee, 2003).

Critical to this study are the underlying implications of implicit and tacit knowledge. An assessment of how and why managers in KIOs consider and choose systems that support the management of tacit knowledge represents an important component of the study, given the complexity involved in managing tacit knowledge. While explicit knowledge can easily be codified and shared using technology, tacit and implicit knowledge present some challenges. Due to the “intuitive, implicit, and personal nature of tacit knowledge, it is difficult, if not impossible, to capture and formalize tacit knowledge in terms of procedures, algorithms, or guidelines” (Abidi, et al., 2005, p. 194). As a result many KMS focus on trying to explicate tacit and implicit knowledge since explicit knowledge can easily be captured and disseminated. As observed by Verna Allee (2003), an assumption one frequently comes across is that the goal of supporting organizational knowledge is to make tacit knowledge explicit so that it can be systematized and made available to others. From a KM in KIOs perspective, the acquisition or capture of tacit

and implicit knowledge proves to be a rather challenging task because it demands the capture and structuring of an expert's mental model, where the mental model may consist of not so easily accessible data of beliefs, assumptions, feelings, biases, intuitions, memories, etc. (Malhotra, 2000; Allee, 2003). In other words, the capture of tacit and implicit knowledge goes beyond a mere technical or physical know-how (Dretske, 1988). In KIOs, where expertise knowledge is said to be fundamental to the success of the organization, the task of managing implicit and tacit knowledge is especially essential. Choosing KMS that facilitate implicit and tacit knowledge management is therefore an important consideration.

2.2.3 Social Dimension of Knowledge

Knowledge can also be viewed along the social-individual dimensions, which are both critical to this study. The theoretical discussion on knowledge outlined thus far has been on knowledge as it pertains primarily to individuals or the individual mind. From an individual dimension, knowledge is viewed as an object "that is passed physically from one to another like bricks," and cannot be shared (Plaskoff, 2003, p. 163). However, recent epistemological and psychological theories have advanced that knowledge is not just passed from individual to individual but it is "socially constructed through collaborative efforts with common objectives" (Plaskoff, 2003, p. 163). Moreover evidence shows that in organizations most work is done as a collective, a cooperative venture, revealing that "most dispositional knowledge is intriguingly collective" (Brown & Duguid, 1998, p. 95). Employees are regarded as co-creators and innovators of new knowledge that they develop through collaboration. Although ideas are formed in individual minds, interaction between individuals plays an important role in developing these ideas (Nonaka, 1994, p. 15). In business organizations interpersonal interactions have been recorded as essential elements for creativity and innovation. Csikszentmihalyi and Sawyer, as cited in Leonard and Sensiper (1998), concluded that "even in the most solitary, private moment—the moment of insight itself—many creative individuals are aware of the deeply social nature of their creative process." In other words while individual creativity is important, exciting, and even crucial to business, the creativity of groups is equally important. While the knowledge-based theory discussed above views

knowledge as a commodity, as something people have, the social theory approach to KM regards knowledge as something people do and thus is important to this study and deserves closer examination.

From a social theory perspective, it is important to understand the different levels of social interaction at which knowledge is created, used, transformed or legitimized within an organization. In companies, there exist both formal and informal networks of interaction, and probably the best networks for knowledge are the informal networks, since much of the work that goes on in companies gets done “because people continually ask one another, through informal networks, who knows how to do things” (Davenport & Prusak, 1998, 37). Julian Orr’s study of Xerox’s technical field representatives, as explained by Brown and Duguid (1998), for example, supported this notion. In this study Orr revealed that, despite the individual character of the Tech Reps’ work and the large geographical areas they often have to cover, they found time to get together at lunch or over coffee and swap work stories, where they shared what they were running into, and what they were learning (Brown & Duguid, 1998, p. 95). They also maintained social ties by calling each other when they ran into real trouble for suggestions and help. It is this type of social group, the group which needs to work together and find ways to create and solve a problem that is referred to in the literature as a "community of practice" (CoP).

The concept of communities of practice (CoPs) is credited to Jean Lave and Etienne Wenger in 1991 while exploring situated learning in organizations. Lave and Wenger viewed the acquisition of knowledge as a social process where people can participate in communal learning. They defined CoPs as a “set of relations among persons, activities, and world, over time and in relation with other tangential and overlapping communities” (Lave & Wenger, 1991, p. 98). Wenger differentiates a CoP from a network by noting that a community of practice is "about" something; it is not just a set of relationships. It has an identity as a community, and it exists because it produces a shared practice as members engage in a collective process of learning (Wenger, 2000). In other words a community of practice owes its existence to a shared practice and the overlapping professional competencies and commitments; practice is thus regarded as the source of

coherence of a community. This is confirmed by Brown and Duguid (1998) who concluded that knowledge is socially embedded within communities, and as such is inseparable from practice. To Brown and Duguid (1998) “the processes of developing the knowledge and the community are significantly interdependent: the practice develops the understanding, which can reciprocally change the practice and extend the community” (Brown & Duguid, 1998, 96). Brown and Duguid are therefore credited with introducing into the knowledge discourse the “social constructivist” view of knowledge, underscoring the need for a group of workers “to work together for its dispositional know-how to be put into practice.”

Boland and Tensaki (1995) observed that CoPs operate within and outside the organization’s boundaries. They explained that a community of practice consists of specialized knowledge workers who interact within the firm, and between the firm and its environment. In other words CoPs can span organizational boundaries to include suppliers and customers. Within an organization CoPs can be found within divisions, functional areas, product lines, professional specialties, project teams, and issue based committees. For instance Gongla and Rizzuto reported over 60 CoPs in existence within one organization, IBM Global Services in 2001 (Gongla & Rizzuto, 2001, pp. 842-862). Verna Allee (2003) pointed out that many other terms are used in corporations to describe communities of practice. CoPs are sometimes referred to as enabling networks, knowledge communities, learning communities or practice communities.

It is also important to note at this point that most scholars present communities of practice as distinctly different from teams. Verna Allee (2003), for example, pointed out that for “teams, major goals and the basic nature of the joint team are predetermined by managers while in real communities of practice members negotiate the terms among themselves. Community of practice is self-selecting and self-organizing” (p. 124). CoPs do not necessarily think of themselves as a team or “community in the conventional sense”. It is through practice that a community develops a shared sense of what it does, its language, its prejudices, and how it relates to other communities and their practice (Brown & Duguid, 1998, p. 96). Similarly, Davenport and Prusak (1998) describe

communities of practice as self-organizing groups of co-workers who communicate with one another because they share common work practices, interests or aims (p. 199). In other words a community of practice is not an organizational structure and is thus relatively free from ties to management structures.

Critical to the distinction between project teams and communities of practice are the underlying implications to organizational knowledge management. Because of the informal nature of CoPs some managers might dismiss and discourage the CoPs in favour of more measurable work. But a number of scholars have emphasized that managers should not underestimate the value of these informal knowledge networks, “the value of talk” as Davenport and Prusak (1998) put it. In fact communities of practice should be regarded as core assets of the firm. As McDermott (2000) observed, communities are not only the places best suited to decide how, where, and why new knowledge should be created and utilized, but also the best places to organize, codify, and transform the company’s knowledge (p. 21). Knowledge management processes and practices should therefore look at ways to capture, preserve and share knowledge emanating from CoPs. It should be highlighted that managing community of practice knowledge is different from managing project teams.

This alternative view of knowledge as a social construct underscores some interesting aspects of knowledge management in organizations, especially in KIOs. The view of knowledge “as a social property stands at odds with the pervasive ideas of knowledge as individual” (Brown & Duguid, 1998, p. 90). Since most knowledge is socially constructed, socialization processes become key drivers of knowledge creation and transmission. In other words the social communities are powerful sources of knowledge, and thus core components in an organizational knowledge management toolkit, and even crucial to KIOs. The management of tacit and explicit knowledge among community members is equally important. In organizational KM, CoPs facilitate the conversion of tacit knowledge into explicit, overcome the barriers to the transfer of knowledge and ensure collaboration.

It is my contention therefore, that a knowledge management strategy that embraces the significance of CoPs should be based on knowledge cultivation. This is in alignment with the knowledge creation phase presented by Desouza and Awazu (2005) which requires an environment that is fluid and nurtures creativity, debate and the creation of new ideas. A top-down hierarchical approach to knowledge management in this scenario cannot be effective; instead a bottom-up cultivation strategy should be employed. The focus should be on the choice of systems that support or enable the communities to identify and take responsibility for key areas of knowledge. In other words management should provide the tools or systems that enable the cultivation or nurture of knowledge. I will develop this notion further in my discussion of knowledge management in knowledge-intensive organizations. The extent to which KIOs are defined by the knowledge-intense features inherent in CoPs, and how these features inform the choice of KMS is also a central theme of the study.

2.3 KNOWLEDGE WORKERS

“Who is a knowledge worker?” In the discussion above, the significance of the concept of knowledge has been underscored. Recently the phrase “knowledge worker” has also found common usage within the literature, in association with activities and attributes of individuals involved with the creation, conversion, and transmission of knowledge. But the concept of a knowledge worker is complex and scholars differ in their definition of this group of workers. Defining what we mean by the term knowledge worker will greatly help our understanding of the significance of these workers in organizations, and in this case knowledge-intensive organizations.

Some scholars believe that one cannot easily identify who knowledge workers are, since it is rather difficult to point out who “clearly are not knowledge workers” (Davenport, 2005). They point out that in today’s economy most jobs require workers to use some degree of knowledge in order to successfully perform their jobs. For example, Davenport (2005) stated that “even ditch diggers need some knowledge of soil conditions and how to lift shovels full of dirt without hurting their backs.” However, a number of authors have identified characteristics specific to knowledge workers in terms of the nature of

their work that warrants their identification as a group from other workers. In this section, I offer a review and critique of current definitions, and then present a summary of my view of a knowledge worker.

In order to establish who is or is not a knowledge worker, the unique elements of knowledge workers as presented in the literature can inform the thinking. The terms “knowledge work” and “knowledge worker” were first introduced to the academic community by Peter Drucker, who defined a knowledge worker as “someone who knows more about his or her job than anyone else in the organization (Drucker, 1959, p. 270). In 1993 Drucker further expounded on the work of the knowledge worker in the “post-industrial society” or the knowledge-based economy. He pointed out that in the knowledge society knowledge workers, including “knowledge executives who know how to allocate knowledge to productive use”, have become “the leading social groups” (Drucker, 1993, p. 8). One of the key economic challenges of the post-capitalist society is the “productivity of knowledge work and the knowledge worker”. Drucker’s identification of a knowledge worker is not very helpful. I agree with his observation that knowledge workers have assumed a high level of importance in the society, but his definition allows for room to include almost every worker as a knowledge worker. One can argue that a cab driver, for example, knows more about his or her job and how to use his or her knowledge of the city routes to maximize profit. I do not think a cab driver fully qualifies as a knowledge worker and therefore another unique definition is needed to distinctively identify who is a knowledge worker.

It is evident that most authors concur that knowledge workers “think for a living” emphasizing the head and not hands as the instrument of work. Reich (1991) for example, identified a unique group of workers he called “symbolic analysts,” workers who solve, identify and broker problems. Reich presented “symbolic analysts” as workers who use their heads instead of their hands, workers with a capacity to effectively and creatively use knowledge (Reich, 1991, p. 182). This notion is also echoed by Davenport (2005) who referred to knowledge workers as people who “think for a living” and “live by their wits”. Nonaka and Takeuchi (1995) presented a slightly different view of knowledge

workers as people who use their heads as well as their hands. Horibe (1999) agrees with Nonaka and Takeuchi but took the argument a step further and defined knowledge workers as simply people who use their heads more than their hands to produce value. He noted that knowledge workers still use their hands but are more likely to input knowledge into a computer than lift a 50 pound sack, and that they “add value through their ideas, their analyses, their judgment, their syntheses, and their designs” (Horibe, 1999, p. xi). This argument has a noticeable problem: some workers “think for a living” but their work also involve a lot of hand use. Surgeons, for example, quickly come to mind. Surgeons use their head to interpret knowledge, and then put this knowledge to action by carrying out surgery using mostly their hands. In other words their head and hands are all important elements of their work. The question is where does one place surgeons following the above definitions? The opportunities that knowledge offers occupational groups such as surgeons, i.e., knowledge as the main authority defining their skill, are well documented in the literature.

A third element identified as unique to knowledge workers is that of educational attainment. According to Davenport knowledge workers are persons with “high degrees of expertise, education and experience (Davenport, 2005, p. 10). Knowledge workers are highly educated. Starbuck (1992) for example, refers to a knowledge worker as someone with formal education and experience equivalent to a doctoral degree. However, characterizing knowledge workers according to educational attainment can be brought to question. This argument as it stands is not conclusive to knowledge workers. One can argue that some highly educated people work in environments which do not require thinking skills. In other words being more highly educated does not necessarily indicate a higher level of knowledge inherent in the jobs in which people are employed. Alvesson (1993) agrees with this view when he argued that for knowledge workers formal education is overestimated. According to Alvesson many knowledge workers are less dependent on formal education because the skills that they possess are usually acquired in most cases after their formal education. Some authors have argued that for us to understand who a knowledge worker is we may need to categorize the type of work as knowledge work as opposed to the attributes of the worker. This argument is echoed by

Blacker (1995) and Jacques (1996) who stated that it is not the presence of knowledge that deserves the term knowledge work but the type of knowledge or expertise, whether theoretical, esoteric or abstract.

In this line the fourth characteristic identified by most authors as unique to knowledge workers is that knowledge is central to the job that the knowledge worker does. The primary purpose of the knowledge worker's job involves the "creation, distribution, or application of knowledge" (Davenport, 2005, p. 10). As Newell et al., cited in Alvesson (2004) observed, for knowledge workers, knowledge is simultaneously the input, medium and output for their work. Furthermore, Horibe (1999) identified consultants as the "purest form of knowledge workers since knowledge is the only thing they have to peddle" (p. 12). The key distinction of knowledge workers is that they reuse knowledge to produce new knowledge, "the only thing they have to peddle."

Despite the definitional disparities outlined above a few knowledge worker attributes are established from the literature. First, a knowledge worker's job is more intellectual than physical. Second, knowledge workers are highly educated or experts, people who have been educated in a specific knowledge area. Third, for knowledge workers the output and input commodity of their work is knowledge. Fourth, knowledge workers can be found in a variety of work environments and industries, not confined to knowledge-intensive organizations only. This view is propounded by Davenport (2005) who concluded that knowledge workers "don't necessarily have to work in knowledge-intensive industries" and gave the example of managers of any organization who can be described as knowledge workers since they apply knowledge to make decisions.

This therefore highlights the fundamental questions that need to be answered, i.e., what do we talk about when we talk about knowledge-intensive organizations? If knowledge workers can be found in any work setting or firm type, how then do knowledge-intensive organizations differ from other industrial firms?

2.4 KNOWLEDGE-INTENSIVE ORGANIZATIONS¹

Starbuck (1992) is credited with first coming up with the concept of the knowledge-intensive organization. But since then the question of what KIOs are has not been fully answered. As Swart and Kinnie (2003) observed, the distinction between “knowledge-intensive and non/less knowledge-intensive organizations or work is not self-evident” as presented in the literature. A number of scholars, for instance, have asserted that in the knowledge economy all firms are in essence KIOs since most organizations make use of knowledge to stay competitive. They argue that the ability of most firms today to gain a competitive edge on the marketplace lies on the continuous generation, synthesis, and use of collective, organizational knowledge (Abell & Oxbrow, 2001; Nonaka & Takeuchi, 1995; Brown & Duguid, 1998).

Although the observation that all organizations use knowledge to stay competitive is true, recent literature has emerged that has argued that not all firms can be considered knowledge-intensive (Ichijo & Nonaka, 2007; Starbuck, 1992; Swart & Kinnie, 2003; Alvesson, 2004; Sveiby & Lloyd, 1988; Robertson & Swan, 1998; Deng, 2008). As important as knowledge may be to every company’s success “it is inappropriate to consider all companies knowledge-intensive” (Ichijo & Nonaka, 2007, p. 323). The literature claims that for some companies knowledge is important but not critical to the company’s success, while for knowledge-intensive companies imbedded knowledge is critical. The literature clearly implies that KIOs differ from non-KIOs or traditional organizations. What is absent from the discussion is the differentiating factors, and how those factors affect KM theory and practice. Developing an understanding of the distinctive characteristics of KIOs and how these characteristics interlace with the choice of systems employed to support KM activities is therefore important.

The concept of a “knowledge-intensive organization”, however, as presented in the literature is multidimensional with a variety of different meanings. For instance Starbuck (1992) acknowledged that his use of the term knowledge-intensive had been strongly

¹ Substantial parts of this section have been published, (see Makani & Marche, 2010).

influenced by economists and was mainly based on knowledge as an input. Starbuck observed that economists label firms in which capital or labour inputs have more production importance, as capital intensive firms or labour intensive firms. Therefore by analogy Starbuck coined the term ‘knowledge-intensive firms’, underscoring the economic significance of knowledge as an input in these firms. He thus emphasized the importance of classifying firms by their input, especially in gaining an understanding of knowledge-intensive firms. According to Starbuck, by emphasizing knowledge as an input, a basis is made for analyzing organizational internal structures and operations since “input classes highlight the effects of resource availabilities, and their determinants” (Starbuck, 1992, p. 3). Although Starbuck’s argument as presented is valid, I think that to understand the significance of knowledge in organizations requires looking at it from a number of different perspectives including both the input and output angles. As Starbuck himself acknowledged, “assessing the importance of knowledge is harder than comparing capital and labour;” it is more than basic economics.

It is evident from the literature that although there is a general acknowledgement among scholars that KIOs may have distinctive characteristics because of the work and workers they employ and also the significance of knowledge within these organizations as both an input and an output (Starbuck, 1992; Swart & Kinnie, 2003; Alvesson, 2004; Sveiby & Lloyd, 1988; Robertson & Swan, 1998; Deng, 2008), the specific distinction of KIOs from other organizations is not self-evident in the characterization. For instance, a review of 58 authors that make reference to KIOs or KIFs demonstrates that only 15 make a substantive attempt to produce an operational definition of KIOs. Table 2 below, presents, in chronological order, a list of these authors, including their operational definitions of KIOs, KIO defining characteristics, and examples of KIOs, as presented. It is evident from the table that the phrase knowledge-intensive organization or knowledge-intensive firm does not appear in the literature until Starbuck introduced it in 1992. In my assessment, Sveiby and Lloyd’s (1988) reference and characterization of “knowhow” companies contributed a lot to the discourse on how we can distinguish a KIO from any other traditional organization and thus their presentation of the organizations is worth adding to the table below.

Table 2 Summary of KIO defining factors identified in the literature.

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Sveiby & Lloyd (1988)	“Knowhow” companies that produce and sell “knowhow”	<p>Classification of companies: (Service company)</p> <p>Product: (Know-how i.e., value added information)</p> <p>Organization distinguishing factors: (non-standard, creative, problem solving service, high dependency on individuals)</p> <p>Worker characteristics: High professional skills, high level of managerial skills, creativity, complex problem-solving abilities, power stems from ability and reputation.</p>	banks, advertising agencies, software firms, management consultancy, architectural consultancy, engineering consultancy
Starbuck (1992, 1993)	A KIF is a firm “in which experts are at least one-third of the personnel”.	<p>Classification of companies: -</p> <p>Product: -</p> <p>Organization distinguishing factors: (knowledge has more importance than other inputs, knowledge is embedded in organizational routines attribute their successes and failures to individuals, emphasis is on esoteric expertise, exceptional and valuable expertise dominates commonplace knowledge.)</p> <p>Worker characteristics: (experts with formal education and experience equivalent to a doctoral degree, may not be professionals).</p>	think tanks, consulting firms, law firms

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Winch & Schneider (1993)	“Knowledge based organizations (KBOs) are organizations that have only the expertise of their staff as assets with which to trade”.	<p>Classification of companies: (business service sector)</p> <p>Product: (expertise of staff)</p> <p>Organization distinguishing factors: (intangible & standardized product, often employs professionalized knowledge workers, but is not coextensive with the employment of professionals, trade independently, and largely with corporate clients, distinctive competence, creativity, provide solutions to their clients' technical problems, assets are its people, emphasizes innovation and problem-solving)</p> <p>Worker characteristics: (creative, frequently torn between satisfying their clients and satisfying their professional peers, professionals, culturally resistant to being managed).</p>	<p>advertising</p> <p>practitioners, management consultants, project managers, market researchers, architectural practice</p>
Blackler (1993)	KIFs are “symbolic-analyst dependent organizations” that focus on “novel problems and place a high emphasis on the embrained skills of key workers”.	<p>Classification of companies: -</p> <p>Product: -</p> <p>Organization distinguishing factors: (entrepreneurial, problem solving, status and power from creative achievements, symbolic manipulation is a key skill, dependent on embrained knowledge, i.e., knowledge that is dependent on conceptual skills and cognitive abilities)</p> <p>Worker characteristics: (highly developed conceptual and cognitive abilities.)</p>	Software consultancy

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Alvesson (2001)	“A knowledge-intensive company refers to firms where most work is said to be of an intellectual nature and where well-educated, qualified employees form the major part of the work force”.	<p>Classification of companies: (product & service)</p> <p>Product: (qualified products and/or services)</p> <p>Organization distinguishing factors: (produce qualified products and/or services, is broader and does not emphasize the features ascribed to a typical profession, such as a code of ethics, standardized education and criteria for certification, a strong professional association, monopolization of a particular labour market through the regulation of entry, etc., well-educated, qualified employees form the major part of the work force)</p> <p>Worker characteristics: (qualified & well educated)</p>	law and accounting firms, management, engineering and computer consultancy companies, advertising agencies, R & D units and high-tech companies
Robertson & Swan (1998)	Firms in which “knowledge assumes more importance than other kinds of inputs and reliance is more heavily on exceptional and rare expertise of individuals”.	<p>Classification of companies: -</p> <p>Product: (knowledge based products and service)</p> <p>Organization distinguishing factors: (knowledge has more importance than other kinds of inputs, relies on individual expertise, flatter, flexible, networked, individual autonomy, interests and career aspirations are given priority)</p> <p>Worker characteristics: (exceptional and rare expertise, high cognitive skills, highly qualified specialists, highly educated usually to a PhD level)</p>	‘Expert’ consultancies

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Nurmi (1999)	KIFs “process what they know into knowledge products and services for their customers”.	<p>Classification of companies: (product & service companies)</p> <p>Product: (Knowledge)</p> <p>Organization distinguishing factors: (less capital intensive than firms in the manufacturing industry, more learning-intensive than other service industries, knowledge is processed into know-how services, knowledge is both an asset and a product, management participates in operations, esteem counts more than status, does not work properly as a structured, departmentalized, hierarchical organization)</p> <p>Worker characteristics: (believe the customer is far more important than their superiors, every knowledge worker also serves as a salesperson, loyalty to their professional group, formal and informal professional contacts and associations more important than the organization)</p>	Consulting, training, education, research, auditing, edp (electronic data processing), architecture, and planning.
Sheehan (2002)	Firms that “create value by using an intensive technology to solve problems”, generating income by “defining and solving their clients’ problems through the direct application of expert knowledge”.	<p>Classification of companies: (service firms)</p> <p>Product: -</p> <p>Organization distinguishing factors: (use technology to create value for their clients, high level of information asymmetry between the firm and the client, define and solve their clients’ problems through the direct application of expert knowledge)</p> <p>Worker characteristics: -</p>	

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Swart & Kinnie (2003)	“Organizations within a knowledge economy that employ highly skilled individuals and create market value through the application of knowledge to novel, complex client demands”.	<p>Classification of companies: (product or service)</p> <p>Product: (application of knowledge to novel, complex client demands)</p> <p>Organization distinguishing factors: (key resource is human capital, novel & complex work processes involving problem solution, income is generated through intangible assets, tacit knowledge is the prime driver for value creation, have different growth patterns when compared with more traditional organizations, mostly engaged in business-to-business relationships with a relatively small number of clients, rather than selling their services directly to the end user.)</p> <p>Worker characteristics: (highly skilled, well educated, qualified employees, creative, innovative).</p>	law and accounting firms, management, engineering and computer consultancy companies, advertising agencies, research and development units and high-tech companies

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Alvesson (2004)	KIFs are “large firms employing substantial numbers of people working with complex tasks that call for autonomy and the use of judgment, possibly rendering traditional forms of control inadequate or only partly relevant. They are organizations that offer to the market the use of fairly sophisticated knowledge or knowledge-based products”.	<p>Classification of companies: (professional service firms and R&D firms)</p> <p>Product: (knowledge based products such as plans, blueprints, or mass-produced products where the R & D cost outweighs manufacturing expenditure)</p> <p>Organization distinguishing factors: (knowledge based work, use of intellectual and symbolic skills, high degree of autonomy, downplaying of organizational hierarchy, use of adaptable, ad hoc forms, need for extensive communication for coordination and problem solving, idiosyncratic client services, information and power asymmetry, subjective and uncertain quality assessment, competitive advantage lies in effective use of human resources)</p> <p>Worker characteristics: (highly qualified, large proportion have academic education, mostly graduates, relevant experience, paid above average salaries, have high status, gold collar workers)</p>	law and accounting firms, management, engine, erring, and computer consultancy firms, advertising agencies, investment bankers, pharmaceutical, biotech companies, and high tech companies based on engineering work. Occupations include engineers, lawyers, accountants, scientists and consultants

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Ditillo (2004)	KIFs are viewed “as organizations that use mainly the knowledge of their individuals to develop and trade immaterial responses to customer requirements”.	<p>Classification of companies: (business services sector)</p> <p>Product: -</p> <p>Organization distinguishing factors: (integrate expertise knowledge, expertise is used to solve varied problems, work oriented toward innovation and problem solving, knowledge is mainly embedded in human capital, work activities mostly characterized by uncertainty)</p> <p>Worker characteristics: -</p>	law and accounting firms, management, engineering and computer consultancy organizations, and research centres
Sheehan & Stabell (2007)	KIOs “create value by solving problems for their clients”.	<p>Classification of companies: (service firms, diagnosis, search, and design shops)</p> <p>Product: (problem-solving capacity)</p> <p>Organization distinguishing factors: (sell problem-solving capacity to their clients, reputational capital plays a critical role in their success, need to attract and retain quality experts, exist as a stand-alone partnership or being embedded within a larger corporation)</p> <p>Worker characteristics: -</p>	consulting firms, pharmaceutical research units, oil and mineral exploration companies, medical practices, executive talent search firms, law partnerships, design shops, advertising agencies, architecture firms and venture capitalists

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Ichijo & Nonaka (2007)	"Companies that sell knowledge".	<p>Classification of companies: (service & product companies)</p> <p>Product: (Knowledge or expertise)</p> <p>Organization distinguishing factors: (embedded knowledge is critical, developing knowledge is what leads to competition and financial success, extremely difficult to govern, innovation, outstanding professionals or stars are the key asset, create rewarding internal structures to attract stars, leaders manage the firm as well as do professional projects, leaders are shareholder/partners/1 significant owners of the company, emphasizes client relationships built on trust)</p> <p>Worker characteristics: (highly talented, motivated, professionals, independent minded).</p>	consulting firms, law firms, accounting firms, pharmaceuticals, software developers, bio-tech research companies
Benbya (2008)	Firms "where most of the work is said to be of an intellectual nature and where well educated, qualified employees form the major part of the workforce".	<p>Classification of companies: -</p> <p>Product: -</p> <p>Organization distinguishing factors: (intellectual work, highly educated and qualified workforce)</p> <p>Worker characteristics: (well educated, highly qualified)</p>	

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Deng (2008)	A firm “whose major workforce comprises well-educated, skilled employees, and creates market value through effective application of knowledge to service provision for its clients”.	<p>Classification of companies: (service)</p> <p>Product: (effective application of knowledge)</p> <p>Organization distinguishing factors: (the compounded knowledge, skills, capabilities and experience of the employees is perceived to be an integral part of its business process.)</p> <p>Worker characteristics: (well educated, skilled)</p>	consulting firm

Author	Definition of KIO	Definitive Factors	Examples Organizations / Occupations
Greenwo od (2009)	“Organizations that operate within considerably less hierarchical structures that focus on the value and engagement of their employees and integrate and diffuse knowledge throughout their value chain”.	<p>Classification of companies: (manufacturing and service)</p> <p>Product: -</p> <p>Organization distinguishing factors: (less hierarchical structures, self-control, self-evaluation, new and flatter systems of management and decision-making, integrate and diffuse knowledge throughout the value chain, focus on the value of the intelligence and engagement of their employees, focus on ongoing learning opportunities and communities of practice, practice and encourage continuous learning, recognize knowledge sharing mentoring and apprenticeship, people are seen as the ultimate repositories of knowledge and the key source of value creation, multiple links with the external environment)</p> <p>Worker characteristics: (intelligent, self-control, self-evaluation).</p>	

A review of Table 2 above reveals that KIOs have a lot in common with many other organizations as well as identified differences among themselves. Some scholars refer to particular industries or industry categories as being knowledge-intensive, e.g., management consulting or service industries. In another instance Sheehan and Stabell (2007) identified and named three specific types of knowledge-intensive organizations: (i) ‘diagnosis shops’ that “create value by defining problems and suggesting remedies”, examples of which might be law firms, audit firms and medical practitioners; (ii) search firms that “create value by searching for and defining opportunities”, e.g., pharmaceutical companies, executive recruiting firms and venture capital firms; and (iii) design firms that “create value by formulating innovative concepts or product prototypes”, a classic example being architecture and engineering firms (Sheehan & Stabell, 2007, pp. 22-29).

As presented by Sheehan and Stabell (2007) KIOs are limited only to service firms and according to one distinctive criterion, i.e., their value creating capabilities. This view was first echoed by Sheehan (2002) who concluded that all knowledge-intensive organizations create value by solving problems for their clients, but the manner by which they do so makes them distinctive. However, I agree with Swart & Kinnie (2003) who commented that it is unwise to define a particular industry as knowledge-intensive. Great disparities exist among organizations within a particular industry or even a particular firm. Not all consultancies, for example, are knowledge-intensive. As Robertson & Swan (1998) argued “some consultancies (for example, general accounting and management consultancies) deal mainly with the diffusion of widely applicable, standardized and generic solution” (p. 544), and thus it is questionable whether these kinds of consultancies are knowledge-intensive. Furthermore as Sveiby and Lloyd (1988) concluded “not all service companies are ‘knowhow’ companies” (p. 18), meaning not all service firms can be considered to be KIOs.

Alvesson (2004) presented a new dimension to the distinguishing characteristics of KIOs: He presented particular occupations as being involved in knowledge-intensive work, i.e., engineers, lawyers, accountants, scientists and consultants. But defining a particular

occupation as being knowledge-intensive is also questionable. In the practice of law, for example, some of the significant practice can be defined as relatively routine. According to Sherer (1995) law firms have lawyers in two distinct capacities, i.e., partners, who are the source or repository of firm knowledge and associates, who are employees who acquire knowledge and perform work for partners. Associates' work can thus be characterized as generally routine. Law firms vary considerably in their mix of these lawyers. Thus not all lawyers can be defined as being involved in knowledge-intensive work.

The same argument can be extended to the definition of the whole firm as knowledge-intensive. It is arguable whether all consultancy or law firms are always, or need to be knowledge-intensive. As noted above, although law firms employ highly qualified graduates, often they rely more heavily on knowledge being more broadly based and embedded in standard systems and procedures than on exceptional or rare expertise. We should be careful, as Alvesson (2004) warned us, against sweepingly applying to the whole company the idea of knowledge-intensiveness since in some companies there may be great disparities in knowledge-intensiveness between different units of the organization. In other words, broadly lumping industries, occupations, or firms together as knowledge-intensive fails to acknowledge the heterogeneity in the industry or particular firm, and the different forms modes of organizing within particular types of firms. I therefore agree with Robertson & Swan (1998)'s proposition that some firms are more knowledge-intensive than others. For the term knowledge-intensive to be applicable to the whole firm the "significance as well as the relative size of its knowledge-intensive units must be substantial" (Alvesson, 2004, p. 18). But no author as of late has provided an instrument to measure the degree of knowledge intensity in particular firms.

As Starbuck concluded, it is also apparent that no clear definition of KIOs has wide acceptance. The authors presented in Table 2, point to a variety of distinctive elements that differentiate KIOs from other organizations. For instance, the reliance on human resources as opposed to physical capital is regarded by a number of scholars as a key differentiator of KIOs (Sveiby & Lloyd, 1988; Winch & Schneider, 1993; Alvesson, 1993, 2004; Swart & Kinnie, 2003; Ichijo & Nonaka, 2007; Deng, 2008). Some authors also point to employee skills as central to the creation of the competitive advantage of

KIOs. In this regard, in their definitions of KIOs, a number of authors place emphasis on the substantive number of knowledge workers within the organization, starting with Starbuck (1992) who defined KIOs as organizations in which one-third of the experts have the equivalent of doctoral degree in formal education and experience. Deng (2008) agrees with this premise and refers to KIOs as firms whose major workforce comprises well-educated and skilled employees.

However, are the workers' formal education and skills the key characteristics that account for knowledge-intensity in organizations? Swart & Kinnie (2003) argue otherwise. They argue that it is not only the presence of human capital that is important in defining KIOs; it is also the way in which expertise is applied that makes these organizations distinctive. Starbuck (1992) agrees with this viewpoint and points out that it is the application of expertise which makes an important contribution in KIOs. Alvesson (2004) states that rather than focus on the educational level of the worker, KIOs should be defined according to the workers' daily tasks i.e., what they do. He stated that KIOs employ substantial numbers of people working with complex tasks that call for autonomy and the use of judgment. In this regard Alvesson presents knowledge as related to intellectual competencies as opposed to practical skills as evidenced by the physical use of the body in work performance. Alvesson (2004) particularly refers to "analytic, intellectual and theory-guided activities," proposing that "the ability to use the body and creative talents—crucial in arts, crafts and sport for example—are not necessarily best understood in terms of knowledge" (p.13). Thus he concludes these kinds of practical skills might instead be called "talent-intensive" work.

It is also evident from the literature that most authors agree that creativity and innovation drive knowledge-intensive firms. The focus is on the capacity of experts to solve complex problems through creative and innovative solutions, as a key source of value creation in KIOs (Sheehan, 2002; Greenwood, 2009; Deng, 2008; Ichijo & Nonaka, 2007). Thus, as Alvesson (1993) reflected, it is the knowledge of "the strategic core and the techno-structure rather than the average employee" that should be the focus. All in all "the expectation of clients, the informed public, and people working in the company, is that

education, training, problem-solving ability, creativity and intelligence, are crucial parts of the work” (Alvesson, 2004, p. 29).

Some authors, on the other hand, focus on the organization’s output or product. A KIO is distinguished as an organization that sells knowledge (Ichijo & Nonaka, 2007), that offers to the market the use of fairly sophisticated knowledge or knowledge-based products (Alvesson, 1993, 2004), or that creates market value through the application of knowledge (Swart & Kinnie, 2003; Deng, 2008). A key point thus emerges from the review of the KIO definitions portrayed in Table 2, that is, a common ingredient to KIO’s output is knowledge. But knowledge as an output is differentiated in the literature from the organization’s use of knowledge as an input or being “knowledge rich”. As Greenwood argued just because an organization is “knowledge rich”, e.g. universities, it does not necessarily mean that it can be regarded as knowledge-intensive. Organizations such as consulting firms, law firms, and accounting firms, however, which are “knowledge rich”, are constantly identified as knowledge-intensive. But the exact boundaries of the KIO category, as portrayed in the definitions of these organizations, are somewhat obscure. One is left to ask whether formal education and knowledge as an output is enough to distinguish a KIO from other traditional organizations. Is it only the presence of human capital that is important in defining KIOs or is it also the way in which expertise knowledge is applied that makes these organizations distinctive?

Greenwood (2009) presents a different outlook on how we view KIOs: If high quality knowledge and a large staff of highly trained people automatically give rise to a KIO then research universities would be by definition KIOs. But as Greenwood concluded they are not. KIOs are a “product of structures, relationships, and dynamics in the organizations, not of the quanta of knowledge they contain, the level of education of their personnel, or their sectoral location” (Greenwood, 2009, p.35). He also postulated that a KIO should have at least some of the “key characteristics of learning organizations, that is, unless organizations are capable of creatively modifying their structures, behaviour and alignment with the environment, then they simply cannot be KIO at all”. Greenwood (2009)’s premise is intuitively attractive but the distinction between KIOs and other organizations needs to be developed if it is to be meaningful.

The major implication of these various conceptualizations of KIOs is that each suggests a different strategy for KM in these organizations and a different perspective of the choice of KMS in support of KM activities. For this study therefore it is important to first explore the factors that might define these organizations as KIOs. On the basis of this evidence, their most salient factors could then be used to assess the relationship of the factors to the choice of KMS in KIOs.

2.5 DEFINING KNOWLEDGE MANAGEMENT

The discussion on knowledge above has revealed the discourse surrounding the two concepts of knowledge and information. This argument continues when it comes to the discussions on information management versus knowledge management. Notably, the development of the knowledge-based theory of the firm as first announced by Drucker in 1993 coincided with the information and communication technology (ICT) boom, which ushered in what has come to be known as the “information explosion”. Since then a noticeable surge in organizational interest in knowledge management has been recorded and in some cases with inherent confusion as to what is knowledge versus information, and how to manage it. For instance, Scarbrough and Swan (2003) observed that in many consultancy firms “KM has been used as a means of repackaging IT products under a new label.” More recently, Rowley (2006) pointed out that in the field of information management there has been resistance in accepting or engaging with knowledge management. T. D. Wilson (2002) went as far as entitling his article, “The nonsense of 'knowledge management'” in which he argues that knowledge management is no more than a repackaged form of information management. Thus pertinent to this study is the answer to the question, what is the difference between information management (IM) and knowledge management (KM)?

Before providing an answer to this pertinent question it is important at this juncture to acknowledge the cognitive knowledge framework for this study. For this study my understanding of knowledge management is greatly influenced by the “resource-based view” approach as propounded in the strategic management and organizational theory

literature. Knowledge is now considered “*the* resource” and not just “*a* resource”: It is defined as a personal and organizational asset or “utility”, “the means to obtain social and economic results” (Drucker, 1993, p. 42). It is not surprising therefore, that with the growing emphasis or recognition of knowledge as a valuable asset, more and more organizations worldwide are paying a close attention to the “knowledge-based view” of firm management, that is, they are “exploring what is and how to create, transfer and use knowledge more effectively” (Davenport, De Long, & Beers 1998, p. 43). The “knowledge-based view” of organizational management, therefore, provides vital insight into the relationships between the organization and its KM strategy, and why organizing knowledge is a critical part of what the organization does.

Although some authors may argue that the “knowledge-based theory” of the firm was never built on a universal understanding of what knowledge really is but on a pragmatic interest by computer scientists or information technologists to manage organizational knowledge (Alavi & Leidner, 2001), the literature shows that the interest in the knowledge-based theory of the firm has grown with debates that extend to many areas of knowledge manipulation including:

- the creation and synthesis of knowledge (Blackler, 1995; Ichijo & Nonaka, 2007; Nonaka & Takeuchi, 1995);
- the relationship of knowledge and work skills (Nonaka & Takeuchi, 1995; Davenport, 2005; Reich, 1991); and
- knowledge and organizational studies (Alvesson, 1993; Blackler, 1995; Brown & Duguid, 2000; Choo and Bontis, 2002; Alvesson, 2004), to mention a few.

For the purposes of this research I do not, however, view any manipulation of knowledge as knowledge management. From a KIO perspective it would be redundant for us to consider knowledge use as KM since it is part of every business process in the organization (Firestone & McElroy, 2003). Knowledge use occurs in KIOs whenever a knowledge worker makes a decision requiring some kind of judgment. Consequently, I consider knowledge management in KIOs as more of the management of knowledge production and knowledge integration. Hence I adopt the definition of KM as presented

by Firestone and McElroy (2003) where KM is defined as “a management discipline that seeks to enhance organizational knowledge processing” (p. 70). In other words KM can be regarded as “knowledge process management, that is, the management of knowledge production, knowledge integration, the KLC, [knowledge life cycle] and their immediate outcomes” (Firestone & McElroy, p. 61). In this regard I acknowledge the importance of managing innovative knowledge processes to enhance the knowledge life cycle performance in the organization.

The academic literature presents two predominant epistemological approaches to KM in organizations; i.e., the content and relational perspectives (Tsoukas, 2001; Hayes & Walsham, 2003). The content approach views knowledge as a commodity that can be codified, stored in repositories, and exchanged between individuals within an organization (Nonaka & Takeuchi, 1994; Davenport & Prusak, 1998; Hayes & Walsham, 2003). The KM studies adhering to this view focus on the collection, distribution, application and measurement of existing codified knowledge. On the other hand, the relational view to KM focuses on the enquiry of the process of knowing and the capability to act (Brown & Duguid, 1998; Blackler, 1993). Although ideas are formed in individual minds, interaction between individuals plays an important role in developing these ideas (Nonaka, 1994). In this sense knowledge management is treated as process oriented and primarily context-dependent (Lave & Wenger, 1991; Blackler, 1995; Hayes & Walsham, 2003).

The other approaches to KM evident in the literature are referred to by Schultze (2008) as “knowledge management as a solution”, and “knowledge management as a problem”. According to Schultze (2008) “knowledge management as a solution” represents the idea that the best way to address knowledge management issues is to utilise particular types of organization-wide IT-based knowledge management systems. On the other hand “knowledge management as a problem” refers to the day-to-day challenges and problems that organizations and workers face in using, sharing and developing knowledge in the management and completion of work activities. Schultze (2008), however concluded that in the business world there had been a shift from a “knowledge

management as a solution” perspective, to one of “knowledge management as a problem”. This viewpoint is supported by Hislop (2010) who recently reported a noticeable decline in the type of large-scale, IT-based knowledge management systems that many organizations were implementing and many IT companies, and professional service companies were promoting in the late 1990s. He also noted a change in emphasis from IT to people-oriented knowledge management.

For this research, I explore KM and the accompanying KMS in knowledge-intensive organizations through the conceptual lens of “knowledge management as a problem” thus underscoring the challenges and problems that organizations and workers in KIOs face in acquiring, exploiting, sharing, and developing knowledge in the management and completion of work activities. I also adopt the relational-oriented perspective, whereby knowledge is created during the execution of organizational processes and thus in order to achieve a higher performance, KM processes must be embedded in the organization processes (Han & Park, 2009; Nissen et al., 2000; Schreiber et al., 1999). Furthermore knowledge is highly context dependent. As Han and Park (2009) observed, if knowledge is separated from the context, it does not result in the right action being taken for the targeted performance. Hence, instead of treating knowledge as a commodity that can be traded on the market, I regard knowledge “as being relative, provisional, and primarily context-bound” (Hayes & Walsham, 2003, p. 55). My goal is to explore both social-based and IT-based systems (Hislop, 2010) in KIOs. By highlighting both technical and social approaches I can thereby emphasize the concerted and pro-active aspects of KM and the accompanying KMS in KIOs, focusing on dedicated, goal-oriented organizational activities, processes and projects.

2.6 ACTIVITY SYSTEMS FRAMEWORK

Linked to the practice perspective of knowledge and the knowledge creation and knowledge commercialization processes discussed above, activity theory (Blacker, 1993) provides a useful prototype to formulate a theoretical perspective for studying KIO defining characteristics and how they interlace with the choices of KMS deployed in these organizations. Activity theory presents an alternative approach to identifying and

understanding knowledge sharing, storage, transfer, and application as well as the innovative processes surrounding the transformation of an idea to an innovative product, and the choice of KMS that enables these processes in KIOs. Activity theory does not view knowledge and practice as separate, but as fundamentally entwined. It focuses on the study of practices, on an “object of activity” (Blackler & Regan, 2009) and thus considers knowing to be achieved through participation in practice (Blackler, 1995). The object of activity, as presented in activity theory, “is the thing, or project that people are working to transform” (Blackler & Regan, 2009, p. 164). Simply stated, the “object of activity” is the aim towards which knowledge workers work skillfully together to meet an identified need. Accordingly, I suggest that an activity theoretical approach will help us understand in new ways the relationship among knowledge management, knowledge creation, and knowledge commercialization work. The literature identifies the key characteristics of KIOs as worker-directed innovations, which suggests effective KM in KIOs should take into account the differences in unit needs and knowledge-intensive processes and practices. The appropriate focus in these organizations is not knowledge in general or knowledge workers but the management of expertise. Expertise, as presented by Blackler (1993) is “effective activity”. Thus, the management of effective activity in the KIO units and the organization as a whole is crucial to KM success.

“Activity theory examines the nature of practical activities, their social origins, and the nature of the 'activity systems' within which people collaborate” (Blackler, 1993). Thus, in order to understand fully KM and the accompanying KMS in KIOs, I have adapted a view of organizational knowledge as existing in activity systems (Blackler, 1993), in which knowledge workers as actors use, share and produce knowledge in context (Blackler, 1995; Spender, 1996). The theory of organizations as activity systems, as presented by Blackler (1993), is useful for exploring the nature of knowledge work, organizational competencies, and organizational learning as factors that differentiate KIOs from traditional organizations. Blackler’s (1993) modeling of organizations as settings for activity provides a good theoretical foundation for the empirical investigation of KM, and the accompanying KMS, in KIOs. Most importantly to my study are the relations between workers, the community of which they are members and the

conceptions people have of their activities. As Blackler (1995) noted, such relations are mediated by other factors, including technologies, implicit and explicit rules, system roles, and the division of labour adopted by the community. In essence, the theory of organizations as activity systems reinforces the relational view of knowledge management (Tsoukas, 2001; Hayes & Walsham, 2003) and social constructionist themes explained in the literature review sections, by presenting organizations as activity systems that are “embedded within, and maintained and restricted by, a broad external network of activity systems” (Blackler, 1993, p. 18).

The principles of activity theory have been applied to a wide range of knowledge management studies such as knowledge sharing, organizational knowledge conceptualization, organizational learning and knowing, systems design, and knowledge management systems (Boer, van Baalen, & Kumar, 2002; Tsoukas & Vladimirou, 2001; Gherardi, 2000, Tsoukas, 1996; Collins & Shukla, 2002; Ardichvili, 2009). For this research study therefore, applying Blackler’s (1993) activity systems framework to the exploration of the link between KIO defining factors and KMS choices encourages a particular analytical view, that moves away from “a concern with the management of experts to a concern with the management of expertise, from an emphasis on plans and strategy to an analysis of activity and activity systems, and from a preoccupation with objective knowledge to a concern with the management of collective instability” (Blackler, 1993, p. 20). As Blackler (1993) argued, activity as a concept draws attention to relationships between motives and the contexts of action, and invites enquiry into the processes through which knowledge workers enact the activities in which they participate. Key aspects of the activity systems theory, as presented by Blackler (1993), pertinent to the empirical exploration of KMS choices in KIOs include:

- (i) People do not just think; they act on the world and they do this collectively. This is a highly appropriate observation which helps to explain the overall coherence of the different actions of the knowledge workers as they perform their tasks using the KMS.
- (ii) Mediating mechanisms, such as tools, language, social rules and the division of labour, transform the relationships among individuals,

communities and shared endeavours. This aspect highlights the importance of the worker elements as well as organizational factors defining KIOs.

- (iii) Novices learn by participating in activities and activity systems. This aspect points to the need for systems that support creative, interpretative and process oriented aspects of learning which is more likely to be tacit than explicit.
- (iv) Activities are socially and historically located, again highlighting the importance of organizational factors and suggesting the need for KMS to be equipped with the capabilities to evolve over time in line with the evolution of the organization.

As depicted in Figure 3, drawing from the activity systems framework, the appropriate approach to the analysis of KIOs and the accompanying KMS that enables effective knowledge generation and knowledge commercialization work can be the exploration of the organization's complex "routines, improvisations, setting conditions, and (often implicit) understandings" (Blackler, 1993, p. 18). From a knowledge management perspective, analyzing KIOs as activity systems encourages one to stand back and perceive the overall pattern into which organization-wide routines and outcomes fall. The activity systems approach emphasizes factors essential to knowledge work, i.e., the interplay of actions, concepts, tools, social structures, implicit and explicit rules, history and institutions. In this vein the theory of activity systems depicts the enterprise as an activity system embedded within a broad external network of activity systems (Blackler, 1993); knowledge generation and innovation, therefore, can be analyzed as activities.

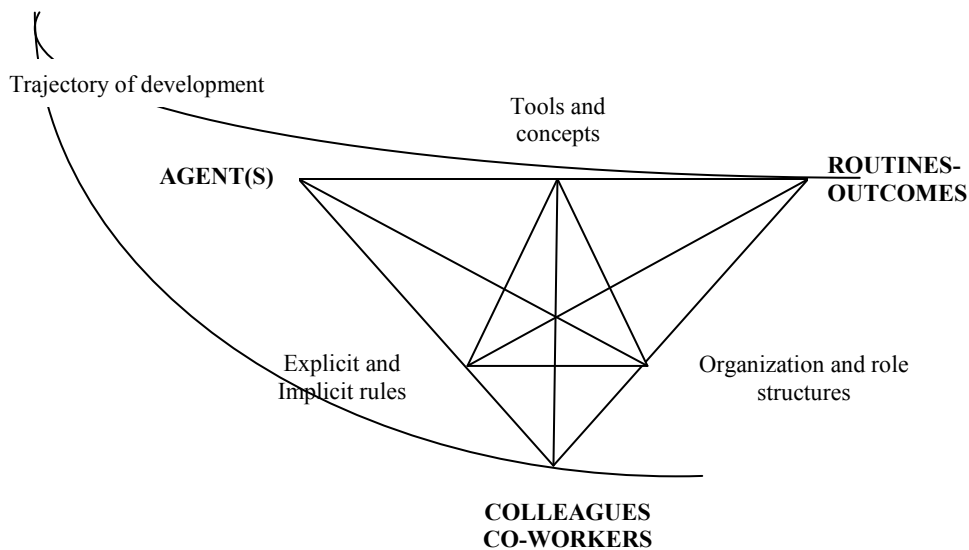


Figure 3 Blackler's (1993) Activity Systems Framework

More importantly, as noted in the discussion above KIOs provide a socially constructed context for actions, and therefore cannot sensibly be divorced from their contexts. As workers perform their tasks they interpret and negotiate such contexts (Blackler, 1993). Figure 3 shows that organizational routines act as the unifying mechanism of the overall system. As Blackler (1993) argues, it is through such routines or repetitive patterns of behaviour, that co-operation rather than conflict becomes the norm in complex organizations. Also, as portrayed in Figure 3, KIOs, “as activity systems are embedded within, and maintained and restricted by, a broad external network of activity systems” and accordingly activities of a KIO “are legitimated and channeled by broader institutional factors, including prevailing 'industry recipes'” (Blackler, 1993, p. 880). This framework, therefore, appears well suited for making sense of KM in KIOs and the choices made to design and implement KMS in these organizations. It provides a multidimensional approach to the analysis of knowledge management in knowledge-intensive organizations. In other words the framework pictures a number of complex knowledge worker practice and process relationships very well.

2.7 TASK COMPLEXITY

The discussion of the activity systems theory presented above draws attention to the design of work in KIOs, and invites closer enquiry into the variety of ways through which knowledge workers perform their work tasks. A number of studies recently have focused on task complexity and demonstrated that task complexity is a critical component in organizational behaviour and decision-making research (Wood, 1986; Wood, Mento, & Locke, 1987; Campbell, 1988; Ditillo, 2004; Harrison & Humphrey, 2010). From a group task perspective, for instance, many scholars argue that the nature of the task plays an important role in a group's interaction process and performance (Zigurs & Buckland, 1998). Thus with regard to knowledge workers' activities in KIOs, it can be argued that, because required behaviors among these workers vary from task to task, knowledge-intensive related activities requirements can legitimately be viewed as characteristics of tasks rather than characteristics of the knowledge worker. What the workers are supposed to do to accomplish the task requires generation of ideas. Also, as Zigurs & Buckland (1998) noted "behavior requirements for a task include not only what must be accomplished to meet stated goals, but how those goals should be accomplished, i.e., the processes by which the task should be carried out" (p. 316). Therefore the driving force behind any given task, explicit, implicit or tacit, can be explained by the interplay of actions, concepts, tools, social structures, implicit and explicit rules, history and institutions of the organization, as elaborated in the activity systems theory.

Wood (1986) defined task complexity as consisting of three components: (i) coordinative complexity (the number of non-linear sequences between components and task products), (ii) component complexity (the number of distinct acts and the number of distinct information cues involved in the task), and (iii) dynamic complexity (the stability of the relationships between inputs and the product). In KIOs I view a complex task as one in which high cognitive demands are placed on the taskdoer, who in this case is the knowledge worker. I therefore consider the three components of task complexity as presented by Wood, as aiding in my understanding of the complexity of knowledge creation and knowledge commercialization in KIOs. I view task complexity dimensions

as closely linked to knowledge complexity in KIOs and suggest that when these dimensions are explored in association with the knowledge-intensive defining factors they can help explain the different choices of KMS deployed in KIOs. Thus to aid in the interpretation of Phase 2 study results and the building of a KMS in KIOs framework, I adapted the core analytical dimensions of task complexity derived from Wood (1986)'s theoretical model of tasks.

2.8 KNOWLEDGE MANAGEMENT, KNOWLEDGE MANAGEMENT SYSTEMS AND KNOWLEDGE-INTENSIVE ORGANIZATIONS

The study of knowledge-intensive organizations in general is still in its infancy (Amar, 2002); consequently, there are not many studies available that look at the management of knowledge in knowledge-intensive organizations. With regard to knowledge management systems, little research and insight exist to frame expectations of the costs and benefits surrounding the choice of such systems in KIOs. In this study I define KMS as the type of systems specifically designed with the intent to manage organizational knowledge which is intended to facilitate organizational learning and enable users to assign meaning to information and to capture some of their knowledge in information and data (Goel & Mousavidin, 2008; Alavi & Leidner, 2001; Damodaran & Olphert, 2000). In this regard I view KMS, not simply from a technological perspective but from a more holistic perspective, i.e., a system that “includes IT/ICT components, repositories, users, processes that use and/or generate knowledge, knowledge, knowledge use culture, and the KM initiative with its associated goals and measures” (Jennex & Olfman, 2005, p. 55). I acknowledge that not all KM initiatives implement an IT solution, but IT is an enabler of KM.

From an IT perspective different types of KMS can be found in the market today. According to Benbya (2008) KMS can be classified into 3 main categories: (i) Dynamic Systems, which mainly support interactive communication between experts with a focus on the tacit dimension of knowledge, e.g., yellow pages and expert networks; (ii) Process Oriented Systems, which capture knowledge for reuse to solve new or old problems, and thus focus more on the explicit dimension of knowledge, e.g. knowledge repositories and

lessons learned from best practices; and (iii) Integrative Systems, which integrate the organization's knowledge sources, thus providing a single point of access with a focus on both explicit as well as tacit knowledge, e.g. corporate portals (extranets and intranets). The question therefore is why do managers in KIOs choose to implement one category of KMS over the other?

As stated above within KIOs, claims of the benefits of knowledge management are well pronounced. "As KIFs [knowledge-intensive firms] primarily rely on the knowledge bases for their employees....then their knowledge management practices should effectively encapsulate the totality of management practices within these firms. All management activity ought to be ultimately directed at the acquisition, development, protection, sharing and exploitation of knowledge within these firms" (McGrath, as cited by Alvesson, 2004). Since knowledge plays such a unique and complex role in KIOs, an exploration of KM strategies can be fruitful to our understanding of the ultimate choices of KMS used within these organizations. Moreover, as Amar (2002) pointed out, knowledge management strategies that work best in knowledge-intensive organizations are different from those in traditional organizations. However, very few studies have looked at the management of knowledge in KIOs. A few of the studies that explore KM in KIOs are discussed below.

Initially, as observed by Ichijo and Nonaka (2007), most organizations' efforts to manage knowledge "followed an unguided approach and belief that more knowledge-sharing, facilitated by technology, would be better". With the growing excitement and recognition of knowledge as a source of competitive advantage, there emerged prevalence among organizations to store "almost every imaginable variety of knowledge documents" in what has come to be known as knowledge repositories. As Tuomi (1999) noted in enterprises organizational knowledge sharing via documents has become so common that in some cases, "knowledge management is considered to be a new name for document management" (Tuomi, 1999, p. 12). However, a number of scholars agree that from an organizational practice perspective simply increasing the distribution of documents within an organization is not an effective solution for successful KM in organizations

(Ichijo & Nonaka, 2007; Tuomi, 1999); it may be part of the problem. For instance the document distribution approach to KM fails to take into consideration the element of contextual knowledge. In knowledge repositories, knowledge is sometimes codified without contextual information. As the repositories grow in size the context of the content is lost. Evidence shows that as some repositories become large, companies find it hard to encourage employees to consult or even contribute to these knowledge repositories (Ichijo & Nonaka, 2007). In this case, it appears KMS should be designed with tools to increase accessibility, relevance and ability of the user to create meaning for themselves.

Hansen et al. (1999) differentiated between two broad knowledge management strategies employed in knowledge-intensive organizations. After studying knowledge management practices in a number of knowledge-intensive organizations, including management consulting firms, computer companies, and health care providers, they observed that most knowledge-intensive companies employ a computer technology-driven codification strategy in which knowledge is explicated, codified, and stored in repositories, and a personalization strategy, in which knowledge is shared through direct person-to-person contact. Computer technology was found to mostly facilitate communication in these organizations. Hansen et al. (1999) thus concluded that in order to be effective in their KM pursuits, KIOs should pursue one KM strategy predominantly, i.e., either codification or personalization, “and use the second strategy to support the first,” with an 80-20 emphasis (Hansen et al., 1999, p. 112). The codification strategy, as Hansen et al. argued, is most relevant for those KIOs whose competitive edge is driven by the reuse of codified knowledge, while the personalized strategy is most relevant for organizations that derive a competitive advantage from “processes of knowledge creation and the provision of innovative, customized products/services” (Hislop, 2009, p. 60). However, this assertion has been questioned by a number of authors.

Alvesson and Karreman’s study of a large management consultancy firm, as reported by Alvesson (2004) casts some doubt on Hansen et al.’s conclusion. Alvesson and Karreman found that the KM strategy employed in their company of study transcended “Hansen et al.’s claim that successful companies concentrate on one of the two strategies” (Alvesson,

2004, p. 178). They also raised considerable doubts regarding the “fruitfulness of the strict separation between a personalization and a codification strategy” (Alvesson, 2004, p. 180). In the KM strategy employed by their company of study, Alvesson and Karreman observed a blurring of codification and personalization elements. Alternatively, Alvesson and Karreman (2001) identified four approaches to knowledge management in organizations: (i) the extended library approach which places emphasis on the transfer of information through techno structural co-ordination, (ii) the community approach which emphasizes the sharing of ideas through social co-ordination, (iii) the normative approach which emphasizes prescribed interpretations through social control, and (iv) the enacted blueprints approach, which emphasizes templates for action through techno structural control (Swan & Scarbrough, 2001). As Hislop (2009) reflected, Alvesson and Karreman’s four approaches to KM are structured around two basic dimensions: (1) the mode of managerial intervention dimension, i.e., management exercising a strong controlling role or a coordination role, and (2) the medium of interaction dimension, i.e., management systems that are behaviour (techno structural) focused or attitudinal (social) focused (p. 66). But as Alvesson and Karreman (2001) concluded, organizations are unlikely to follow exclusively one approach to KM but are likely to use a combination of the four approaches. Furthermore, Alvesson and Karreman stated that the four approaches they presented were based solely on analytical evidence of the literature rather than on empirical evidence.

After studying the generation, dissemination and translation of knowledge in large, global management consulting organizations, Werr and Stjernberg (2003), also questioned the validity and generalizability of Hansen et al.’s (1999) conclusions, specifically with regard to the codification strategy. They observed that knowledge generated in the ongoing projects is difficult to articulate and referred to this as the barrier to codification within the consulting firms. For instance the specificity of each new consulting project was seen to require adaptation to a new situation since the “development of the knowledge system was also dependent on making the individual consultant’s tacit knowledge available to the organization” (Werr & Stjernberg, 2003, p. 898). Thus they argue that although the codification of some knowledge aids the communication and

sharing of tacit knowledge there are significant difficulties in achieving this, mostly because most of the knowledge is tacit and therefore not amenable to codification. Moreover, they argue that consulting project knowledge is so highly specialized and context-specific that its general relevance within the organization is limited. Werr and Stjernberg (2003) thus provided a KM strategy solution specific to these organizations: They suggested the employment of personalization strategies they referred to as (i) “leveraging”, which denotes making available an individual consultant’s experience to the organization by organizational means, and (ii) “extension” which denotes creating shared experience spaces to ensure that “the consultant’s tacit experiences were not only made available, but transferred to other consultants” (Werr & Stjernberg, 2003, p. 898). They also developed a model of the organizational knowledge system in management consulting organizations which identified “three interrelated knowledge elements: common methods and tools, a repository of cases, and individual consultants’ experience” (Werr & Stjernberg, 2003, p. 902). However there is no empirical evidence pointing to the success of this model in KIOs.

McKinlay (2002), on the other hand, reported on KM initiatives in a global pharmaceutical company which resulted in three distinct and somehow competing knowledge management projects. These projects included the development of the “Lessons” system and a reporting infrastructure meant to capture “lessons learned” at the end of each major phase of the drug development process. This was followed by the development of a comprehensive database, called “Warehouse”, which was hailed as an attempt to integrate the social and technical dimensions of KM. Another form of KM was developed in the form of “electronic cafés”, which is a set of linked web sites that compiles employee stories associated with drug development. However, as McKinlay concluded, despite all these efforts, none of the three KM projects could be registered as a great success. In this organization KM “remained an incomplete form of power/knowledge and dependent upon the willing participation of the knowledgeable” (McKinlay, 2002, p. 86). Howe and Levin (2007)’s study of accounting practices yielded similar observations: they observed shortfalls with KM systems in these organizations. They noted that the systems that had been developed in accounting practices failed to

capture the information that lies outside the “technological boundaries, such as little-known or personal facts about a client, special circumstances regarding a client process, or new procedures that might enhance the firm’s operations”. They also noted that there was a prevalent culture in accounting firms that inhibited knowledge sharing. According to Howe and Levin the prevalent stratification culture i.e., the “belief that senior members should only socialize with other senior firm members, is a lost opportunity to share knowledge with someone who is on the front line, interacting with clients every single day” (Howe & Levin, 2007, p. 3).

What is evident from the KM approaches discussed above is that KM involves all management processes that gather, organize, share, and analyze an organization’s knowledge base (Figueiredo, 2006). I therefore subscribe to the viewpoints expressed by Hansen et al. (1999) when they concluded that management strategies for knowledge should be informed by the nature of the business. In other words a “company's choice of knowledge management strategy is not arbitrary - it must be driven by the company's competitive strategy how it creates value for customers, how that value supports an economic model, and how the company's people deliver on the value and the economics” (Hansen et al., 1999, p. 107).

2.8.1 Gaps in the Literature

It is evident from the literature that business processes determine the underlying design of KMS. Different views of knowledge lead to different perceptions and approaches to knowledge management and the design and application of the supporting KMS. The success of KMS in organizations is therefore depicted as dependent on understanding these differences and managing the integration processes. However, with regard to KM and the choice of KMS in KIOS the literature was limited in the integration of the distinct characteristics of KIOS and strategies employed to support KM. There is therefore a need for models, frameworks, or methodologies that can help knowledge management executives in KIOS to understand the knowledge elements unique to KIOS and to identify KM initiatives that are possible and make sense in their organizational context. In other words the literature presented an opportunity to build on the existing body of knowledge

through interrelating KIO defining factors and KMS choices and also develop new knowledge, including the application of the activity systems theory and the core analytical dimensions of task complexity to the KIO and KMS research to form even stronger foundations to our understanding of effective KM in these organizations.

2.9 SUMMARY TO CHAPTER 2 AND TRANSITION TO CHAPTER 3

In this chapter, I have examined the literature on knowledge, knowledge workers, knowledge-intensive organizations, knowledge management and knowledge management systems pertinent to this study. In Chapter 3, I discuss the theory on which the study is based and present a conceptual approach that attempts to understand KIOs and their defining factors.

CHAPTER 3 CONCEPTUAL MODEL

3.1 INTRODUCTION

The extant literature on KM in KIOs discussed in chapter 2 reveals a need for a clear KIO definition and understanding of the knowledge-intensive characteristics that define these organizations. Lack of clarity is observed in the presentation of the knowledge attributes that differentiate these organizations from others. This chapter presents the conceptual model which was validated in Phase 1 of the study through a survey of knowledge management professionals. By conceptual model I mean a description of “some aspects of the physical and social world around us for purposes of understanding and communication” (Mylopoulos, 2008) as opposed to models intended to communicate the design aspects of a knowledge management system or information system.

The conceptual model presented in section 3.2 of this chapter was developed through critical examination of scholarly literature associated with knowledge-intensive organizations. The initial review of the literature began with an examination of publications that discussed the concept of knowledge and how this knowledge is created and managed within KIOs. The review process was then narrowed down to publications that referred specifically to the factors identified as defining or differentiating KIOs from traditional organizations. The purpose for this extensive research was solely to pull out the most common elements acknowledged by other researchers as determining knowledge-intensity in organizations. The key defining factors related to KIOs that emerged from the literature were then synthesized to form the conceptual model presented in this chapter. Also, the literature showed an opportunity to integrate KIOs knowledge-intensive defining factors, and the principles from the activity systems theory to improve our understanding of how the defining factors relate to each other and contribute to knowledge intensity in KIOs. The conceptual model presented below is therefore an attempt to bring together all these ideas into one whole to provide a more comprehensive approach to our understanding and determination of whether a particular organization is a KIO or not and the different knowledge-intensive factors defining these organizations.

Also presented in this chapter is a proposed typology of KIOs illustrating relationships between the different factors and different types of KIOs identified in the literature. A typology in this case refers to the systematic classification of organizations into types on the basis of their shared knowledge attributes. Some of these relationships are apparent in the literature, whereas others are being proposed in this typology to further explore the interrelatedness of the factors that define knowledge-intensity in KIOs. Section 3.5 provides a summary of the chapter.

3.2 CONCEPTUAL MODEL²

The conceptual model integrates KIO defining factors and activity systems principles to provide for a robust knowledge-intensive organization model, i.e., revealing the interrelatedness of the knowledge-intense factors in the creation and commercialization of knowledge in the organization. In this study I posit that knowledge-intensity in organizations can best be defined by two distinct groups of factors, i.e., those related to knowledge workers' activities, and organizational needs. This view is drawn from the literature, and from the typology of KIOs presented below, which identifies two critical dimensions of knowledge intensity, i.e., the worker dimension and organizational/unit dimension. The two dimensions are presented in Figure 4 and discussed below.

The worker dimension (see Figure 4) assesses the organization's focus on expertise and innovation as the core strategy of the firm. Traditionally in organizations elements such as "capital", "natural resources" or "labour" have been singled out as defining elements of the organizations, the "controlling resource and the absolutely decisive factor of production" (Drucker, 1993). In this study, KIOs are viewed primarily as organizations where the sophistication and complexity of what the worker knows and does, i.e., worker "expertise" and "innovation" defines organizational output and success". It is important to note that knowledge intensity is presented as a continuum measured by the extent of worker knowledge. In other words on one end of the continuum, worker knowledge may

² Substantial parts of sections 3.2 and 3.3 have been published, (see Makani & Marche, 2010).

be described as familiar or experiential knowledge, and on the other end is esoteric or novel knowledge. Esoteric knowledge is restricted to, or intended for, the purview of the identified experts in the organization. Novel knowledge is intellectually appealing and unfamiliar to most people in the organization.

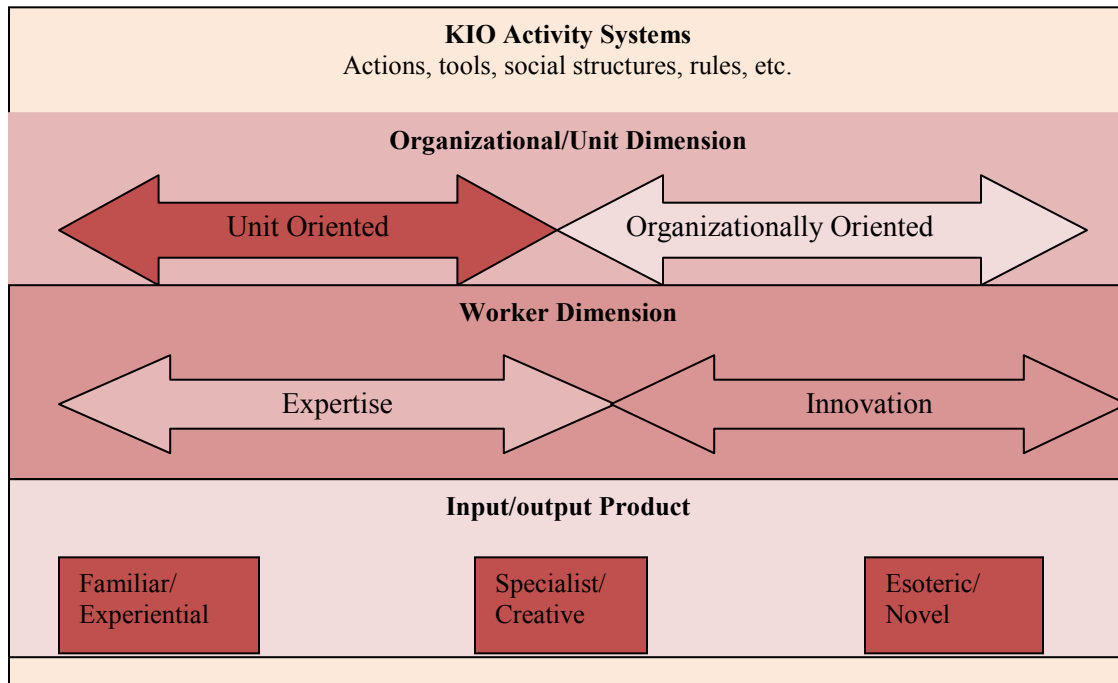


Figure 4 A Conceptual Model of Knowledge-Intensive Organizations

On one end of the worker dimension, for example, is a KIO that may depend on individual experts who focus on familiar problems or use experiential knowledge to solve problems; accounting firms are identified as examples of organizations that can fit this description. The performance of the organization is mostly dominated by the work of the specialists /professionals, who are the accountants in this example. Sheehan and Stabell (2007) confirm this assertion by noting that accountants “create value by defining problems and suggesting remedies” but in suggesting remedies they mostly use knowledge gained from their training and experience, which is regarded as familiar knowledge. On the other end of this dimension are KIOs which are highly dependent on the innovation of their individual workers; drug discovery firms, for example, are driven by innovation. In other words the use of knowledge for innovation is inextricably linked

to the strategy of those companies. Organizations belonging to this end of the dimension are dependent on knowledge workers who work with novel knowledge to innovate and create new knowledge.

The organizational/unit dimension (see Figure 4) assesses the extent of knowledge use and production in business operations throughout the organization. In KIOs, as discussed in the literature review above knowledge is identified as both the input and product, i.e., workers work extensively with knowledge to create new knowledge. The extent to which the esoteric use and production of knowledge may vary on this dimension from being a single unit characteristic to an organizational-wide defining characteristic, depending on how much the organization relies on its experts' knowledge and innovation skills for success. KIOs whose characteristics vary from a single or a few units are usually biased by the occupational or professional orientation of the majority of workers comprising the unit(s), e.g., law firms. Law firms, as exemplar KIOs, rely on high degrees of esoteric expert knowledge but also a relatively high degree of manual skills or routine intellectual skills since some of the practice work is carried out in almost production line routine processes, e.g., the work done by associates. The need for intellectual skills in these organizations is therefore dependent on a particular unit within the organization. On the other end of the continuum of this organizational/unit dimension are organizations which are highly reliant on individual key workers to innovate and create new knowledge. In firms such as management consulting firms the extent of knowledge use and production is widespread. In these firms there are high degrees of esoteric expert knowledge use and production, since knowledge is the core to the firms' survival. These organizations, as a result, rely heavily on workers' *'high levels of intellectual or cognitive skill usage'* as the majority of their workers "think for a living" to produce and sell knowledge.

A key distinguishing feature of KIOs highlighted in the model presented in Figure 4 is that knowledge is both an input and an output and thus a critical resource for the organization. Nevertheless, by integrating the activity systems principles the model underscores that knowledge production activities in KIOs are done in context, i.e., production is mediated by other factors such as implicit and explicit rules, the division of

labour, and technologies. Thus from the discussion of the two dimensions given above one can conclude that KIOs can be differentiated from traditional organizations due to their unique knowledge characteristics. This concern is central to the study. Emphasis will be placed, among the KIOs themselves, more on the distinctions that can be observed in the fit between their organizational/unit defining factors and worker elements and how these factors inform the choice of KMS deployed in these organizations. A proposed typology of KIOs is presented in section 3.3.

3.3 PROPOSED TYPOLOGY OF KNOWLEDGE-INTENSIVE ORGANIZATIONS

A proposed typology of KIOs that uses the two dimensions discussed above is presented in Figure 5 below. The conceptualization using the two dimensions is presented in Figure 5. It is of the organization as a whole as opposed to focusing on specific processes or subparts of the organization. While the importance of knowledge has often been demonstrated within work groups or for particular organizational processes, [in this particular presentation], it is regarded as a basis for analyzing the organization as an organization.

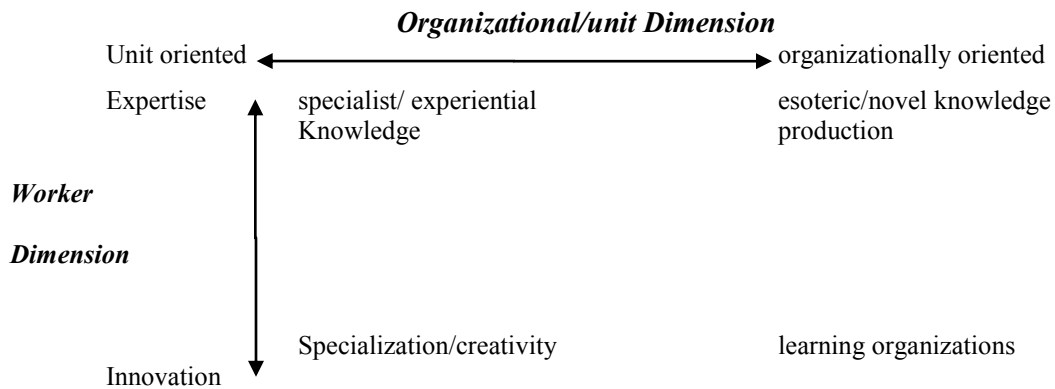


Figure 5 A Typology of Knowledge-intensive Organizations

As discussed above the two dimensions are presented on a continuum of levels of knowledge-intensity levels. It is interesting to note that knowledge intensity is prevalent not only at the end points of the two dimensions but along the continuum. The four corners of the matrix in Figure 5 indicate the four levels of KIOs in the typology. These are unit oriented-expert driven firms, unit oriented-innovation driven organizations, organizationally oriented- expert driven firms, and organizationally oriented-innovation driven firms. The literature presents unique characteristics identified as defining KIOs which, when incorporated into the typology presented in Figure 5, help explain the different characteristics of the four levels of KIOs. Table 3 illustrates how the various elements of KIOs discussed in the literature are incorporated into the typology.

Table 3 Characteristics of Knowledge-Intensive Organizations

CHARACTERISTICS	DESCRIPTION	KIOS			
		Unit oriented-expert driven firms	Unit oriented-innovation driven firms	Organizationally oriented-expert driven firms	Organizationally oriented - innovation driven firms
Worker independence	Degree of worker independence as evidenced by less managerial control	Professional bureaucracy	worker interdependency	professional bureaucracy with some limited managerial control	high worker autonomy
Cognitive skills	The level of complexity	mixed complex & simple	highly complex	mixed complex & simple	highly complex
Decision impact	The degree to which individual worker's decision impacts organizational success	low to moderate	moderate to high	moderate	high
Accountability	The degree to which the worker is held accountable for their decision	low to moderate	moderate to high	moderate	high
Managerial control	The extent to which top and middle managers have opportunities to exercise direct supervision and control	high	medium	medium	limited

CHARACTERISTICS	DESCRIPTION	KIOS			
		Unit oriented-expert driven firms	Unit oriented-innovation driven firms	Organizationally oriented-expert driven firms	Organizationally oriented - innovation driven firms
Body of knowledge	The volume, complexity, and rate of change of knowledge the organization uses and produces	low	high	medium	high
Nature of tasks	The complexity of tasks the organization is mostly involved in	simple, routine, & complex	complex and unique	a mixture of complex & simple, static tasks	complex, unique, & dynamic
Expertise	The degree to which worker demonstrates mastery of skills, knowledge and attitude, taking into account the difficulty of such mastery	high	high	high	high
Demand for innovation	The degree to which innovation is core factor for success	low	moderate	low	high
Dimensions of professional orientation	Whether an organization is accredited by a self-regulated body or its workers belong to a professional group	mostly professionals & specialists	mixture of accredited, non-accredited specialists & skilled-craft workers	mostly professionals & specialists	mostly professionals & accredited workers

CHARACTERISTICS	DESCRIPTION	KIOS			
		Unit oriented-expert driven firms	Unit oriented-innovation driven firms	Organizationally oriented-expert driven firms	Organizationally oriented - innovation driven firms
Nature & size of occupational network	The degree to which worker/organizational outside & inside networks extends	small simple usually professional networks	medium size and simple	small simple usually professional networks	large complex
Relationship to others, internal & external	The degree of extent of relationships within and outside	strong professional ties & shared values	moderate social ties and shared values	strong professional ties & shared values	strong social ties & shared values
Leveraging effect	Value adding component, i.e., the production value	Knowledge is both an input & output product i.e., familiar, experience & professional knowledge	Knowledge is both an input & output product i.e., mixture of esoteric and common knowledge	Knowledge is both an input & output product i.e., familiar, experience & professional knowledge	Knowledge is both an input & output product i.e., esoteric, innovative knowledge
Organization examples		medical firms, accounting firms & law firms	advertising firms, architectural firms, engineering consulting services	investment companies, computer consulting firms	business management consulting firms, drug discovery firms

Unit oriented-expert driven firms, as exemplified by medical, accounting and law firms (see Table 3), are those firms that rely on experts' use of high degrees of specialized, professional, and experiential knowledge. In other words, in these organizations high emphasis is placed on the contributions of a few key experts who are housed in defined units of the organization. The need for cognitive and innovative skills is dependent on the particular department within the organization. Consequently knowledge use and production is prevalent in particular units only. Therefore although these organizations are referred to as knowledge-intensive, according to this definition, we cannot distinctively consider the whole firm as knowledge-intensive.

Unit oriented-innovation driven organizations: KIOs that fall within this category e.g., advertising firms, architectural firms, and engineering consulting services, (see Table 3), focus on few key departments that use novel knowledge to solve novel problems. Most of the work in these organizations is performed in project-based groups formed within units or departments. For instance advertising experts working on an advertising campaign project not only work from experience but also with sophisticated knowledge to produce new creative advertising campaigns. In other words these organizations are defined by relatively high levels of cognitive skills, high expertise, and the use of a mixture of esoteric content, and common knowledge. Thus knowledge use in these organizations, although unit focused, can be described as more innovative than experiential or familiar.

Organizationally oriented- innovation driven firms, as exemplified by business management consulting firms and drug discovery firms, on the other hand, exhibit high degrees of esoteric expert knowledge use and production. Their dominant workers exhibit high levels of innovative skills and complex cognitive skills. Most of the workers in these organizations "think for a living" to produce and sell knowledge. They are continually learning so as to upgrade their skills. They perform complex, unique, and dynamic tasks, and are highly accountable for their decisions. In other words their decisions have strong impact on the success of the organization as a whole. As a result, the organizational form is less formal or controlling, with management ceding a high degree of autonomy to the individual workers in their work process. In addition, these organizations are character-

ized by a high degree of worker interdependence, arising from the experts' need to supplement each other's expertise in order to effectively analyze complex work problems.

3.4 SUMMARY TO CHAPTER 3

In this chapter I presented conceptual model of knowledge-intensive organizations developed through a thorough review of the literature. Also presented in this chapter is a proposed typology of KIOs. The next steps in my research were twofold. First I investigated the capability of the conceptual model to answer the questions pertaining to factors distinguishing KIOs from non-KIOs and how these defining factors relate to each other and contribute to knowledge intensity in the organizations. Then drawing from the results from the first investigation I empirically explored the interlacing relationships between defining factors for KIOs and the choices of KMS deployed in KIOs to support knowledge management processes and activities. The study's research methodology is presented in chapter 4.

CHAPTER 4 RESEARCH METHODOLOGY

4.1 INTRODUCTION

As mentioned previously this thesis was designed to explore empirically the defining factors for KIOs and relate these factors to the choices of KMS deployed in these organizations to support knowledge management processes and activities. The specific objectives of the study are:

Research Objective 1: Identification of factors that differentiate knowledge-intensive from non-knowledge-intensive organizations;

Research Objective 2: Specification of a correlation model of the knowledge-intensive defining factors and an organization's choice of KMS; and

Research Objective 3: Development of a framework that allows a proactive examination of possible KMS choices and KM process outcomes based on the correlation model under different KIOs scenarios.

The research questions of the study are:

1. What factors distinguish KIOs from non-KIOs?
2. How do these defining factors relate to each other and contribute to knowledge intensity in KIOs?
3. How do KIOs' defining factors relate to the choice of KMS?
4. In what way do the KIO organizational knowledge attributes and knowledge worker activities inform the choice and application of KMS?

Both quantitative and qualitative approaches were employed in this study. There is a growing body of literature on social science research methods that advocates the use of multiple methods. This form of research strategy views qualitative and quantitative methods as complementary methods. In fact, as Jick (1979) postulated, "most textbooks underscore the desirability of mixing methods given the strengths and weaknesses found in single method designs" (p. 602). Hence, to achieve the stated objectives of this research the most appropriate research strategy was deemed to be triangulation. I utilized both the "between (or across) methods" and "within-method" kinds of triangulation (Jick,

1979) as discussed in the sections below. In other words no single method was considered sufficient and as a result a design evolved that utilized a combination of methods.

Triangulation provided me with several important opportunities: (a) it afforded me to have more confidence with the research results, and (b) it helped to uncover different viewpoints, which enabled me to refashion or develop new theories pertaining to the research phenomenon. Moreover as Jick (1979) pointed out “divergent results from multi methods can lead to an enriched explanation of the research problem” (p. 609). However certain shortcomings of the triangulation strategy were considered; for instance the literature underscores the difficulty in replicating a mixed-methods package. Nevertheless, I consider the use of triangulation, which prominently involves both qualitative and quantitative methods, as potentially generating “what anthropologists call "holistic work" or "thick description" (Jick, 1979).

The research design of this study is presented in two phases discussed in the sections below. Two techniques for data collection, namely survey and document analysis techniques were used in the first phase of the study in order to establish KIO defining factors and how these factors relate to each other and contribute to knowledge intensity in KIOs. In the second phase I used primarily an open-ended approach of grounded theory (Glaser & Strauss, 1967; Corbin & Strauss, 2008) to examine how KIO defining factors, KIO organizational knowledge-intensity attributes and knowledge worker activities relate to the choice of KMS in these organizations. The following sections outline the methodology adopted for each phase of the study, including a description of the study area, units of analysis, research design, data collection techniques, data analysis and the validity as well as the limitations of the study methodology.

4.2 PHASE 1 STUDY³

4.2.1 Introduction

The primary goal of phase 1 of the study is to identify factors that differentiate knowledge-intensive from non-knowledge-intensive organizations. The research questions addressed in this phase of the study are:

1. How does the knowledge management community of practice distinguish between KIOs and non-KIOs?
2. Can we identify what factors the knowledge management community uses to separate KIOs from non-KIOs?
3. According to the knowledge management community what factors contribute to knowledge intensity in an organization?

As a result I hypothesize: *There are no clear and outright factors that distinguish a KIO from a non-KIO.*

4.2.2 Phase 1 Study Area/Unit of Analysis

To test the null hypothesis I surveyed a purposely-selected community of KM professionals. The survey was also aimed at validating the conceptual model and typology of knowledge-intensive organizations presented in Chapter 3. I solicited the cooperation of people who consider themselves to be knowledge management professionals, and are familiar with the concept knowledge-intensive organization or knowledge-intensive firm. The focus of this phase of the study is to learn and establish from professionals the underlying factors they consider to define knowledge-intensive or non-knowledge-intensive organizations. Since the literature is inconclusive and problematic, my interest was to ask the professionals in the field to identify conclusive factors. For this study, knowledge management professionals are defined as workers, in any type of organization, who are responsible for managing and/or providing access to knowledge. In this regard I considered individuals surveyed in this study informants rather than respondents.

³ Substantial portions of this chapter have been published (see Makani & Marche, 2012)

Knowledge management professionals who participated in this study were drawn from targeted virtual KM professional groups from around the globe with a total membership of approximately 4000, an unknown percentage of which is overlapping (i.e., number of individuals with membership to more than one group). Also unknown was the total number of group members who could read and write in English. In addition, the lack of a KM Internet central registry further prevented the researcher from identifying all the members of the online population of KM professionals along with multiple email addresses for the same person and invalid or inactive email addresses. Thus with an unknown sample frame, it is difficult in this case to calculate the response rate. However, studies have shown the use of a targeted collective group of key informants as having an added important advantage to the research process. It provides a “high probability that the most knowledgeable informant is providing data” (Doty et al., 1993). The virtual KM professional groups from which the participants were drawn were chosen because of their affiliations as international professional KM groups with membership coverage spanning a number of countries. In other words I did not target any national or country specific professional groups.

4.2.3 Phase 1 Research Design

The survey was conducted in English, using the Opinio online survey system. Although surveys in general have been described as “imperfect vehicles for collecting data” (Andrews, Nonnecke, & Preece, 2003), for this phase of the research study electronic surveys were considered the most practical and financial feasible methodology to access the population of study. Moreover, as Sheehan (2001) observed online surveys are very cost effective, as the costs per response decrease as sample size increases. More importantly the web-based survey employed in this study allowed automatic verification and survey response capture in the Opinio database. A survey on the Internet is considered a useful methodology, since it can offer anyone with Internet access the opportunity to respond to the survey (Sheehan, 2001).

Multiple contact and invitation methods, as recommended in the literature (Sheehan, 2001; Pereira & Bruera, 2001), were utilized. A recruitment letter which includes a short introduction to the study, a request to participate, and a hyperlink to a consent form (see Appendix A) accompanied the survey. Participants were recruited to the survey as follows:

1. A link was created to the survey from the investigator's website (<https://surveys.dal.ca/opinio/s?s=6107>)
2. A message was posted on 3 KM professional virtual groups' discussion/message boards, ICTKM, KMCI & Toolbox for IT KM, inviting participation in the survey. These message boards were deemed very active among all the targeted KM groups.
3. Email messages were sent to four KM professionals' listserves, KMPro, ACTKM, KMDG and BUSLIB inviting their participation in the survey.
4. Personal email messages were sent to the KM professional groups' registrant members for whom email addresses were publicly available or made available on request from the group administrator (n=310), inviting their participation in the survey.

Notably, this accrual method did not allow for determination of the response rate (Pereira & Bruera, 2001). The study was open on the participants' discussion/message boards for 60 days. During this period, additional qualified participants drawn from the professional groups' registrant email lists were solicited via email communication.

The typology of KIOs presented in Chapter 3 was used to develop the survey instrument for Phase 1 of the study. The survey consisted of 49 items. The survey is presented in Appendix B. Screening questions were used to improve the validity of the study to ensure that participants had the requisite understanding of knowledge-intensive organizations. The first question in the survey asked the respondents whether they were familiar with the term KIO. If a respondent's answer was positive they were directed to the full survey; if negative then they were thanked for their participation and their participation ended. The questions focused on the respondents' specific perceptions, attitudes, beliefs and knowledge of what a KIO is. Information concerning respondents' location, job title/rank,

position level, and length of experience with knowledge management was also obtained. To ensure anonymity, respondents were assured that identifying information would not be included or in any other way associated with the data collected in the study, and that all of the data collected would be summarized and only the researchers would have access to the data. In addition, it was made clear that participation in the study was voluntary. Respondents could decline to answer any questions that they did not wish to answer and they could withdraw their participation at any time.

In this phase of the study I was also interested in identifying groups of firms that share certain common characteristics that might define them as knowledge-intensive. As discussed above drawing from the literature I approach the definition of KIOs from two perspectives, that is, the worker perspective and the organizational perspective. But instead of directly asking KM professionals for their perceived groupings, a number of computational steps discussed below were followed in order to infer different KIO groupings and capture the multidimensionality of the knowledge-intensity constructs of interest. The computations were carried out using the PASW Statistics 17.0 package.

In any quantitative study reliability and validity are central concepts. Reliability refers to the consistency of a measuring instrument, in the sense that a respondent will give the same response when asked again (Agresti & Finlay, 2009). Reliability is important because it allows for confidence that the survey designer is not responsible for differences in outcome; rather, differences can be explained based on the target population (Agresti & Finlay, 2009). Validity, on the other hand, assesses the extent to which the concept measures the thing it was intended to measure and whether the results are generalizable. Validity is critical to ensure that the results accurately reflect the variables of interest for the study. Furthermore, studies using survey data run the risk of mono-method bias. For this research therefore it was important to determine whether the KIO survey measured what was intended (validity), but first I needed to establish that it measures something in a consistent fashion (reliability) as explained below.

The main theoretical constructs of the study were measured on multi-item scales. I used the seven-point Likert-type scale to measure KIO defining factors. Survey responses were quantified by assigning numeric values to varying degrees of worker and organizational related defining factors. A sample item is: “The majority of workers in a KIO have high cognitive skills” (“1”=“strongly disagree”; “7”=“strongly agree”). In addition respondents completed the measures for KIOs and non-KIOs using a five-point Likert-type scale e.g., “law firms” (“1”=“not at all knowledge-intensive”; “5”=“most knowledge-intensive”). For each of the constructs, scale scores were computed as the means of the individual items. Care was taken to provide definitions on important concepts used in the questionnaire. Thus, the threat against the construct validity originating from that participants have different background perspectives and therefore relate differently to the definitions and concepts given was minimized. This coupled with the full anonymity provided to the participants should have helped in allaying some concerns about mono-method bias.

I conducted a reliability analysis to verify the construct and scale validities of the survey. Specifically, Cronbach’s alpha was used to determine whether items based on the average inter-item correlation are sufficiently interrelated to justify their combination as a construct. In other words Cronbach’s alpha test was used to measure the reliability of the constructs as suggested by Cronin (1993). Typically, reliability coefficients of 0.7 or greater are considered adequate. The scales that exhibit reliability values greater than 0.7 can therefore be accepted. In this study, the Cronbach’s alpha measure of reliability for the KIO defining factors construct was 0.851 and for the KIO/non-KIO construct was 0.879, indicating that the reliabilities of the constructs were adequate. In addition a draft survey instrument was tested with a group of thirteen master’s students in an Information Management program to assess construct relevance and the clarity of questions. For the final survey some items were slightly reworded based on the students’ suggestions, resulting in considerable improvement in scale reliability and validity for the data collected.

A total of 129 KM professionals responded to the survey. With regard to study validity and generalizability, it could be argued that many KM professionals did not take part in the study. It is my assessment, however, that with regard to external validity, as shown in Table 4 below, conditions were met and thus the sample selected can be generalized and will prove useful to our understanding of the determinant factors of KIOs as an organizational type. Table 4 presents research data that supports external validity, showing the number of respondents as representative of the population.

Table 4 Research data

<i>FACTOR</i>	<i>DETAIL</i>
Universe	Knowledge management professionals who are familiar with the concept knowledge-intensive organization or knowledge-intensive firm.
Geographic coverage	Global.
Data collection method	Online survey using Opinio survey system.
Sample unit	Knowledge management professionals.
Population census	Approx. 4 000
# of respondents	129
Sample error	8.6 per cent
Confidence level	95 per cent; $z=1.96$; $p=0.5$
Survey procedure	The online survey was posted on the discussion/message boards of KM professional virtual groups, KMPro, ICTKM, KMCI, and Toolbox for IT. Messages were also emailed to KM professionals' listserves, KMPro, ACTKM, KMDG and BUSLIB.
Data collection duration	The survey was launched in late November 2009 and closed in late January 2010.

4.2.4 Phase 1 Data Analysis Methods

In evaluating the defining characteristics of KIOs several variables were measured; however, not all measurements were available for every respondent. Before running the computations, I therefore first executed a missing values analysis (MVA). MVA describes the missing value patterns in a data file (data matrix). I employed the expectation maximization (EM) algorithm in the SPSS Missing Values option to estimate the variables' means, correlations, covariances, and most importantly to test whether cases with missing values were missing at random or not. My assumption was that the pattern of missing data was related to the observed data only, thus explaining my choice of EM. The use of EM allowed estimates to be adjusted using available information. The patterns of missing data were displayed, tabulated, and the results indicated that the data did not appear to be missing completely at random. Moreover most of the variables had more than 5% missing values cases and as a result I opted not to drop cases but instead imputed missing values. This is supported by the literature (Little & Rubin, 2002; Meyers, Gamst, & Guarino, 2006; Garson, 2009). Case deletion strategies, as Garson (2009), noted “assume that the deleted cases are a relatively small proportion of the entire dataset and are representative of it”, but research reveals that in a number of cases missing data are indicative of some pattern and cannot safely be assumed to reflect randomness. Deletion, therefore, can introduce substantial bias into the study and the loss in sample size can significantly diminish the statistical power of the analysis (Garson, 2009). Thus for the purposes of data analysis I imputed values to replace missing values using the EM algorithm in the SPSS Missing Values option. I employ the EM method because it makes fewer demands of the data in terms of statistical assumptions and provides excellent parameter estimates (Garson, 2009; Graham, 2009).

In the first steps of computation I identified, by means of cluster analysis, homogeneous classes of KIOs or non-KIOs. In cluster analysis, a sample of elements, in this case firm types, is grouped such that the statistical variance among them is minimized while between-group variance is maximized. Cluster analysis has most frequently been

employed as a classification tool, i.e., the identification of discrete categories or taxonomies. The basic criterion for any clustering is nearness (or similarity). Objects that are near each other should belong to the same cluster, and objects that are far from each other should belong to different clusters. Cluster analysis particularly fits the objectives of this study, since it places objects into groups suggested by the data. However, clustering techniques can be criticized since by their nature they will break the data available into subsets, however weak the association among data points (Ketchen and Shook, 1996; Hair et al., 1992). For this study, therefore, I employed two clustering methods, each of which has different strengths and weaknesses as explained below. If both clustering methods give similar results using multiple criteria, confidence that the groups are an inherent part of the data and not an abstract creation of the particular clustering algorithm is increased. Cluster analysis is carried out using the Pearson correlation coefficient as the measure of similarity. I decided to standardize all variables by using the z-scores so that variables with large units could not be overemphasized.

The first clustering technique I used, the Complete Linkage (furthest neighbor) centroid method, maximizes the distance between group means, recomputing the centroids each time a new observation is included in a cluster. A shortcoming of this methodology is its dependence on the researcher's choices (Hair et al., 1992), but it is considered a more robust method "to outliers than most other hierarchical methods" (Reger & Huff, 1993, p. 109). I then used Ward's method as the second technique. For this method groups are formed by minimizing the within-cluster ANOVA sum of squares. The aim "is to join cases into clusters such that the variance within a cluster is minimised" (Field, 2000). With this technique Ward's method tends to join clusters with a small number of observations and is strongly biased toward producing clusters with roughly the same number of observations (Reger & Huff, 1993).

The second and third steps of computations are aimed at verifying, by means of association analysis, the existence/non-existence and the intensity of the relationship between the KIO defining factors and types of firms/organizations. First I determined the relationship between KIO defining factors and firm types on a bivariate level. This is

tested by the Pearson product-moment correlation (Pearson's r) which measures the degree of linear association between two variables. More particularly, Pearson's r tells us how well two sets of data correlate to each other. The correlation coefficient communicates both the strength and the direction of the linear relationship between the two variables. The value can fall between -1 to $+1$, with 0.00 indicating no relationship (no correlation) and 1.00 indicating perfect relationship (perfect correlation). A p value tells us if the Pearson's r is significant or not.

The literature suggests that KIOs might have multiple defining factors or characteristics. As a result I feel that examining only singular causes and effects of factors on KIOs may distort the complex reality of these organizations. I agree with Fish (1988) who pointed out that when data are analyzed using univariate methods important multivariate relationships can be missed. Consequently, I employ the Canonical Correlation Analysis (CCA), a multivariate analytic method, as a way to explain the relation between KIO firm types and defining factors sets of variables. CCA is a multivariate technique that enables one to investigate variables that possibly have multiple causes and multiple effects. It is the correlation of two canonical (latent) variables, one representing a set of independent variables, the other a set of dependent variables, which in this study refers to KIO most defining factors and firm type variables respectively. For this study, therefore, Canonical Correlation Analysis examines the relationship between a linear combination of the set of KIO defining factors variables and a linear combination of the set of firm type variables. The purpose of Canonical correlation analysis is not to model the individual variables, but to measure the linear relationship between the two multidimensional variables. In other words I employed Canonical correlation to explain the relation of the two sets of variables, not to model the individual variables. I not only care about whether there is a relationship between defining factors and KIO firms, but I am also interested in knowing which defining factors are more or less useful in modeling KIOs and whether they relate to each other in expected directions. Thus I ask the basic question whether the most defining factors variables of KIOs are predictive of certain knowledge-intensive firm types.

More importantly, the use of CCA reduces the probability of committing a Type 1 error sometimes referred to as the “experiment wise error” (Thompson, 1991). Dependent variables, just as independent variables, as Thompson (1991) noted, “can interact with each other to create effects that would go unnoticed, absent a multivariate analysis”. Thus since I am testing multiple dependent variables there is a high probability that an "experiment wise" error is likely, but it is difficult for me to know which of the statistically significant results errors are and which are not. Multivariate methods, therefore, minimize the risk of this error by allowing simultaneous considerations of the full network of variable relationships, and as a result honouring the reality in which all the variables can and often do simultaneously interact and influence each other (Thompson, 1991).

For the Canonical correlation analysis the predictor variable set contains six measures representing the factors identified in the Pearson Correlation tests as the factors most defining of KIOs. These predictor variables are ‘workers use novel knowledge to solve complex problems’, ‘a worker is held highly accountable for decisions’, ‘workers have high cognitive skills’, ‘organization produces & sells knowledge’, ‘organization’s core assets are its people’, and ‘organization is accredited by a self-regulated body’. The criterion variable set contains eight measures representing KIO firm types as presented in the cluster analysis results, i.e., law firms, drug discovery firms, management consulting firms, software development firms, medical practices, biotech research firms, architecture, and computer consulting firms.

For the purposes of corroboration and to get a real grip on the professionals’ perceptions and understanding of KIO, qualitative methods were also employed in the form of document analysis. In addition to completing the survey knowledge management professionals were asked to write in a few words their definition of the term KIO. The resulting definitions were imported into QSR NVivo 9 (a tool for qualitative analysis), which was used to code and analyze the data. The codes for knowledge-intensive defining factors were extracted from the typology of KIOs presented in Chapter 3 and were refined through several iterations. No structure was imposed during this coding and, to reduce bias, the coding was carried out by me as well as a master’s student who had

not been involved in the development of the typology. Every sentence was covered at least by one code. Then the text covered by the codes were repeatedly compared and examined. When the coding process was finished, the codes were categorized according to worker related or organizational related groupings.

4.3 PHASE 2 STUDY

4.3.1 Introduction

The debate on knowledge-intensity in organizations draws attention to the differences in approach to KMS that may develop among organizations whose employees' work involves the execution of procedural routines and those whose employees are involved in creative, problem solving work. But little is presented in the existing academic literature on the ways in which organizations' understanding of their activities and the contexts in which their workers work influence the organizations' choice and application of KMS.

The main goal of phase 2 of the research study was to uncover how knowledge-intensive determining factors interlace with the choice of KMS deployed in KIOs. The aim was to answer the question "how do the knowledge-intensive defining factors identified by the knowledge management professionals help to explain the choices of KMS deployed in KIOs?" Qualitative methods were considered to be the most appropriate research strategy to achieve the stated goal. Qualitative research can be defined as the kind of research that produces findings not arrived at by means of statistical procedures or means of quantification (Corbin & Strauss, 2008). The literature shows that in instances when the goal of the study is to learn a phenomenon and identify its characteristics, it is appropriate to use qualitative research methods and tools rather than corroborating predetermined hypotheses (Glaser & Strauss, 1967; Corbin & Strauss, 2008). This thesis aims to develop rather than to test a theory. As a result grounded theory, a research approach that allows themes and theories to emerge from the data, rather than from hypotheses or other research, was chosen. Grounded theory is a qualitative method of inquiry "in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of the participants" (Creswell, 2009, p. 13).

To date, there have been no comprehensive studies to gain insight into the factors that drive the choices of KMS in KIOs. Grounded theory method was therefore considered an appropriate choice because theory development through grounded theory research goes beyond the descriptive phase of qualitative research (Walls, Parahoo, and Fleming, 2010). In other words grounded theory allows for the conceptualization of the interlacing patterns of the phenomenon of study with the use of multiple data sources in order to provide a more comprehensive perspective. In fact it allows for theories to develop from the data themselves. As Corbin & Strauss (2008) observed, in grounded theory methodology, theory creation acquires data from many different vantages with the goal of finding relationships within a phenomenon. Importantly, for this phase of the study my interest is not to describe the environments in which participants make KMS choices through participant observation; rather, my interest is to analyze patterns and connections of core or central processes and factors transcending time and place (Corbin & Strauss, 2008). Hence this research study uses the tenets of grounded theory to analyze interview data to allow the themes and ideas to emerge from the data. Also, it provides a framework for comparing these themes and ideas to the findings from Phase 1 of the thesis.

This is not to say that grounded theory method is not without its problems. A number of researchers refer to the danger associated with early examination of the literature, citing forced analysis tendencies particularly in the early stages. They argue that examining the “literature should not happen until a later stage in the research when it becomes a part of data analysis and that early interrogation of the literature can have implications for the integrity of the emergent theory” (Edmonds & Gelling, 2010). The fear is that the researcher might not keep close to their gathered data, but focus on what they have read or what they might have previously assumed or wished was the case. This view was echoed by Glaser (1998), as cited by Walls, Parahoo, and Fleming (2010), when he concluded that grounded theory research method requires the researcher to enter the field without reviewing the literature in the substantive area, with no theoretical perspective in mind, and to trust in emergence.

Nevertheless, for the purposes of this study, I reject this assertion and use information drawn from the literature and the data from phase 1, to inform the design of phase 2. Notably, the defining factors and knowledge-intensity data from phase 1 were critical in interpreting the interview study data from phase 2. This is supported by the literature. Recent studies reveal that having experience in the substantive area of the research can be valuable and should not pose a threat to the rigour of the study or introduce undue bias (Walls, Parahoo, & Fleming, 2010). Even Glaser is cited as having recanted his earlier assertions and “‘opened the door’ to the use of literature by saying ‘all is data’ ” (Walls, Parahoo, & Fleming, 2010, p. 11). In this way Glaser is said to have recognized the need for some knowledge of the subject on the part of the researcher to provide orientation and direction. Moreover, as Walls, Parahoo, and Fleming (2010) concluded “the constant comparing in grounded theory of incidents that emerge forces researchers to state their assumptions and their knowledge in a self-interview or memo which become data to compare with other data from the field (Glaser 1998). This process validates, alters, or rejects the researcher's observations and can minimise the potential for bias” (p. 9). For the purposes of this study, I adapted concepts and practices from multiple grounded theory researchers in order to develop a framework for investigating how knowledge-intensive determining factors interlace with the choices of KMS in KIOs.

Triangulation techniques were also employed for this phase of the study. Survey methodology proved to be especially fruitful. Survey data was utilized to develop quantifiable schemes for coding the data sets. Surveys were distributed to a sample of knowledge managers. Without the survey data, as Vidich and Shapiro (1955), as cited by Jick (1979) observed, I “could only make reasonable guesses about [my] area of ignorance in the effort to reduce bias.” Importantly, the quantitative results for phase 2 were used to supplement the qualitative data, “rather than the reverse which is far more common in organizational research” (Jick, 1979). The survey became more meaningful when discussed in light of the qualitative results from the interviews. I consider the use of survey research as contributing to greater confidence in the generalizability of the results of this study.

4.3.2 Phase 2 Research Design

As noted above data collection for Phase 2 followed primarily grounded theory methods. Information drawn from the literature and Phase 1 study findings informed the design of the study in Phase 2. First, in-depth, semi-structured but open ended interviews were conducted with knowledge management practitioners. In order to prevent the interviewees and interviewer from wandering into trivial conversations, a semi-structured interview technique was used as a reference point for the interviewer. The actual interview process, however, was carried out as an open-ended interview to draw out unexpected latent constructs. Table 5 summarizes these questions, highlighting those questions that were used for this thesis. Open-ended interview questions permit interviewees to freely articulate their beliefs and insights, and as a result were considered to be the most appropriate method to understand how knowledge-intensive determining factors relate to the knowledge managers' choices of KMS in KIOs.

Table 5 Open-Ended Interview Questions

<i>Have you heard of the term KIO? Are you aware of any KIOs? Which ones and why?</i>
<i>Would you characterise your organization as a KIO? Why?</i>
<i>How would you briefly define knowledge management systems?</i>
<i>Are you aware of any KMS? Which ones?</i>
<i>Have you been involved in choosing KMS in organizations? How did you go about it? What factors shaped your choice decisions?</i>
<i>What are the main functions of KMS in your organization?</i>
<i>What has been the impact of KMS on your enterprise?</i>
<i>What are the key things that a KMS should do in order for it to be successful?</i>
<i>What are the main factors defining knowledge-intensity in your organization?</i>
<i>What are the system objectives you consider key to the choice of KMS in a KIO? Do you think the same system objective drive KIO choices in non-knowledge-intensive organizations? Why?</i>

What are the issues and challenges that can be considered critical to the successful exploitation of KMS in your organization?

These questions were a rough guideline for the interviews, and in all cases, the participants were asked all of these questions, in the order specified above. But due to the open-ended nature of the interviews, during the course of the interview the questions were explained or elaborated upon. I utilized both planned and unplanned probing to uncover details and specific descriptions of the respondents' experiences. Descriptive statistics were also collected to assist in categorizing and summarizing results. It is important to note that the topic of the questions were generated based on the common topics found in the literature review, the researcher's professional experience with choosing systems for knowledge/information management (Corbin & Strauss, 2008), as well as the data from phase 1 of this research study. The questions were arranged in order to start from fact gathering leading to open-ended triggers in an effort to elicit the revelation of deeply residing constructs. Interviews were conducted face-to-face or by telephone. All the interviews were audio-recorded with permission from the interviewee. The interviewer took detailed notes during the interview process. Each interview lasted approximately one and half to two hours.

Second, the next piece of data for this phase of the study was collected through a survey. From the qualitative data gathered through interviews I used concepts and questions to design a quantitative survey instrument. The survey used for this phase of the study consisted of 49 items. The survey is presented in Appendix D. The interview questions invited participants to reflect, explore, and relate KIOs as an organization type to their experiences participating in choosing and implementing KMS. The first set of questions was intended to collect basic information about their experience choosing KMS as well as the type, size and scope of the organization they worked in. The next set of questions was designed to elicit responses regarding the factors determining knowledge-intensity in their organization. The third set of questions explored system objectives important to the choice KMS as well as KMS features and functionalities. An online self-administered survey was set up using Opinio, a web-based survey design and online hosting platform.

The survey was piloted with 4 MBA and 6 MLIS students at Dalhousie University. A link was created to the final version of the survey from the researcher's website. Using the Opinio built-in invitations module the survey link was then distributed to the potential respondents via email (see appendix E for invitation script). The survey ran for approximately 60 days. Follow-up reminder invitations were automatically emailed 2 weeks apart to those invitees who had not yet responded.

4.3.3 Phase 2 Study Area/Unit of Analysis

The primary data collection method for phase 2 was interviews with knowledge management practitioners working in a variety of organizational settings. Interview participants were recruited using a purposeful sampling technique. Purposeful sampling allowed the selection of participants in a targeted way so as to illuminate the phenomenon of KIO setting patterns related to KMS choices and defining factor variables. A review of the literature (Patton, 1990) reveals purposeful sampling as the dominant strategy in qualitative research. Purposeful sampling refers to the technique in which participants are selected because they have particular features or characteristics which will enable detailed exploration of the research objectives. For the purpose of this study therefore, selected respondents consisted of information-rich knowledge practitioners, who could be studied in depth. In other words using this procedure, participants were selected who were deemed knowledgeable in the information required and were willing to reflect on the phenomenon of interest. Furthermore, for this study it was also important to choose participants based on the information that is sought as the theory begins to emerge to suit the dictates of grounded theory research's theoretical sampling approach (Glaser & Strauss, 1967). Theoretical sampling in grounded theory research stipulates that data directs the next sampling choice. Hence, at first the emerging theory was based on a small number of participants; however, from that data more participants were chosen to further elaborate and validate data. Hence there is no minimum number of interviews required for this qualitative research.

Recruitment began by inviting knowledge management conference participants who were attending the 2010 International Conference on Knowledge Management (ICKM). The

ICKM conference was chosen for a data collection site because, as a global knowledge management conference, it provided the availability of over two hundred KM practitioners and academics from around the globe. In the year the data were collected, the ICKM was held in Pittsburgh Pennsylvania. Permission was obtained for subject recruitment from the conference chair to email every registered conference participant. Potential participants were recruited by email a few weeks before the conference began. The email invited KM practitioners who have work experience in knowledge-intensive organizations to participate in a study about choosing KMS in KIOS. Potential participants were asked to contact this researcher by phone or email if they were interested in participating in the study. Networking during social breaks was also utilized for recruitment during the conference. Interested participants were offered an interview at the conference. The consent form was either given in person or emailed, and then explained orally to participants before they gave written consent to participate in the study (see Appendix C for consent script). The initial set of interviewees included six knowledge management practitioners.

After the initial set of interviews came a procedure through which the researcher consciously selected participants according to their potential for developing new insights or refining the insights that had already been gained. Another research technique employed in this study was a snowball sampling technique. Participants were asked to refer other potential participants to the study. Participants were asked whether they knew someone who has worked as a KM practitioner with responsibilities for choosing and deploying KMS and who may be interested in the study; the names and email addresses of those potential participants were collected. Those participants were then contacted by email to ask whether they were interested in joining the study. For this process, I interviewed 8 more KM practitioners who had experience in different organizational settings. Table 6 provides an overview of the key characteristics of each participant and the interviews that generated the data.

Table 6 Interview Participants Characteristics

Participant	Type of organization(s)	Location	Position(s) of Interviewee	Interview Type
P1	University, Military Intelligence, Management Consulting	Canada & USA	Chief Knowledge Officer, Management Consultant, Professor	Face-to-Face
P2	University	USA	Professor/Consultant	Face-to-Face
P3	University, Software development company, Management Consulting	USA	Director of Decision Support systems, software engineer, Management Consultant	Face-to-Face
P4	Mortgages/Real Estate Credit	USA	Risk modeling Manager	Face-to-Face
P5	Management Consulting	Korea & Japan	Research Manager	Face-to-Face
P6	Think Tank, Management Consulting	Hong Kong	Director for innovation and knowledge networks	Face-to-Face
P7	Information & Communication Technology	Canada	Chief Operating Officer	Face-to-Face,
P8	Electrical and Electronic Appliance	Canada	Director of Ecommerce	Face-to-Face, Email Feedback
P9	Government	Canada	Senior Director of collaborative tools	Phone Call
P10	Management Consulting	Canada	Chief Knowledge Officer	Phone Call, Email

Participant	Type of organization(s)	Location	Position(s) of Interviewee	Interview Type
	Education			Feedback
P11	Medical	Canada	Physician	Phone Call
P12	Law Firm	Canada	Partner	Face-to-Face
P13	Computer Software Company	USA & Canada	Director for Innovation	Phone Call
P14	Education, Think Tank	Canada	Knowledge Manager	Phone Call, Email Feedback

Ultimately, 14 in-depth interviews were conducted. At least 5 more interviews were still on schedule to be conducted, but data collection ceased after the fourteenth interview when the indicators pointed to conceptual saturation (Corbin & Strauss 2008), i.e., the point at which interchangeable examples revealing the same phenomenon in different instances could be identified. The literature reveals that saturation is accepted when no new concepts emerged from new data and variations are explained (Munhall, 2007). As Munhall (2007) observed, studies with a narrow focus would find saturation with a smaller sample than qualitative research with a broader scope. Therefore in this study after 14 interviews it was felt that additional data was no longer adding to the concepts and relationships being developed and thus there was no need to continue with the collection of data.

Lastly, a survey was distributed to a sample of knowledge practitioners. The target population was knowledge practitioners with experience choosing or implementing KMS. For study quality assurance purposes the criterion sampling technique was used to select survey respondents who met certain criteria as explained below. As Patton (1990) explains ‘the logic of criterion sampling is to review and study all cases that meet some predetermined criterion of importance’ (p. 176). Requests for participation were emailed

to 383 knowledge managers whose emails were retrieved from a search in the LexisNexis company directory database for managers/professionals with “knowledge manager” in the job title field. After excluding unknown or inactive email addresses in total 150 knowledge managers were invited to participate in the study.

4.3.4 Phase 2 Data Analysis Methods

Each interview was transcribed into a Microsoft Word document. The transcripts were verified by the researcher by comparing them with the rigorous notes taken during the interview. In this regard recall error was minimized through the use of detailed note-taking. It should be noted that at this juncture verbal expressions were revised into a more formal format, i.e., unfinished sentences were completed in consultation with the participants.

To increase reliability and validity QSR NVivo 9 software was used to analyze, classify, sort and arrange data automatically. The transcripts were converted into an NVivo project. NVivo 9 is a program designed to handle rich text-based information, where deep levels of structure analysis are required; it automates the processes of classifying, sorting and arranging information, enabling the researcher to have more time to explore trends, build and test theories and, ultimately, arrive at answers to questions. Some researchers have criticized the use of QSR NVivo software citing that the software can stray from the original premise of the research thus complicating the analysis process (Bringer, Johnston, & Brackenridge, 2004). However, for this study the use of NVivo was considered as having core advantages: It added to the transparency of the data analysis for the reader. Moreover in grounded theory, keeping detailed memos is recommended as a method for conceptual development (Glaser and Strauss, 1967; Strauss and Corbin, 2008). In this regard NVivo 9 software allowed for an automatic extensive audit trail of the researcher’s work over the duration of the research study. More importantly, NVivo 9 allowed for the creation of numerous active links, for example, from one memo to the next, or one category to a memo, or from the model to an original quotation which could be followed with just a click of a mouse (Bringer, Johnston, & Brackenridge, 2004).

For the purpose of this research the goal as previously stated was to explore and relate KIOs as an organization type to the choice of KMS employed in these organizations. As a result other than this aforementioned goal the researcher did not utilize a preexisting coding framework. Since identifying underlying themes presented through the data was the main goal, a constant comparison analysis was considered to be helpful. For this research constant comparison was undertaken inductively, i.e., codes emerged from the data (Leech & Onwuegbuzie, 2007). The use of the constant comparative method in grounded theory research increases the study's validity because verification of analysis occurs continually throughout the research process (Shenton, 2004). NVivo 9 was used to label incidents in the data with code words and to write theoretical notes that captured the researcher's momentary thoughts. Each of the transcripts was read by the researcher as a whole, two times before any coding began. Following this entire reading, key words and themes were identified and coded into "free nodes" of unrelated and ungrouped information. Each time a node was created, a memo that recorded analytical ideas designed to stimulate further exploration of concepts, was created and linked to that node.

This analytical procedure facilitated the iterative process, a core characteristic of grounded theory, "because it encouraged future sampling directed at finding answers to any early emergent questions" (Hutchison, Johnston, & Breckon, 2010). The questions were reread several times and key words and phrases were repeatedly coded. NVivo 9 was then used to create "tree nodes" of similar and related codes, for example, of all codes related to "knowledge sharing" or of the different responses to the question "What are the main functions of KMS in your organization?" However, as Hutchison, Johnston, and Breckon (2010) observed, in grounded theory one should be wary of forcing concepts into categories, therefore for the data analysis tree nodes were only used for concept management and not as an analytical tool. But it should be noted that even during analysis I was open to the emergent of new possibilities informed by the data, i.e., if at any time during the analysis a new concept was identified in the data, I simply created an additional node to represent it. The main themes from each question were brought into family nodes to indicate the types of responses that occurred. Quotations were selected as examples in this thesis to be as representative of as many different knowledge

practitioners as possible, and also to be as representative of as many knowledge-intensive organizations as possible.

According to Corbin and Strauss (2008) data analysis for grounded theory research is a continual process. It begins with the initial data collection, then the data are reviewed, initial concepts are derived from the data, and these concepts are compared to other sources of data for validity. In other words for this method the researcher does more than review and validate data. The grounded researcher processes the data in search of a deeper understanding. Consequently, precautions had to be taken in order to avoid any possibility of bias: the interviewing process was organized in detail, rehearsed and tested before beginning the formal study. Additionally, the researcher utilized member checking, as recommended in the literature, which involved showing the findings and interpretations to the participants for assessment of accuracy. Member checking as Leech & Onwuegbuzie, (2007) reckoned enhances descriptive validity, interpretive validity, and theoretical validity. In other words by employing member checking techniques the rigour and trustworthiness of the findings were increased thorough descriptive triangulation, i.e., consistency between researcher and participant[s] (Leech & Onwuegbuzie, 2007). Also, upon initial determination of codes, themes and categories that surfaced were summarized and discussed with three other experienced researchers not involved with the data collection.

It is recognized however that grounded theory qualitative inquiry is rife with ambiguities. Thus for this thesis I utilized the triangulation of quantitative and qualitative data as a way to validate and crosscheck the findings. The interview data for this study was supplemented by survey data. The data from the survey were loaded into NVivo and coded using the same codebook used for the interviews. The purpose of utilizing the survey was to corroborate findings from the interviews and achieve data triangulation.

4.4 SUMMARY TO CHAPTER 4

This chapter presented the methods of quantitative and qualitative approaches used in Phases 1 and 2 of this thesis. Also included are discussions on the collection methods as

well as analysis procedures intended to increase data reliability and validity. Chapter 5 provides a discussion of the research findings of Phases 1.

CHAPTER 5 PHASE 1 STUDY FINDINGS AND DISCUSSION⁴

5.1 Introduction

The research design of this study was divided into phases as discussed in Chapter 4. The purpose of Phase 1 of the study was to explore factors that differentiate knowledge-intensive from non-knowledge-intensive organizations. The research was guided by the following question: How does the knowledge management community of practice distinguish between KIOs and non-KIOs? Two sub-questions also guided this study:

1. Can we identify what factors the knowledge management community uses to separate KIOs from non-KIOs?
2. According to the knowledge management community, what factors contribute to knowledge intensity in an organization?

The methodology adopted for this phase of the study, including a description of the study area, units of analysis, research design, data collection techniques, and the validity as well as the limitations of the study methodology, are presented in Chapter 4. This chapter presents Phase 1 study results, including an interpretation and discussion of the results.

5.2 PHASE 1 SURVEY RESULTS

5.2.1 General observations

As stated in the previous chapter, a total of 129 KM professionals responded to the survey. Approximately 44.2% (n=57) of the respondents reported 5 years or more of experience with knowledge management. A breakdown by geographical region is shown in Figure 6. The majority of respondents (35.5%) were from the USA while 18.4% were from Asia and 10.5% from Europe. The other reported regions each contributed <10% of respondents. It is interesting to note that 14 respondents admitted to not being familiar at all with the definition of knowledge-intensive firm or knowledge-intensive organization, an observation that confirms the researcher's interest in exploring these organizations and

⁴ Substantial portions of this chapter have been published (see Makani & Marche, 2012)

the associated factors that differentiate KIOs from non-KIOs. It is, however, evident from the literature that KIO or KIF is a new concept that is attracting great interest among professionals and academics. Moreover, KM professionals who responded to this survey and who hold senior management positions showed great interest in the final results of this study. Many professionals who decided not to participate in this academic research cited time pressure reasons due to the holiday season.

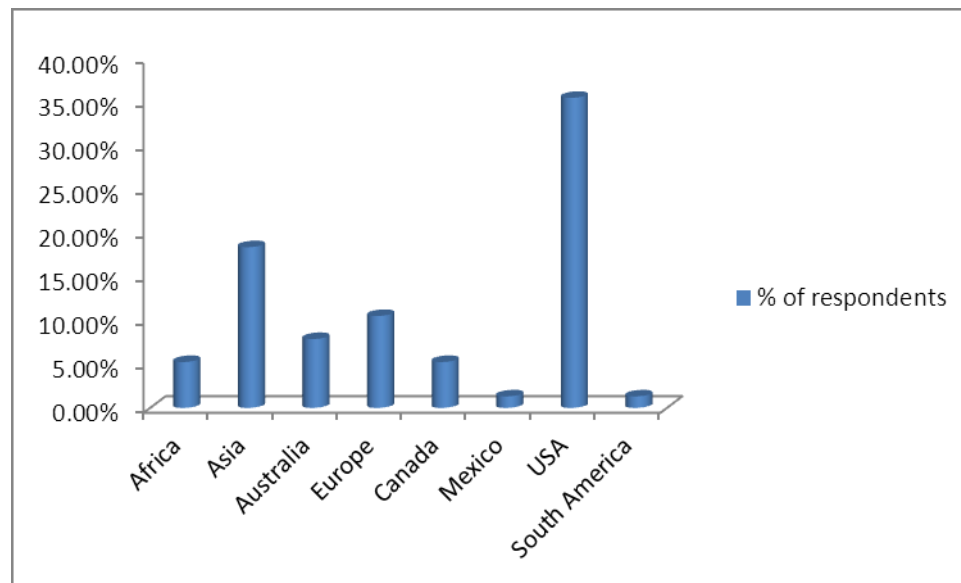


Figure 6: Location of Respondents

When asked what they thought were the most defining factors of a KIO the majority of the respondents 43.4% (n= 56) believed that the most defining factors lie within both the organization and the people. An interesting point to note about the responses is that when these 56 respondents were probed to weigh in on the 'People' and 'Organization' relationship i.e., whether it is a 50-50 split or a bias in favour of one or the other, 51% indicated a bias towards people factors, 21.6% towards organization factors, and 27.5% indicated a 50-50 split.

5.2.2 Firm Type Cluster Analysis Results

Table 7 shows cluster results of a 3-cluster solution for the Complete Linkage and Ward clustering methods. The table depicts the cases in each cluster. Landscaping, construction, breweries, food manufacturing firms, hotels & motels, and apparel stores

have been placed in one cluster; law firms, management consulting firms, biotech, architecture, computer consulting, drug discovery firms, medical practices, and software development firms in a second cluster; and call centres, accounting firms, and employment agencies are in the third cluster. Oil and mineral exploration firms are the only ones not clearly associated. The following analysis indicates that all firms, with the exception of oil and mineral exploration firms fall into one cluster or another. Oil and mineral exploration firms fall into different clusters depending on the cluster analysis in use.

Table 7 Complete Linkage Cluster and Ward Cluster membership

Case	Complete Linkage Clusters	Ward Clusters
1. landscaping	1	1
2. construction	1	1
3. breweries	1	1
4. food manufacturing	1	1
5. hotels & motels	1	1
6. apparel stores	1	1
7. law	2	2
8. drug discovery	2	2
9. management consulting	2	2
10. software development	2	2
11. medical practices	2	2
12. architecture	2	2
13. computer consulting	2	2
14. biotech	2	2
15. call centres	3	3
16. accounting	3	3
17. employment agencies	3	3
18. oil & mineral exploration	2	1

The results, displayed most clearly as a dendrogram (Figure 7) in which the points (from left to right) at which firms are 'joined', gives a picture of how great the distance is between groups that are clustered in a particular step using a 0 to 15 scale along the top of the chart. The dendrogram (see Figure 7) revealed that firms are initially split in two distinct groups, i.e., drug discovery firms, management consulting firms, architecture, software development firms, law firms, medical practices, biotech and computer consulting firms belong in one group and landscaping firms, construction firms, breweries, call centres, accounting firms, employment agencies, food manufacturing firms, hotels & motels, apparel stores, and oil & mineral exploration companies in another group. In fact, if we refer to the literature on KIOs, this first separation has divided firms into KIOs and non-KIOs. There doesn't seem to be any controversy therefore, among KM professionals that firms can be divided into two groups of KIOs and non-KIOs. In other words, according to the respondents, firms can be divided into two groups of KIOs and non-KIOS.

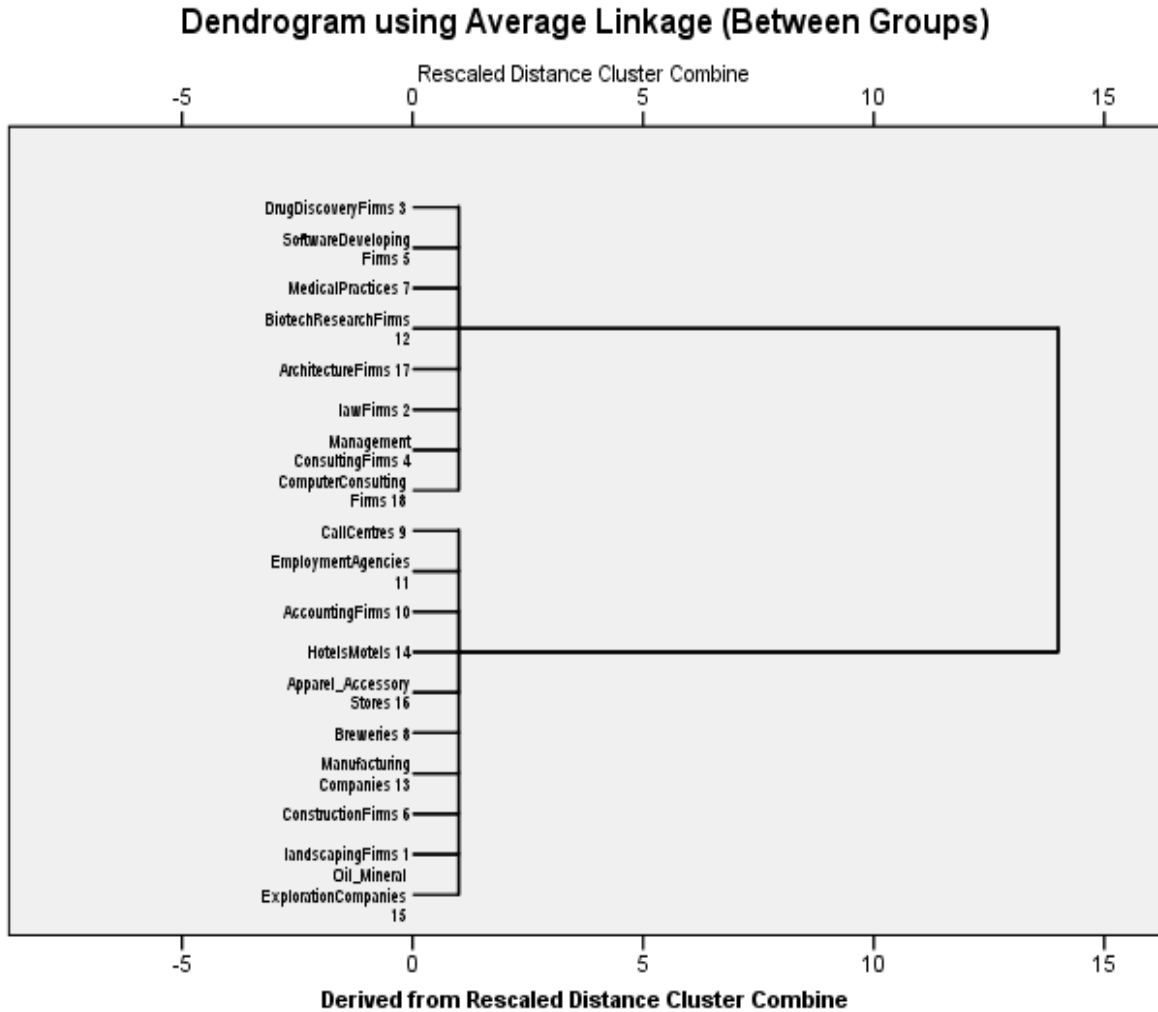


Figure 7: The dendrogram

One interesting observation is the placement of accounting firms in the non-KIO group. Drawing from the literature we see that although accounting firms are usually identified as knowledge-intensive (Alvesson, 2001, 2004; Ditillo, 2004; Ichijo & Nonaka, 2007) there might be an oversight in this identification. It is undisputed that accounting firms are defined by their experts, who are the accountants, who make heavy use of professional knowledge in their day-to-day operations. In this regard accounting firms can be considered ‘knowledge rich’. Knowledge rich organizations are those organizations “in which different structural units or expert groups might accumulate and preserve deep professional knowledge in their specific field, but which lack processes to combine the knowledge that is kept in the isolated treasuries in order to increase the value

of the intellectual capital for the whole organization” (Elenurm, 2010, p. 203). But as Greenwood (2009) observed, being ‘knowledge rich’ does not necessarily mean that the organization can be regarded as knowledge-intensive. KIOs are a “product of structures, relationships, and dynamics in the organizations, not of the quanta of knowledge they contain” (Greenwood, 2009, p. 35). Robertson & Swan (1998) agree with this viewpoint stating, “some consultancies (for example, general accounting) deal mainly with the diffusion of widely applicable, standardized and generic solution” (p. 544), and thus it is questionable whether these kinds of consultancies are knowledge-intensive. This analysis provides new evidence in support of the position taken by Robertson & Swan (1998).

The cluster analysis results also reveal that organizations can be grouped according to their level of knowledge-intensity or non-knowledge-intensity. We observe from the cluster groups given in Table 7, call centres, accounting, and employment agencies separated from drug discovery firms, medical practices, software development, architecture firms, law firms, management consulting firms, biotech, and computer consulting firms. In the third group we have landscaping, construction, breweries, food manufacturing, hotels & motels, and apparel stores. In short both cluster analysis techniques used in this study have revealed that firms can be grouped into distinctive clusters. These clusters map to defining factors (i.e., knowledge-intense versus non-knowledge-intense) which seem to be related to the organizational classifications in the literature.

As discussed in Chapter 3, the literature shows that among or within companies there may be great disparities in knowledge-intensiveness. The evidence suggests that one cannot broadly lump industries, occupations, or firms together as knowledge-intensive. As Alvesson (2004) concluded, for the term knowledge-intensive to be applicable to the whole firm the ‘significance as well as the relative size of its knowledge-intensive units must be substantial’ (Alvesson, 2004, p. 18). With regard to accounting firms, call centres and employment agencies therefore, we can conclude that although some units within the organization can be referred to as knowledge-intensive, according to the results of this study, we cannot distinctively define the whole firm as knowledge-intensive. Most

importantly, relating to the proposed typology of KIOs presented in Chapter 3, call centres, accounting, and employment agencies can thus be defined as belonging to the group of organizations falling under the “unit oriented” expert/innovation driven firms’ umbrella. In other words call centres, accounting, and employment agencies place high emphasis on the contributions of a few key experts who are housed in defined units of the organization. The need for cognitive and innovative skills is dependent on the particular department within the organization.

Results from both cluster analysis methods allow us to conclude that organizations can be grouped according to their level of knowledge-intensity or non-knowledge-intensity. But the question remains, what defining factors contribute to this distinct division of firms? What is needed at this juncture is an instrument to measure the degree of knowledge-intensity in particular firms and which factors contribute to this intensity.

5.2.3 Defining Factors Descriptive Statistics Results

Respondents were asked to respond to each given defining factor in terms of how descriptive it is of a KIO -- where “KIO” refers to the whole organization and not just a department or unit within the organization. The KIO defining factor questions were given in two different sets, (1) worker related factors, and (2) organizational related factors. Characteristics of the distributions of the answers were obtained by calculating means and standard deviations for each factor in the different sets (see Table 8 and 9). The responses with the highest average response score represented strongest agreement and thus indicated that the category that the question represented was more important than other categories in that set.

Table 8 Descriptive Statistics for Worker Related Factors

Factors	N	Mean	Std. Deviation
The majority of workers in a KIO have high cognitive skills.	129	5.61	.892
In a KIO a worker is held highly accountable for their decision.	129	5.49	.979
The majority of workers in KIOs perform complex, unique, and dynamic tasks.	129	5.45	1.025
The majority of workers in KIOs have high worker autonomy (independence).	129	5.31	.986
The majority of workers in KIOs are considered experts of their domain.	129	5.19	1.106
The majority of workers in a KIO use novel knowledge to solve complex problems.	129	5.07	.971
The majority of workers in a KIO have formal education and experience equivalent to an undergraduate degree.	129	4.88	1.338
The majority of workers in a KIO have formal education and experience beyond an undergraduate degree, such as a law degree, an MBA, or advanced professional designations.	129	4.79	1.361
The majority of workers in a KIO belong to, or are accredited by, a professional group.	129	4.37	1.266
The majority of workers in a KIO have formal education and experience equivalent to a doctoral degree.	129	3.27	1.338
Valid N (listwise)	129		

From Table 8 we see that respondents felt that workers’ cognitive skills, workers’ decision accountability, and workers’ performing complex, unique and dynamic tasks, were the top defining worker related characteristics for KIOs. It is interesting to note that education related factors were rated low as defining characteristic of a KIO; in particular, formal education and experience equivalent to a doctoral degree was ranked last in contrast to what the literature says.

Table 9 Descriptive Statistics for Organizational Related Factors

Factors	N	Mean	Std. Deviation
A KIO's core assets are its people.	129	6.15	.916
A KIO's organizational network can be defined as large & complex (extends both inside and outside the organization).	129	5.87	.888
A KIO's core factor for success is innovation.	129	5.69	.922
A KIO acquires status and power from creative achievements.	129	5.60	.926
In a KIO an expert worker's decision highly impacts the organization's success.	129	5.49	.939
A KIO is highly dependent on individual expertise.	129	5.18	1.199
A KIO produces and sells knowledge.	129	4.78	1.201
A KIO's production consists of complex non-standardized problem solving.	129	4.68	1.284
In a KIO top and middle managers have fewer opportunities to exercise direct supervision and control.	129	4.26	1.277
A KIO is accredited by a self-regulated body.	129	4.21	.960
Valid N (listwise)	129		

Table 9 above reveals that the top organizational related factor defining a KIO according to the respondents is people as the organization's core assets. In addition, the size of a KIO's network, *core factor for success is innovation*, and *organization acquires status and power from creative environments*, are ranked highly as describing factors for KIOs. It is interesting, however, to note that the statement that "*a KIO produces and sells knowledge*" is not ranked as highly as is presented in the literature.

5.2.4 Pearson Correlations Results

From the descriptive statistics presented in Tables 8 and 9 it is impossible to tell whether the factor differences are real or are due to chance variation. I then checked the test statistics to be sure. All types of firms identified in the cluster analysis as KIOs were tested for association with 18 of the 20⁵ factors presented in the literature as most defining of KIOs. I used Pearson's r to analyze the association (strength) of the relationship between each KIO firm type and each KIO identifying factor. Table 10 gives the correlation matrix. The value of the correlation coefficient is given which measures the strength of the relationship. In the following analysis correlation coefficient values less than 0.3 are described as relatively weak and values of 0.3 and above are described as relatively strong and indicating a greater degree of relationship. The sign (+ or -) denotes the direction of the relationship (positive or negative).

Table 10 The Correlation between KIO Firm Types and KIO most defining factors

	Law	Drug Discovery	Management Consulting	Software development	Medical Practices	Bio-tech research	Architecture	Computer Consulting
workers have high worker autonomy	0.451**	0.001	0.453**	0.265**	0.131	0.212*	0.419**	0.387**
worker's decision highly impacts the org.'s success.	0.386**	0.109	0.035	0.364**	0.223*	0.164	0.325**	0.319**
Org. produces & sells knowledge	0.451**	0.053	0.452**	0.340**	0.067	0.195*	0.263**	0.347**
core assets are its people	0.167	0.312**	0.310**	0.145	0.255**	0.285**	0.112	0.309**
Org. accredited by a self-regulated body.	0.329**	0.205*	0.188*	0.215*	0.201*	0.156	0.174*	0.300**
Org. acquires status & power from creative achievements.	0.214*	0.047	0.322**	0.144	0.151	0.162	0.074	0.315**
workers use novel knowledge to solve complex problems	0.168	0.289**	0.194*	0.234**	0.189*	0.271**	0.318**	0.271**

⁵Based on the descriptive statistics analysis two of the education related factors were considered repetitious and were therefore dropped from the list of defining factors.

	Law	Drug Discovery	Management Consulting	Software development	Medical Practices	Bio-tech research	Architecture	Computer Consulting
workers' education equivalent to an undergraduate degree.	0.255**	-0.105	0.338**	0.084	-0.019	0.123	0.286**	0.258**
Org. core factor for success is innovation.	-0.041	0.247**	0.057	0.264**	0.433**	0.137	-0.076	0.106
workers perform complex, unique, & dynamic tasks	0.318**	-0.015	0.138	0.218*	0.078	0.217*	0.276**	0.073
org. network can be defined as large & complex	-0.117	0.138	-0.058	0.067	0.084	0.033	0.051	-0.105
workers are considered experts of their domain	0.053	0.072	0.161	0.119	0.082	0.123	-0.034	-0.087
workers have high cognitive skills	0.156	0.255**	0.244**	0.233**	0.198*	0.285**	0.259**	0.257**
Org. highly dependent on individual expertise	0.046	0.129	0.012	-0.004	0.053	0.139	-0.019	0.087
worker is held highly accountable for their decision	0.187*	0.209*	0.262**	0.157	0.243**	0.243**	0.184*	0.233**
Org. prod. consists of complex non-standardized problem solving.	0.067	0.168	-0.083	0.102	0.052	0.201*	0.237**	0.122
fewer opportunities to exercise direct supervision	-0.076	0.086	0.032	0.085	0.015	0.014	0.060	0.036
workers belong to, or are accredited by, a professional group.	0.231**	0.157	0.042	-0.006	0.226*	0.102	0.055	0.032

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

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

The analysis of the correlation matrix indicates that few of the observed relationships were relatively strong. Regarding law firms the strongest relationships were with: *workers have high worker autonomy* ($r = 0.451$; $p < 0.05$), *workers perform complex, unique, & dynamic tasks* ($r = 0.318$; $p < 0.05$), *organization produces & sells knowledge* ($r = 0.451$; $p < 0.05$), *worker's decision highly impacts the organization's success* ($r =$

0.386; $p < 0.05$), and *organization is accredited by a self-regulated body* ($r = 0.329$; $p < 0.05$). This indicates that the more positive the respondents were about law firms being knowledge-intensive, the more inclined they were to pick *workers have high worker autonomy, workers perform complex, unique, & dynamic tasks, organization produces & sells knowledge, worker's decision highly impacts the organization's success, and organization is accredited by a self-regulated body*, as defining factors for KIOs. On the other hand, drug discovery firms showed the strongest relationship with *KIO's core assets are its people* ($r = 0.312$; $p < 0.05$), meaning that if a respondent had chosen drug discovery firms as a KIO he/she was more likely to have selected *KIO's core assets are its people* as most defining of KIOs.

Management consulting firms were relatively strongly correlated with *worker has high worker autonomy* ($r = 0.453$; $p < 0.05$), *workers have an education equivalent to an undergraduate degree* ($r = 0.338$; $p < 0.05$), *organization produces & sells knowledge* ($r = 0.452$; $p < 0.05$), *KIO's core assets are its people* ($r = 0.310$; $p < 0.05$), and *organization acquires status and power from creative achievements* ($r = 0.322$; $p < 0.05$). In addition, with regard to these relationships, the value of each set of measures is more than 0.31, indicating that while the relationships are different from 0, they are also rather relatively strong. This means that the more positively the respondents perceived management consulting firms as knowledge-intensive, the more inclined they were to select *workers have high autonomy (independence), workers have an education equivalent to an undergraduate degree, organization produces and sells knowledge, KIO's core assets are its people, and organization acquires status and power from creative achievements*, as the most defining factors for KIOs.

For software development firms the strongest relationships were found between software development firms and *organization produces & sells knowledge* ($r = 0.340$; $p < 0.05$), and software development firms and *expert worker's decision highly impacts the organization's success* ($r = 0.364$; $p < 0.05$). Medical practices, however, were only relatively strongly correlated with *organization's core factor for success is innovation* ($r = 0.433$; $p < 0.05$). Architecture firms were relatively strongly correlated with *workers*

use novel knowledge to solve complex problems ($r = 0.318$; $p < 0.05$), *workers have high worker autonomy* ($r = 0.419$; $p < 0.05$), and *worker's decision highly impacts the organization's success* ($r = 0.325$; $p < 0.05$). Relatively strong and positive relationships were revealed between computer consulting firms and *workers have high worker autonomy* ($r = 0.387$; $p < 0.05$), computer consulting firms and *organization produces & sells knowledge* ($r = 0.347$; $p < 0.05$), and computer consulting firms and *KIO's core assets are its people* ($r = 0.309$; $p < 0.05$), computer consulting firms and *worker's decision highly impacts the organization's success* ($r = 0.319$; $p < 0.05$), computer consulting firms and *organization is accredited by a self-regulated body* ($r = 0.300$; $p < 0.05$), and computer consulting firms and *organization acquires status and power from creative achievements* ($r = 0.315$; $p < 0.05$). This means that when a respondent positively selects computer consulting firms as knowledge-intensive, he/she is more likely to choose as the most defining factors of KIOs, *workers have high worker autonomy*, *organization produces & sells knowledge*, *KIO's core assets are its people*, *worker's decision highly impacts the organization's success*, *organization is accredited by a self-regulated body*, and *organization acquires status and power from creative achievements*.

Interestingly, with regard to bio-tech research firms none of the observed relationships are relatively very strong. However, significant positive correlations (see Table 10), although rather weak, are revealed between bio-tech research firms and *workers use novel knowledge to solve complex problems* ($r = 0.271$), bio-tech research firms and *workers have high worker autonomy* ($r = 0.212$), bio-tech research firms and *worker is held highly accountable for decisions* ($r = 0.243$), bio-tech research firms and *workers have high cognitive skills* ($r = 0.285$), bio-tech research firms and *workers perform complex, unique, and dynamic tasks* ($r = 0.217$), bio-tech research firms and *organization produces & sells knowledge* ($r = 0.195$), bio-tech research firms and *KIO's core assets are its people* ($r = 0.285$), and bio-tech research firms and *production consists of complex non-standardized problem solving* ($r = 0.201$). Marginally statistical significant positive relationships are also shown between bio-tech research firms and *organization acquires status and power from creative achievements* ($p=0.067$), between bio-tech research firms

and *worker's decision highly impacts the organization's success* ($p=0.063$), and between bio-tech research firms and *organization accredited by a self-regulated body* ($p=0.077$).

The results also show (see Table 10) statistically significant positive relationships, although again relationship was relatively weak, between management consulting firms; and *workers use novel knowledge to solve complex problems* ($r = 0.194$), *worker is held highly accountable for decisions* ($r = 0.262$), *workers have high cognitive skills* ($r = 0.244$), and *organization accredited by a self-regulated body* ($r = 0.188$); law firms; and *worker is held highly accountable for decisions* ($r = 0.187$), *workers have an education equivalent to an undergraduate degree* ($r = 0.255$), *workers belong to, or are accredited by, a professional group* ($r = 0.231$), and *acquires status and power from creative achievements* ($r = 0.214$). It is worth noting that the associations between law firms and *workers have high cognitive skills* ($p=0.077$) as well as *core assets are its people* ($p=0.059$) are marginally significant and rather weak as indicated by the values of the set of measures which are all below 0.3 but above 0.1.

Statistically significant positive, but relatively weak, associations are also found (see Table 10), between drug discovery firms and *workers use novel knowledge to solve complex problems* ($r = 0.289$), between drug discovery firms and *worker is held highly accountable for decisions* ($r = 0.209$), drug discovery firms and *workers have high cognitive skills* ($r = 0.255$), drug discovery firms and *core factor for success is innovation* ($r = 0.247$), and drug discovery firms and *organization accredited by a self-regulated body* ($r = 0.205$). The relationship between drug discover firms and *workers belong to, or are accredited by, a professional group* is marginally statistically significant ($p=0.075$). However, drug discovery firms, in comparison to law firms for example, did not show a statistically significant association with either *high worker autonomy* or *workers perform complex, unique, and dynamic tasks*.

Using Pearson correlation (see Table 10) we find statistically significant positive, but rather weak associations between software development firms and *workers use novel knowledge to solve complex problems* ($r = 0.234$), software development firms and

workers have high worker autonomy ($r = 0.265$), software development firms and *workers have high cognitive skills* ($r = 0.233$), software development firms and *workers perform complex, unique, and dynamic tasks* ($r = 0.218$), software development firms and *organization's core factor for success is innovation* ($r = 0.264$), and software development firms and *organization accredited by a self-regulated body* ($r = 0.215$). The relationship between software development firms and *worker is held highly accountable for decisions* ($p=0.076$) is marginally significant and positive.

With regard to medical practices, Table 10 reveals positive, relatively weak relationships between medical practices and *workers use novel knowledge to solve complex problems* ($r = 0.189$), medical practices and *worker is held highly accountable for decisions* ($r = 0.243$), medical practices and *workers have high cognitive skills* ($r = 0.198$), medical practices and *workers belong to, or are accredited by, a professional group* ($r = 0.226$), medical practices and *KIO's core assets are its people* ($r = 0.255$), medical practices and *worker's decision highly impacts the organization's success* ($r = 0.223$), and medical practices and *organization accredited by a self-regulated body* ($r = 0.201$). Nevertheless, it is worth noting that the relationships between medical practices and *organization acquires status and power from creative achievements* ($p=0.088$) is marginally significant and positive.

The correlation results (see Table 10) show relatively weak and positive associations between architecture firms and *worker is held highly accountable for decisions* ($r = 0.184$), *workers have high cognitive skills* ($r = 0.259$), *workers have an education equivalent to an undergraduate degree* ($r = 0.286$), *workers perform complex, unique, and dynamic tasks* ($r = 0.276$), *organization produces & sells knowledge* ($r = 0.263$), organization accredited by a self-regulated body ($r = 0.174$), and *production consists of complex non-standardized problem solving* ($r = 0.237$). Statistically significant positive, relatively weak associations are also shown between computer consulting firms and *workers use novel knowledge to solve complex problems* ($r = 0.271$), computer consulting firms and *worker is held highly accountable for decisions* ($r = 0.233$), computer

consulting firms and *workers have high cognitive skills* ($r = 0.257$), computer consulting firms and *workers have an education equivalent to an undergraduate degree* ($r = 0.258$).

The correlation results discussed above reveal that, according to the survey respondents, a number of factors are most defining of KIOs. Of the 20 factors drawn from the literature, 15 have a statistically significant positive association with one or more of the identified KIOs. In other words using Pearson correlations measures, the study revealed statistically significant, if not relatively strong, positive associations between KIOs and 15 defining factors. More importantly, the correlations results show that knowledge-intensity in organization can best be defined by both worker related factors and organizational related factors.

It is interesting to note that even though they are significantly associated with all the other KIOs in the study, there is no statistical significant relationship between the defining factor *workers use novel knowledge to solve complex problems* and law firms. This is evidence to the disparity in knowledge use and production in KIOs sometimes referred to but not explained in the literature. From the literature we learn that for KIOs knowledge is both the input and output, i.e., workers work extensively with knowledge to create new knowledge. But the extent of the esoteric use and production of knowledge may vary on this dimension from being a single unit characteristic to an organizational-wide defining characteristic, depending on how much the organization relies on its experts' knowledge and innovation skills for success. As exemplar KIOs, law firms rely on high degrees of novel knowledge but also a relatively high degree of routine intellectual skills since some of the practice work is carried out in almost production line routine process e.g. the work done by associates. In contrast, in firms such as architecture firms where the results show as relatively strongly correlated with workers use novel knowledge to solve complex problems ($r = 0.318$; $p < 0.05$), the extent of knowledge use and production is widespread. In these firms we see high degrees of novel expert knowledge use and production, since knowledge is the core to the firms' survival as both an input and output.

It is also interesting to note the factors which do not exhibit statistically significant relationships with KIOs: (i) a KIO is highly dependent on individual expertise, (ii) a KIO's organizational network can be defined as large & complex (extends both inside and outside the organization), and (iii) in a KIO top and middle managers have fewer opportunities to exercise direct supervision and control. Thereby it cannot be said that either of these factors is more likely to define (or not define) KIOs or to contribute (or not contribute) to knowledge-intensity in KIOs. Further research is needed to assess the relative weight of these variables and their interactions in defining knowledge-intensity KIOs.

5.2.5 Canonical Correlation Analysis (CCA) Results

A canonical correlation analysis was computed using six defining factor variables, (i.e., factors identified in the Pearson Correlation tests as the factors most defining of KIOs), as predictors of the eight firm type variables to evaluate the multivariate shared relationship between the two variable sets (KIO firm types and most defining factors). The predictor variables were '*workers use novel knowledge to solve complex problems*', '*a worker is held highly accountable for decisions*', '*workers have high cognitive skills*', '*organization produces & sells knowledge*', '*organization's core assets are its people*', and '*organization is accredited by a self-regulated body*'. In the following analysis I am going to refer to these variables in a shortened form; i.e., '*novel knowledge (w)*' instead of '*workers use novel knowledge to solve complex problems*'; '*accountability (w)*' instead of '*a worker is held highly accountable for decisions*'; '*cognitive skills (w)*' instead of '*workers have high cognitive skills*'; '*knowledge as product (o)*' instead of '*organization produces & sells knowledge*'; '*people assets (o)*' instead of '*organization's core assets are its people*'; and '*accreditation (o)*' instead of '*organization is accredited by a self-regulated body*'. The (w) indicates worker related factors and (o) indicates organizational related factors. The criterion variable set contained eight measures representing KIO firm types as presented in the cluster analysis results, i.e., law firms, drug discovery firms, management consulting firms, software development firms, medical practices, biotech research firms, architecture, and computer consulting firms. Tables 11, 12, 13, and 14 below present the output of the canonical correlation analysis results.

Table 11 Statistical Significance Tests for the Full CCA Model
 Effect ... Within Cells Regression Multivariate Tests of Significance (S = 6,
 M = 1/2, N = 56 1/2)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	0.82982	2.41	48	720.00	0.000
Hotellings	1.17861	2.78	48	680.00	0.000
Wilks	0.37558	2.61	48	569.91	0.000
Roys	0.39656				

As presented in Table 11 collectively, the full model across all functions is statistically significant, using the wilks's $\lambda = 0.376$; $p < 0.001$. Wilks's λ represents the variance unexplained by the model. As a result by computing $1 - \lambda$ we get the full model effect size in r^2 metric. Hence, I compute the overall effect size ($1 - \lambda$) and find an overall effect of 0.624 for the full model. This indicates that a substantial portion, about 62%, of the variance shared between the variable sets is explained by full model. Accordingly I can reject the null hypothesis that there is no relationship between the variable sets and conclude that there probably is a relationship.

Table 12 Canonical Correlations for each variable separately
 Eigenvalues and Canonical Correlations

Root No.	Eigenvalue	Pct.	Cum. Pct.	Canon Cor.	Sq. Cor
1	0.65717	55.76	55.76	0.62973	0.39656
2	0.27965	23.73	79.49	0.46748	0.21854
3	0.16984	14.41	93.90	0.38103	0.14518
4	0.04094	3.47	97.37	0.19832	0.03933
5	0.02854	2.42	99.79	0.16658	0.02775
6	0.00246	0.21	100.	0.04952	0.00245

The analysis, as depicted in Table 12, yielded six functions with squared canonical correlations of 0.397, 0.219, 0.145, 0.039, 0.028, and 0.003 for each successive function. An examination of each of the functions (i.e., variates) reveals that the first three functions explain 39.66%, 21.85%, and 14.52% of the variance within their functions, respectively. It is important to note that functions four, five and six each explained less than 10% of the variance in their functions (3.93%, 2.78%, and 2.45%, respectively), and therefore may not be noteworthy or replicable in future studies.

Table 13 Hierarchical Statistical Significance Tests
Dimension Reduction Analysis

Roots	Wilks L.	F	Hypoth. DF	Error DF	Sig. of F
1 TO 6	0.37558	2.61463	48	569.91	0.000
2 TO 6	0.62240	1.67184	35	490.40	0.011
3 TO 6	0.79645	1.14990	24	409.37	0.285
4 TO 6	0.93172	0.56422	15	326.15	0.901
5 TO 6	0.96987	0.45861	8	238.00	0.884
6 TO 6	0.99755	0.09833	3	120.00	0.961

Table 13 presents a reduction analysis in which the hierarchical statistical significance tests are presented. The dimension reduction analysis allows the researcher to test the hierarchical arrangement of functions for statistical significance. The results show the full model (Functions 1-6) as statistically significant ($p=0.000$) as well as the cumulative effects of functions 2 to 6 ($p=0.011$). The cumulative effects of functions 3 to 6, 4 to 6, and 5 to 6 are not statistically significant. In addition, function 6 (the only function tested

in isolation) is not statistically significant. Interestingly, although function 3 is found to be significantly contributing to the explanation of the relationship between the variable sets, i.e., explaining 14.52% of the variance within its function, at the cumulative level the total solution is not statistically significant and perhaps not that noteworthy after all. Further investigations are therefore warranted for this function.

Given the squared canonical correlation effects for each function, only the first two functions were considered noteworthy in the context of this study (39.66% and 21.85% of shared variance, respectively). I can therefore conclude that there is indeed a noteworthy relationship between the variable sets and this relationship is mostly captured by the first two functions in the canonical model. But the question still remains: What variables are contributing to this relationship between the variable sets across the two functions? Identification of the contributing variables can be critical to my accepting or refuting the null hypothesis, “there are no clear and outright factors that distinguish KIOs”. I want to be able to say, in terms of degree and directionality, what defining factors variables were related to what KIO variables in this analysis. To help answer this question I therefore looked at the standard weights and structure coefficients results.

The analysis above has revealed that the relationships in our model are largely captured by Functions 1 and 2. My interest is now focused on these two functions. Consequently, in Table 14 I present the standardized canonical function coefficients (weights) and structure coefficients for Functions 1 and 2. The squared structure coefficients are also given as well as the communalities across the two functions for each variable. I view communalities as an indication of how useful the variable was for the solution. In other words, the communality coefficients aid in determining which variables are not contributing at all to the CCA solution. As a result, for emphasis, I underline in Table 14 communalities above 45% revealing variables with the highest level of usefulness in the model. I also underline and highlight in green for function 2 and yellow for function 1 structure coefficients above 0.45.

Table 14 Canonical Solution for defining factors predicting KIOs for functions 1 and 2

Variable	Function 1			Function 2			Comm. coef (%)
	Coef	Structure coef	Sq. structure coef (%)	Coef	Structure coef	Sq. structure coef (%)	
law	-.28750	<u>-.73431</u>	53.92	-.39316	-.16155	2.61	<u>56.53</u>
drug discovery	-.30066	-.27539	7.58	.78747	<u>.62530</u>	39.1	<u>46.68</u>
management consulting	-.53913	<u>-.77124</u>	59.48	.43397	-.18298	3.35	<u>62.83</u>
Software development	-.11835	<u>-.64235</u>	41.26	-.80678	-.01106	0.01	41.27
medical practices	-.23645	<u>-.66609</u>	44.37	.30329	<u>.45532</u>	20.73	<u>65.43</u>
Computer consulting	-.14057	<u>-.45186</u>	20.42	.25933	.37043	13.72	34.14
Architecture	-.15611	<u>-.57346</u>	32.89	.44324	.20070	4.03	36.92
Bio-tech Research	.36602	-.26302	6.92	-.19577	.17616	3.10	10.02
Sq. Cor			39.66			21.85	
novel knowledge (w)	-.11072	<u>-.55657</u>	30.97	.54281	<u>.68552</u>	46.99	<u>77.96</u>
accountability (w)	-.01556	<u>-.48500</u>	23.52	.29258	<u>.49873</u>	24.87	<u>48.39</u>
cognitive skills (w)	-.35996	<u>-.88184</u>	77.76	.07795	<u>.56423</u>	31.84	<u>109.6</u>
knowledge as product (o)	-.77178	<u>-.52327</u>	27.38	-.76942	.28167	7.93	35.31
people assets (o)	.17223	-.12009	1.44	.30871	.35767	12.79	14.23
accreditation (o)	-.13595	<u>-.55503</u>	30.81	.24711	-.34136	11.65	42.46

Note. Structure coefficients greater than 0.45 are underlined. Communality coefficients greater than 45% are underlined.

Coef = standardized canonical function coefficient; structure coef = structure coefficient; sq. structure coef = squared structure coefficient; comm. coef = communality coefficient.

An analysis of the Function 1 coefficients reveals that relevant dependent variables, which I have highlighted in yellow, are primarily law firms, management consulting firms, software development firms and medical practices, with architecture firms and computer consulting firms making secondary contributions to the synthetic dependent variable. This conclusion is supported by the squared structure coefficients which show the amount of variance the observed variable can contribute to the synthetic dependent variable. These KIOs also tend to have larger canonical function coefficients, with management consulting firms exhibiting the largest canonical function coefficient.

Notably, law firms and medical practices have modest function coefficients but large structure coefficients while software development firms, computer consulting firms and architecture firms have rather small function coefficients but large structure coefficients. This result can be due to the multicollinearity that these variables have with the other dependent variables. Interestingly, drug discovery firms and bio-tech research firms are revealed as having very limited contributions to the dependent variable, contributing only 7.58% and 6.92% respectively, to the variance. Nevertheless, all of these variables' structure coefficients have the same sign, indicating that they are all positively related.

Regarding the independent (predictor) variable set in Function 1, '*cognitive skills (w)*' defining factor variable is the primary contributor to the predictor synthetic variable, with secondary contributions by '*novel knowledge (w)*', '*accountability (w)*', '*knowledge as product (o)*' and '*accreditation (o)*'. These variables are also highlighted in yellow in Table 14 above. In addition all defining factor variables are positively related to the firm type variables. These results generally support the theoretically expected relationships between the defining factors and KIOs, i.e., both worker-related factors and organizational-related factors contribute almost equally to knowledge-intensiveness in KIOs. Bearing in mind that the related factors addresses the characteristics of the whole organization I therefore label Function 1 and the related firms as "organizationally-driven KIOs".

An analysis of Function 2 coefficients in Table 14 reveals the only dependant variables of relevance as drug discovery firms and medical practices (highlighted in green). These firms are positively related on this function. With regard to the defining factors, '*novel knowledge (w)*' is now the dominant predictor, along with '*cognitive skills (w)*' and '*accountability (w)*' (also highlighted in green). These variables are also positively related on this function. Looking at the structure coefficients for the entire function, we see that '*novel knowledge (w)*', '*cognitive skills (w)*' and '*accountability (w)*' are positively related to drug discovery firms and medical practices. Notably only worker related factors are associated with these firms. Thus given that the related factors address the characteristics of key "knowledge workers" driving knowledge-intensity in these

firms who are located in specific units of the organization, I label this function and the related firms “worker-driven KIOs”. In other words, I placed drug discovery firms and medical practices in the worker-driven KIO group.

5.3 PHASE 1 QUALITATIVE FINDINGS

Qualitative analysis served as another method of verifying and validating Phase 1 research study findings. For the quantitative analysis I present the outcome of the textual analysis of the definitions of KIOs provided by the respondents. Respondents to the survey were asked to provide, using no more than a couple of sentences, their definition of a knowledge-intensive organization. It is evident that most knowledge management professionals strongly believe that a KIOs’ success is driven by the activities and cognitive mental models of its workers, as underscored by statements such as:

A knowledge-intensive organization is for its production dependant on a high proportion of experts with a higher education doing non-routine work...

A KIO is an organization where tasks are mostly cognitive and the success of which depends on sharing knowledge within the organization and producing K based products for the clients.

A KIO is an organization that relies on its employees to use data and their own expertise to solve problems in a way that is unique, or is ahead of the pack.

A Knowledge-intensive Organization is an organization where intellectual capital is the most important asset. Therefore highly qualified people are much more valued than in traditional organizations.

KIOs are highly knowledgeable individuals known for their creativity and innovativeness in solving organizational problems based on their knowledge.

Most of the definitions of KIOs presented by survey respondents reflected on the cognitive and intellectual capabilities of the knowledge worker. They underscored a human related focus and a recognition of worker-related characteristics as core defining factors of KIOs as presented in the quantitative findings. This supports the findings from the quantitative analysis. Further the recognition of organizational related factors is demonstrated through statements such as:

A KIO is an organization that invests on knowledge production, innovation. Such company makes money using its knowledge.

A KIO is an organization that relies on knowledge to ensure that its goals are achieved.

A KIO is an organization where applying existing knowledge to create new knowledge is key to the organization's success.

A Knowledge-intensive Organization produces a knowledge product--. A KIO is a learning organization as it is constantly adjusting its customer relationship and product fulfillment to reflect the knowledge creation and sharing around addressing the customer's requirement.

Thus several extracts of definitions of KIOs from knowledge management professionals, introduced above, provided a true sense of the gathered data and gave further support to the quantitative findings that the defining factors of KIOs are driven by both worker and organizational related factors. They also unearthed a very strong belief among knowledge management professionals that KIOs can best be defined by knowledge as an asset or production value to the organization.

5.4 PHASE 1 RESULTS DISCUSSION

This Phase of the study was motivated by a desire to understand factors that differentiate KIOs from non-KIOs. The study set out to resolve three questions: A. How does the knowledge management community of practice distinguish between KIOs and non-KIOs? B. Can we identify what factors the knowledge management community uses to separate KIOs from non-KIOs? And C. According to the knowledge management community what factors contribute to knowledge intensity in an organization? In the case of the first two questions, this research examined and identified how the knowledge management community of practice distinguishes between KIOs and non-KIOs. The results demonstrate that as presented in the prevailing theoretical propositions, organizations can generally be divided into two groups - KIOs and non-KIOs. The KIO classification is positively associated with management consulting firms, law firms, medical practices, drug discovery firms, software development firms, computer consulting firms, and architecture firms. However, contrary to the presentation in the literature, the study placed accounting firms in the non-KIO group, thereby supporting Robertson & Swan's (1998) claim that accounting firms are not KIOs. Drawing from the

research results and the literature I therefore placed accounting firms in a separate group of firms that are referred to as ‘knowledge rich’ organizations (KROs), i.e., organizations “in which different structural units or expert groups might accumulate and preserve deep professional knowledge in their specific field, but which lack processes to combine the knowledge that is kept in the isolated treasuries in order to increase the value of the intellectual capital for the whole organization” (Elenurm, 2010, p. 203). The KIO classification relationship also did not hold for bio-tech research firms. The data from the bio-tech research firms revealed limited contribution to the canonical model and statistically insignificant, an interesting result to note.

These findings suggest several important contributions to organization science research. First, the study confirms that KIOs exist as a distinct organizational type that is mostly exemplified by organizations such as management consulting firms, law firms, medical practices, drug discovery firms, software development firms, computer consulting firms, and architecture firms. Second, the study provides evidence that some organizations such as accounting firms are knowledge rich but cannot be regarded as knowledge-intensive, thereby confirming the viewpoint that KIOs are a “product of structures, relationships, and dynamics in the organizations, not of the quanta of knowledge they contain” (Greenwood, 2009, p. 35). Third, the findings underscore the existence of distinct factors that aid in defining KIOs as an organization type. From the results of Phase 1 of the Research, the KM communities of practise have identified clear and outright factors that differentiate KIOs from non-KIOs.

According to this community KIOs are positively associated with ‘*workers have high cognitive skills*’, ‘*workers use novel knowledge to solve complex problems*’, ‘*worker is held highly accountable for decisions*’, ‘*organization produces & sells knowledge*’ and ‘*organization is accredited by a self-regulated body*’ defining factor variables.

Interestingly, a number of factors highly cited in the literature as defining KIOs did not exhibit statistically significant relationships with KIO: ‘*a KIO is highly dependent on individual expertise*’, ‘*a KIO's organizational network can be defined as large & complex (extends both inside and outside the organization)*’, and ‘*in a KIO top and middle*

managers have fewer opportunities to exercise direct supervision and control'. Thus this study does not support the assertion that these factors are more likely to define (or not define) KIOs or to contribute (or not contribute) to knowledge-intensity in KIOs.

More importantly, with regard to the third question on what factors contribute to knowledge intensity in an organization, the results of Phase 1 of this study point to two critical dimensions of knowledge intensity defining KIOs, i.e., the worker dimension and organizational dimension. As is presented in the conceptual model presented in Chapter 3, knowledge-intensity in organization can best be defined by the worker-related factors as well as organizational related factors. The degree of knowledge-intensity distinction is contingent on the fit between the organizational defining factors and worker elements. The results from the CCA Function 1 analysis, for instance, show that there are KIOs that are best defined by a somewhat 50-50 balance between organization and worker related factors as exemplified by law firms, management consulting firms, software development firms and medical practices which are depicted as the most relevant dependent variables. I therefore classified these organizations as the “organizationally-driven KIOs”. Function 2 of the canonical correlation analysis revealed a group of KIOs that can best be defined by mostly worker related factors, i.e., drug discovery firms and medical practices, organizations which I then classified under the group “worker-driven KIOs”.

The study findings illuminate the relationship among knowledge-intense elements and KIOs. I therefore advance a revised framework of KIOs as discussed below. The KIO framework advanced here relates the various knowledge-intense elements to the organizations that fall within the two identified dimensions. Table 15 shows the characteristics of KIOs as presented in the research findings, including how the various knowledge-intense elements can be incorporated into a typology of KIOs. Also included in Table 15 and in the discussion below is information on KROs highlighting the differentiating elements between KROs and KIOs.

Worker-driven KIOs, as exemplified by drug discovery firms and medical practices (see table 15), focus on few key departments that use novel knowledge to solve complex

problems. In other words, in these organizations high emphasis is placed on the contributions of a few key experts who are in defined units of the organization. These organizations are defined by relatively high levels of cognitive skills, high expertise, and the use of a mixture of esoteric content, and common knowledge. But the need for cognitive and innovative skills is dependent on the particular unit within the organization. Consequently knowledge use and production is prevalent in those units only. Therefore, although these organizations are referred to as knowledge-intensive, according to this definition, we cannot distinctively consider the whole firm as knowledge-intensive.

Organizationally-driven firms, as exemplified by management consulting, law, software development, computer consulting, and architecture firms, on the other hand, exhibit high degrees of esoteric expert knowledge use and production. Their dominant workers exhibit high levels of innovative skills and complex cognitive skills. Most of the workers in these organizations “think for a living” to produce and sell knowledge. They are continually learning so as to upgrade their skills. They perform complex, unique, and dynamic tasks, and are highly accountable for their decisions. In other words their decisions have strong impact on the success of the organization as a whole. As a result, the organizational form is less formal or controlling, with management ceding a high degree of autonomy to the individual workers in their work process. In addition, these organizations are characterized by a high degree of worker interdependence, arising from the experts’ need to supplement each other's expertise in order to effectively analyze complex work problems.

Knowledge-rich organizations, as exemplified by accounting firms (see Table 15), are those firms that rely on experts’ use of high degrees of specialized, professional and experiential knowledge. The experts in these organizations work in structural units or expert groups which accumulate, organize, and preserve deep professional knowledge in their specific field. But the knowledge in these organizations is kept in isolated repositories and is used primarily as an input informing the experts in the particular units. The organization does not have processes in place to organize the knowledge in the

different structural units so as to increase the value of the intellectual capital for the whole organization.

Table 15 Characteristics of Knowledge-Intensive Organizations & Knowledge-Rich Organizations

DEFINING FACTOR	DESCRIPTION	KIOS		KROS
		Worker-driven firms	Organizationally-driven firms	
Workers have cognitive skills	The level of complexity	mixed highly complex and simple	highly complex	mixed complex and simple
Organization produces & sells knowledge	The production value	Knowledge is both an input & output product i.e., mixture of esoteric and common knowledge	Knowledge is both an input & output product i.e., esoteric, innovative knowledge	Knowledge an input i.e., familiar, experience & professional knowledge
Workers use novel knowledge to solve complex problems	The body of knowledge, i.e., the volume, complexity, and rate of change of knowledge the organization uses and produces	medium to high	high	low to medium
Organization is accredited by a self-regulated body	Dimensions of professional orientation	mostly professionals & specialists	mostly professionals and accredited workers	mixture of accredited, non-accredited specialists & skilled-craft workers
Worker is held highly accountable for decisions	The degree to which individual worker's decision impacts organizational success	moderate to high	high	low to moderate

DEFINING FACTOR	DESCRIPTION	KIOS		KROS
		Worker-driven firms	Organizationally-driven firms	
Leveraging effect	Value adding component	Innovative processes in place to increase the value of the intellectual capital for the whole organization	Innovative processes in place to increase the value of the intellectual capital for the whole organization	No processes in place to increase the value of the intellectual capital for the whole organization
Organization examples		Drug discovery firms and medical practices	Management consulting, law, software development, computer consulting, and architecture firms.	Accounting firms

An important theoretical implication of this phase of my research is that knowledge management considerations in KIOs might be mediated by the knowledge-intensive factors, which are contingent on the fit between the organizational defining factors and worker elements. This notion is explored further in the second Phase of my study.

5.5 SUMMARY TO CHAPTER 5

This Chapter presented Phase 1 study results. Also included is an interpretation and discussion of the results. Chapter 6 provides a discussion of the research findings for Phase 2 of the research study which was informed by the Phase 1 study findings.

CHAPTER 6 PHASE 2 STUDY RESULTS AND DISCUSSION

6.1 INTRODUCTION

Phase 2 of the study examined how the knowledge-intensive factors identified in Phase 1 as defining KIOs interlace with the choice of KMS deployed in KIOs to support knowledge management processes and activities. Chapter 4 presented a summary of the methodology adopted for this phase of the study, including a description of the study area, units of analysis, research design, data collection techniques, data analysis and the validity as well as the limitations of the study methodology.

As outlined in Chapter 4 data collection and analysis for this phase of the study followed a mixed methods approach. For the qualitative grounded theory method, in-depth, semi-structured but open ended interviews were conducted with knowledge management practitioners. Survey quantitative data was then used to supplement the qualitative data. In total 150 knowledge managers were invited to participate in the survey. A total of 44 surveys were returned, giving an overall response rate of 29.3%. But it should be emphasized that the intent of the survey was to use it as a test instrument to support the findings from the interview and not a definitive survey of the population of KM managers. The purpose of utilizing the survey, as mentioned above, was to corroborate findings from the interviews and achieve data triangulation. Therefore, although the survey was based on a small non-representative sample of the population, the findings have been most informative because they support the findings from the interview data as well as validate the KMS for KIOs framework presented below. The data from the survey was loaded into NVivo and coded using the same codebook used for the interviews. Both sets of data were thus analyzed in combination (Miles & Huberman, 1994).

This Chapter presents Phase 2 study results including an interpretation and discussion of the results. In the presentation below, because the survey study was designed to complement interview data, I present findings in the survey that directly bear on interview results, as well as new themes that emerged.

6.2 GROUNDED THEORY RESULTS

6.2.1 Generating Categories, Themes and Identifying Patterns

To facilitate the grounded theory process, the software package NVivo (Versions 9) was used. Included in this section are the identified primary patterns which emerged from the data across the fourteen interview transcripts, centred on understanding participants' reflection on knowledge-intensive related factors and experience choosing KMS within each of the cases. For this thesis a theme is identified as a conceptual element of a theory, i.e., "an abstract representation of something the researcher identifies as being significant in the data" (Pace, 2004, p. 337). These themes were developed using an inductive constant comparison analysis coding process, which ensured that categories were continually compared, revised, expanded or reduced until a potential saturation of theory occurred (Strauss & Corbin, 1998); for instance codes numbered about 100 halfway through the first review. Concepts were compared, combined, and merged as general themes began to form. The following set of 63 categories emerged in the first instance.

Grounded Theory Open Coding Categories

collective development	organization size	share	conversation
organizational factor	space	culture	structure
organizational knowledge	human theme	networks	awareness
KMS type (negative/positive)	system objectives	competency	infrastructure
individual action	production factor	retrieval	meetings
individual knowledge	communication	learning	processes
individual skill	social networking	storage focus	KM Processes
socio-technical theme	employees	conversation	attitude
organizational memory	search	repository	collaboration
knowledge transfer	worker factor	project management	
knowledge manipulation	networks	management	collection
technological theme	integrated units	focus	tactic
collective development	performance	trust	power
communication (face-to-face)	division of labour	interaction	cognitive
communities of practice	workspace design	motivation	planning
content management teams	explicit	decision-making	

The coding stripes function in NVivo proved to be of great help to provide a visual overview of how the emergent concepts might relate to one-another. Modifying categories involved constant questioning. As Corbin and Strauss (2008) explained, asking questions such as who, when, why, where, what, how, and with what results, enhances the development of the evolving grounded theory. To facilitate appropriate questioning of interview data, I used the coding query function in NVivo 9 to search for intersecting concepts. For example, during the review of the *knowledge transfer* node, coding stripes revealed references to knowledge transfer were also coded at a concept labeled *conversation*. I identified the *conversation* theme in initial coding to reference instances in the data where people described transfer, communication / sharing of knowledge. Reviewing all of the references coded at *conversation* shows in most cases *conversation* had also been coded at either the significant or insignificant *KM processes* nodes. Using a coding query, I retrieved two separate data sets, which represented significant and insignificant *conversation*. By saving the results of this query, it was then possible to use the coding stripes function to make comparisons between these two types of *conversation* (see Figure 8).

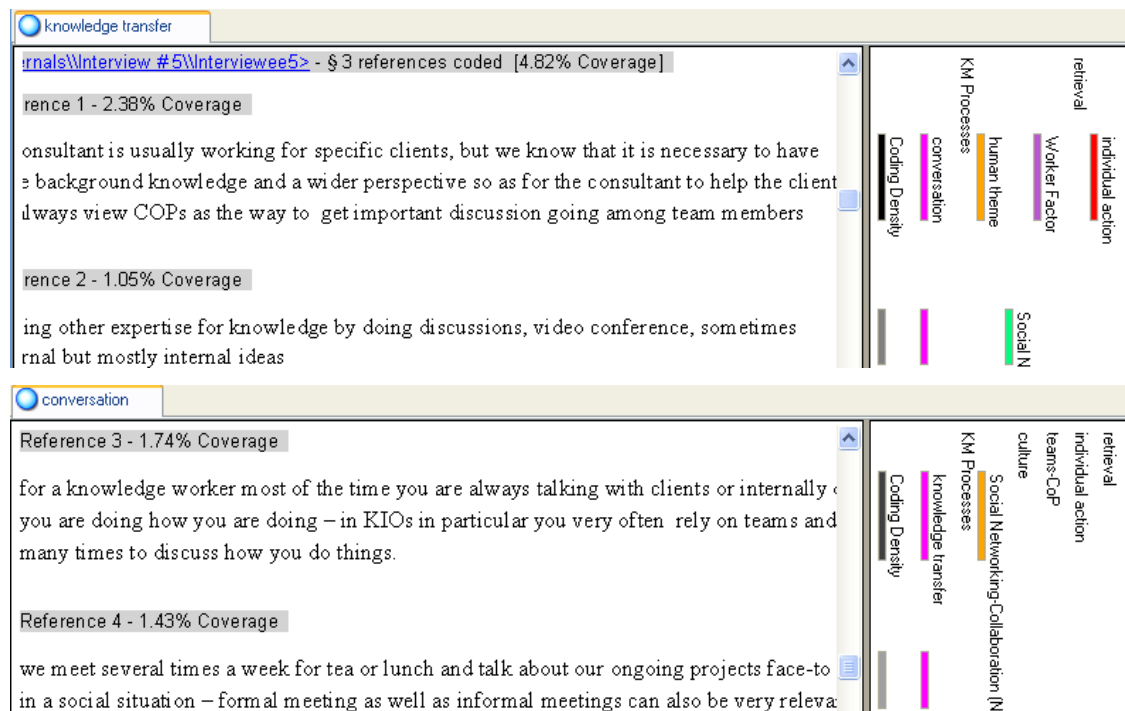


Figure 8 Comparing two coding query results using coding stripes

Further comparisons of the datasets revealed that significant *conversation* included references to *knowledge transfer* and described instances of successful processes of enabling talk in teams and communities of practice, whereas insignificant *conversation* included references to poor and inconsistent communication. Thus the use of the coding query function helped me to identify higher order themes by allowing me to view and examine data relevant to the emergent questions of interest to the study.

For conceptual and theoretical development, I also utilized the matrix coding query function in NVivo 9 which allowed for an in-depth investigation of relationships between concepts and categories by simultaneously searching for data coded to multiple pairs of items. For example, in order to make comparisons between the sets I had created to represent positive and negative choices of KMS types a matrix coding query was launched to explore the factors commonly associated with the two sets. The results of this process provided me with an indication as to whether any of the previously identified concepts were commonly associated with either positive KMS type or negative KMS type. These results are presented in Figure 9. Each cell in the matrix in Figure 8 displays chosen information concerning the corresponding pair of items (e.g., number of sources or cases coded to both concepts for the corresponding coded data). The numbers in Figure 8 represent corresponding coding references. The results revealed a number of concepts which appeared to be closely associated with either positive KMS type or negative KMS type. As a result it was possible for me to quickly identify relevant cells in the matrix, displaying only the data coded to both concepts, and explore in more detail potential relationships.

Matrix Coding Query - Results Prev		
	A : negative K... ▼	B : Positive K... ▼
4 : human the... ▼	8	17
5 : individual a... ▼	4	4
6 : individual k... ▼	0	0
7 : individual s... ▼	1	0
8 : KM Proces... ▼	3	9
9 : knowledge ... ▼	4	22
10 : negative ... ▼	1	1
11 : negative ... ▼	3	1
12 : negative s... ▼	1	0
13 : negative ... ▼	0	0
14 : organizati... ▼	0	0
15 : organizati... ▼	0	8
16 : organizati... ▼	3	8
17 : Productio... ▼	0	0
18 : retrieval ▼	0	2
19 : Social Net... ▼	2	14
20 : socio-tech... ▼	6	13
21 : storage fo... ▼	2	7
22 : System O... ▼	1	8
23 : teams-CoP ▼	1	6
24 : technologi... ▼	13	125
25 : technologic... ▼	12	119
26 : Worker F... ▼	5	9

Figure 9 Matrix coding query results example

Further, throughout the grounded theory research process, in order to identify emerging patterns, theories and explanations, I utilized diagrams, facilitated by NVivo 9's model building tool which allows concepts (nodes or relationships) to be presented diagrammatically. Four related but different thematic areas emerged from my analysis of the data, *collective development theme*, *conversation theme*, *socio-technical focus theme*, and *organizational structure theme*, which are discussed below. The discussion that follows offers rich descriptions of these emerging thematic relationships. The analysis focuses on the thoughts of the participants to demonstrate the most plausible explanations offered and the summary of findings (Marshall & Rossman, 2006).

6.2.2 Collective Development Theme

Drawing on results from the survey and interviews the first theme that emerged points to *collective development* as a source of organizational knowledge creation and diffusion. Collective development describes the collaborative processes that enable the creation, and sharing of knowledge in an organization. Generally the management of the collective development of knowledge appeared to be a key consideration of all the informants in this study regardless of their organizations' knowledge-intensive related factors. The following comments from participants illustrate this finding.

We hold a lot of meetings, we encourage collaboration, and our furniture was designed with collaboration in mind. We also encourage and train our employees in cross-functional work, e.g. people in management are trained in marketing etc., crossover operations (P8).

What is important in my company is pooling together expertise for knowledge by doing discussions, video conference, sometimes external but mostly internal ideas (P1).

I think what is important in KM is that systems have to support both individual knowledge construction as well as organization wide knowledge construction; there is principal called symmetric knowledge advancements. It is the idea that an individual in pursuit of their own knowledge needs also creates knowledge for the organization. So as individuals struggle to deal with complex challenges the knowledge-intensive system basically is able to support the knowledge needs of them as well as those of the organization (P10).

An analysis of the comments underlying the collective development theme helped explain the association between the factors defining KIOs identified in Phase 1 of this study and the choices of KMS in KIOs. The results of phase 1 revealed KIOs as organizations whose knowledge is mainly embedded in "human capital", (i.e., 'workers have high cognitive skills' and 'workers use novel knowledge to solve complex problems') and also institutionalized at the organizational level in the "form of collective frames of reference, systematized methods of work, sophisticated routines and processes" (Ditillo, 2004, p. 409) (i.e., 'organization produces & sells knowledge' and 'organization is accredited by a self-regulated body'). Furthermore the tasks driving the production of knowledge in KIOs were defined as complex thereby underscoring the constant need for searching for, and evaluating various alternatives in these organizations (Ditillo, 2004).

The activities involved in searching and evaluating alternatives are reckoned as not just individual activities but activities that demand the coming together of minds since more knowledge is required than is possessed by an individual knowledge worker. The study data showed that in KIOs teams, groups, or communities of practice (CoPs) provide the collective solution which is particularly suitable to deal with a dynamic, complex environment “that requires fast and innovative responses” (Ditillo, 2004). To illustrate this finding, consider the following comments from participants.

The consultant is usually working for specific clients, but we know that it is necessary to have more background knowledge and a wider perspective so as for the consultant to help the client so we always view CoPs as the way to get important discussions going among team members (P5).

There is the whole idea of communities of practice which is important in my company. These provide people in the organization with time for reflection and discourse and collaboration. So the face to face interaction creating collaborative spaces is very important. That is certainly one of the schools of knowledge management that is if you create the right kind of physical environment that supports and is conducive to collaboration and knowledge sharing that will go a long way to building a knowledge centric organization (P10).

Consulting work is always the temporary project, so every time a client has a project we see the contents of that project and choose the people who fit the project. We see this as a temporary team, and that means they are temporary projects (P5).

In KIOs therefore, the data revealed that a key consideration informing the choice of KMS is the KMS’s ability to support collective knowledge development. Also as the comments above reveal the ability to support communities is also paramount since teams, groups or CoPs provide greater collective knowledge than individual knowledge workers. CoPs were also held up by participants as core vehicles for enabling the management of tacit knowledge in KIOs as presented in the conversation theme discussion below. The choice of KMS in KIOs therefore, is determined by the system’s ability to “create the right kind of physical environment that supports and is conducive to collaboration and knowledge sharing” (Participant 13, personal communication, April, 20, 2011).

6.2.3 Socio-Technical Focus Theme

A second major theme which emerged from the data is the socio-technical focus. This unanticipated finding emerged as participants remembered and described either highly successful or unsuccessful KMS initiatives. According to Pan and Scarbrough (1998) the term “socio-technical” was first suggested by Trist to describe a method of viewing organizations which emphasizes the interrelatedness of the functioning of the social and technological subsystems of the organization, and the relation of the organization as a whole to the environment in which it operates (p. 57). What was evident from the participants’ comments was the constant reference to social as well as technical requirements of a KMS, thereby underlining the complex interactions which take place in KIOs between the “subjective perceptions of employees and the objective characteristics of work processes” (Pan & Scarbrough, 1998). The data showed that when participants talked about KMS they referred to a system of individual experience, social relations, and technologies. In other words, instead of emphasizing the role of information technology in knowledge management, participants talked about KMS in a more wholistic view, recognizing the interplay between social and technical factors as evidenced by the comments below.

On one hand you have systems designed to manage what I would call explicit and then there are systems meant to support tacit development and sharing. One is much more social. Social knowledge needs to be managed – websites, wiki more tacit than explicit. Tacit knowledge is more kicking around in their heads so you need systems that encourage the sharing of that, encourage the discovery of that (P13).

Yes the styles include both technological and face-to-face or written, what have you, and the understanding is that people can relay information through different channels and that technology should not be overstated when people are looking for information and are seeking knowledge. Because that is often the case, I think people are inclined to use technology to look first before they proceed to talk to or phone up other people (P11).

From statements like these, the participants reflected that both technological and social aspects are important in the choice of KMS deployed in KIOs. In their view technical artefacts are important to the organization of data into information, and the assignment of meaning to information, and the ultimate creation of knowledge. Knowledge workers in

KIOs are endowed with interpretative capabilities. It is therefore important, as the participants revealed that KMS in KIOs include both the technological capabilities as well as the capabilities to shape and redefine interactions between its people and techniques. As Bhatt (2001) observed, technologies enable coordination between workers and their CoPs by minimizing a number of human and physical constraints. Participant 9 agrees with this viewpoint and concluded,

Technology is an enabler for sure. Yes. But it's not the answer to organizational KM. As I said there are other knowledge management processes which don't require technology which should be considered as part of an organization's knowledge management strategy.

It is evident that technology enables the searching, storage, manipulation, and sharing of a huge amount of information per unit of time, by minimizing the limitations of time and space, but the essence of offering "meaning" depends on individuals (Bhatt, 2001).

According to Bhatt (2001) as individuals in organizations interact with others (including technologies, and techniques), they are likely to understand and share their views of the same situation in a different light. Participants in this study therefore agreed with Bhatt's assertion and highlighted how interaction process can be helpful in developing a wholistic view of the realities, thereby facilitating the integration of a diverse body of knowledge prevalent in KIOs. KMS which were identified as successful in KIOs are revealed as carefully coordinating both the social relations and the technologies.

6.2.4 Conversation Theme

Somewhat linked to the first and second themes is the third major theme, of *conversation*. The theme of conversation was discussed in the context of the complexities involved with the management of tacit knowledge. As indicated earlier tacit knowledge management is considered a rather daunting task that goes beyond a mere technical or physical know-how (Dretske, 1988). Conversation came out as a theme when participants referred to ways of enabling talk in their organizations, as fuelled by the need to communicate or share tacit knowledge in the organization:

We have implemented systems enabling talk, i.e., we have 7 employees in Halifax, and we have a kitchen next to work areas which encourages interaction. We also have breakout spaces for informal talk – informal way of interacting, get updates, keep tabs on what others are doing (P8).

We have some rules in the organization, e.g. that everybody is ccd on everything, keeps everybody in the loop. We have one person who is responsible for work in China and he writes very lengthy emails on what he did. Everybody is kept in the knowhow, everybody needs to be informed in a small organizations. We simply have more holistic systems – everybody is responsible for the whole (P6).

We meet several times a week for tea or lunch and talk about our ongoing projects face-to face, in a social situation. Formal meetings as well as informal meetings can also be very relevant (P6).

Conversation in this case refers to the back and forth communication among the organization's community members. Participants viewed KMS supporting the management of tacit knowledge as focussing on dialogue between individuals resulting in knowledge that is transferred from individual to individual through conversations, meetings or brain storming sessions. As aptly observed by McDermott (2000) when people sit close enough to interact daily, they naturally create connections for knowledge sharing. This thought was echoed in most of the participants' narratives. For effective KM in KIOs it is therefore evident from the data that tools should be chosen and deployed that enable "technical schmoozing", or immediate sharing of success stories or problems (McDermott 2000, 21-39). In order for knowledge workers in KIOs to thrive the right KMS should be deployed, i.e., systems that enable talk, that support real-time and immediate need for back and forth exchange of information, ideas, and knowledge. For instance the data revealed that most KIO managers prefer the use of face-to-face, or the emphasis is on "word of mouth" to enable conversation. Informal talks, meetings, conferences, knowledge cafes, and discussion forums were cited by most participants as the ideal forums for enabling conversations. However it should also be noted that email was identified as the major mode of communication used in KIOs. The reason given for the prevalent use of email was because to most participants it provided a good document record of conversations and interactions. The use of video or audio meetings was found not to have been successful in a number of the organizations as the following comment revealed:

Without face to face the teams never gel. Even with the video, it's not just enough. You got to be in a room with someone. You got to spend some time with someone. Video or audio meeting software – those are interesting tools, but what we

discovered in the last 10 years, not good experience. We misjudged them. We thought we could trade all of the semiotics stuff, you know hand, eye motion – we thought we could trade that because we would just be exchanging information – but no (P1)

It is evident from the participants' comments that underlying the conversation theme is the acknowledgement that the real value of KIOs depends more on the ideas, insights and information in the minds of their employees. Conversation was thus considered a core vehicle for knowledge transfer. Consequently, social media systems, such as Wikis, blogs, LinkedIn and Twitter were seen as systems that improve on knowledge interpretations, by bringing multiple views on the knowledge. Creating the necessary conversation connections among employee with a goal of enabling knowledge creation and transfer was therefore considered an essential element in the choice of KMS. Moreover from the data analysis it emerged that knowledge creation, knowledge transfer and knowledge sharing were closely related to conversation. Also conversation was identified as a core vehicle for expertise growth and leadership in KIOs. One participant remarked:

Workers always stay connected – very accessible and reachable because as the knowledge professionals our task is to the enquirer. We have to stay connected to the client and consultant. Also in [Name of Company] there is one clear item/ vision that is knowledge leadership. So the person needs to disseminate his knowledge to others if it is not done well one cannot be promoted. The more you know the more you need to give or share that knowledge with others to show your knowledge leadership. You are rewarded, promoted for showing leadership in knowledge. That is what we call knowledge leadership (P5).

As a general finding, therefore, it was revealed that most participants' individual perceptions of the effective features of a KMS were closely associated with its capabilities in successfully supporting conversation and social interactions in organizational communities, i.e., teams, groups or CoPs. Also the data revealed that face-to-face conversations were more favourable in KIOs since they encouraged team working, openness, and rich inter-personal working relations required for the success of KM initiatives in these organizations.

6.2.5 Organizational Structure Theme

Another theme that emerged from the data is that of *organizational structure*, which refers to the size of the organization in terms of number of employees and managers, and also extends to the outside community which includes customers, clients, suppliers and partners. Most participants mentioned size as one of the key factors informing their final decision on which KMS to deploy in the organization. Participant 7's comment below, for example, revealed how size is important in deciding which tools to use to enable knowledge transfer.

Because there is such small number of us we are in lucky situation which is going to change very quickly that we have it in our heads, we have it in our computers and we are talking about what's the next sprint, the delivery cycle, we know what the client needs because we kind of collectively talk about and we know what the key deliverable need to be and what is wrong. You know, right now we don't need to get into some major documentation process because there are such a small number of people. It's just efficient for us to just talk among ourselves and say yeah we need to do this but as we grow we have to get better at collecting what's relevant and important to what my clients want, what my partners want, what my vendors need, what my employer needs. But right now because we are such a small company it's all in our heads (P7).

Furthermore organizational structure is also presented as a way of explaining the complexity of relationships within KIOs. The relationships within a KIO can be described as “short-lived, loose, labile, virtual, ad hoc, even disposable force field of interactions and ever-changing networks of relationships” (Nurmi, 1999, p. 173). In this regard a KIO is compared to a marketplace of knowledge and learning, where individuals gather to exchange their expertise. This denotes a kind of network organization that is composed of a community of people, including customers, partners, subcontractors, and even competitors. This network is said to be in a continuous state of change. This therefore makes formal coordination or directives from management in KIOs of little avail. As Nurmi concluded instead of concentrating on complicated structural designs, most KIOs strategic efforts are directed at motivating the individual knowledge workers, e.g. by making their compensation packages more directly linked to their billing. From the perspective of choosing a KMS this therefore helps explain the focus on conversation or knowledge sharing explained above, in particular the linking of knowledge leadership and promotion to knowledge sharing.

The choice of systems that enable the building of knowledge workers networks in knowledge-intensive organizations was underscored in the participants' responses. As discussed above knowledge among knowledge workers is shared not only face-to-face, but also by email, over the phone and via video-conferencing. It was also evident from the participants that in KIOs, "knowing who knows what is a powerful way to keep ideas alive" (Hargadon & Sutton, 2000, p. 162). The data also confirms Szulanski's, as cited by O'Dell and Grayson (1998), identification of ignorance as the primary barrier impeding the sharing or transfer of knowledge within the firm studied. Szulanski observed ignorance on both ends of the transfer, i.e., neither the "source" nor the "recipient" knew someone else had knowledge they required or would be interested in knowledge they had. The challenge for KM in organizations like the one Szulanski observed is to find ways to automatically identify and harvest information on the experts, i.e., experts residing both inside and outside the organization. This challenge is echoed frequently in the comments of the participants:

You need to understand knowledge in KIOs resides in the heads of individuals, it resides within the corporate memory of the organization, it resides with the customer, and it resides within the industry, so effective KMS must be able to leverage knowledge from all those areas. I haven't come across a single commercial off the shelf KMS that does that. So need to be able to integrate systems. Technology integration, as you realize, is very complicated especially with the off-the-shelf products. So I use open source technologies which are more easily integrated. In fact I think the most effective KMS are the ones that are designed by the organization (P10).

For non-technology related goals I would say formalizing networked connections is core to KMS achieving success, enabling knowledge and information transfer inside and outside the organization, e.g. providing conferences, collaborative workshops by traditional methods rather than technological means (P11).

Actually we spent so much money on our CoPs. We have more than 40 or so. Quite a big budget goes to the development of people and expert system, Running systems, for example we have on demand lecture systems and learning modules (P5).

The above statements point to the fact that choosing KMS that identify and capture, together with the organizational 'know-how' and 'know-what' knowledge, the 'know-

who' knowledge needed to link experts at the time of need is a core systems consideration in KIOs. This links well to the socio-technical focus theme discussed above.

6.3 DISCUSSION: KMS IN KIOS FRAMEWORK

According to the qualitative and quantitative findings, four themes emerge that relate knowledge-intensity to the choices of KMS in KIOs. From a KMS in KIOs perspective the emergence of these four core themes gave me a very useful lens to critically analyse and understand how the knowledge-intense related factors in KIOs identified in Phase 1 of the study relate to the choice of KMS. First I explored the emerging themes in the light of the activity systems theoretical lens expounded by Blackler (1993).

Examined through the lens of activity systems theory (Blackler, 1993), the emerging themes confirm the core systems aspects fundamental to our understanding of KMS in KIOs. These aspects include: (i) People do not just think, they act on the world and they do this collectively, which is a highly appropriate observation which helps to further explain the collective development theme prevalent in the participants' responses, and the overall coherence of the different actions of the knowledge workers as they perform their tasks; (ii) Mediating mechanisms, such as tools, language, social rules and the division of labour, transform the relationships between individuals, communities and shared endeavours. This aspect highlights the socio-technical theme and the need for appropriate embedded tools or mechanisms that facilitate workers' thinking and acting on the world, individually or collectively; (iii) Novices learn by participating in activities and activity systems. This aspect underscores the conversation theme and the need for KMS to support creative, interpretative and process oriented aspects of learning which is most likely to be tacit than explicit; and (iv) Activities are socially and historically located. This suggests the influence of the organizational structure and extended networks on the choice of KMS, focusing on the need for KMS to be equipped with the capabilities to evolve over time in line with the evolution of the KIO's activities.

Furthermore an analysis of the emerging themes, i.e., collective development, socio-technical focus, conversation, and organizational structure, reveal that both worker-

related and organizationally-related knowledge-intense factors inform the KMS choices in KIOs. Specifically, the effect of distinct knowledge-intense factors can be explained by exploring the nature and complexity of knowledge use and production in KIOs. As one participant stated,

I would say relative to the vast majority of industries our workers use novel knowledge but let's face it technology is open we use other people's knowledge but we innovate more (P7).

Not unexpectedly, related to the worker-related defining factor, 'workers have high cognitive skills' most participants highlighted the importance of handling complex tasks and cognitive thinking processes in their considerations of effective KMS. The comments from participants given below sum up the importance of cognitive skills in KIOs:

Workers have high cognitive skills - strongly agree - yes definitely – we are trained to do that – if we do not have such characteristics we are asked to go – we couldn't work in this organization (P5).

It's not the knowledge that allows them to solve complex problems – it is the critical thinking skills, the problem solving skills that allow them to solve complex problems (P1).

I predicted, when coupled with complex innovative tasks, cognitive thinking affords its own knowledge management systems. Thus further examination of the data suggested differences in choices of KMS among the participants from Worker-driven KIOs, Organizationally-driven KIOs, and knowledge-rich organizations (KROs) (see Table 15) revealing a relatively strong association between the knowledge-intense factors defining these organizations and their ultimate choices of KMS. In other words the results of the grounded theory research, supported by the survey results, show that the differences in choices of KMS in KIOs and KROs could be relatively explained by the inherent knowledge-intense related factors that differentiate these organizations.

The qualitative and quantitative findings create an interesting picture pointing to knowledge task complexity and its association with managers' deliberations when choosing KMS in their organizations. In other words one variable identified as important to the choice of KMS in KIOs is task complexity. Recent studies have demonstrated that

task complexity is a critical component in organizational behaviour and decision-making research (Wood, 1986; Wood, Mento, & Locke, 1987; Campbell, 1988; Ditillo, 2004; Harrison & Humphrey, 2010). Thus to aid in the interpretation of Phase 2 study results and the building of a KMS in KIOs framework, I adapted the core analytical dimensions of task complexity derived from Wood (1986)'s theoretical model of tasks. Wood (1986) presented a model outlining products, acts, and information cues, as the three essential components of all tasks from which the analytical dimensions of task complexity, “component complexity, coordinative complexity, and dynamic complexity” are derived. In this study I present these dimensions as closely linked to knowledge complexity in KIOs and suggest that when these dimensions are explored in association with the knowledge-intensive defining factors they can help explain the different choices of KMS deployed in KIOs and KROs. Consequently, component complexity, coordinative complexity, and dynamic complexity were adapted as the core analytical dimensions of task complexity in KIOs and formed the basis for the development of a framework for KMS in KIOs presented in Table 16.

Table 16 KMS in KIOs Framework

Organization Type	Knowledge-Intense Defining Factors	Knowledge task complexity dimension	Description of KMS task features	Choice of KMS examples
Worker-driven KIOs e.g. medical practices	Mixed highly complex and simple cognitive skills; knowledge is both an input & output product i.e., mixture of esoteric and common knowledge; medium to high volume, complexity, and rate of change of the knowledge that the organization uses and produces.	Coordinatively complexity	Enabling primarily collective development of knowledge. Integrating contextual knowledge that accommodates the different perspectives of different roles into the workflow of organizational processes so that the knowledge is automatically captured when it is created and presented when it is needed.	Business Process modeling (BPEL) Decision Support Systems Recommender Systems Differential Diagnostic system e.g. Spotlight

Organization Type	Knowledge-Intense Defining Factors	Knowledge task complexity dimension	Description of KMS task features	Choice of KMS examples
Organizationally-driven KIOs e.g. management consulting firms	Highly complex cognitive skills; knowledge is both an input & output product i.e., esoteric, innovative knowledge; high volume, complexity, and rate of change of knowledge the organization uses and produces	Dynamic complexity	Enabling conversation within the KIO extended community network and continuous learning in the organization	Conferences Knowledge cafes On demand lecture systems & learning modules Blogs/ Microblogging Wikis
KROs e.g. accounting firms	Mixed complex and simple cognitive skills; knowledge is an input i.e., familiar, experience & professional knowledge; low to medium volume, complexity, and rate of change of knowledge the organization uses.	Component complexity	Facilitating the location of desired knowledge. Knowledge workers have the ability to search for, locate, and extract meaning from the desired knowledge.	Document management systems e.g., Google Docs Knowledge Repositories

The framework is composed of three parts: *A KMS for worker-driven KIOs*, *A KMS for organizationally-driven KIOs*, and *A KMS for KROs*. Although KROs are identified as non-KIOs in Chapter 5, I included them in the framework discussed below because Phase 2 research data revealed some interesting findings regarding these organizations. The framework, as discussed below, focuses on the association of knowledge-intensive related factors and the choice of KMS. In other words this framework specifically targets the knowledge-intensive related factors that define these organizations.

6.3.1 A KMS for Worker-driven KIOs

In worker-driven KIOs, e.g., drug discovery firms and medical practices (see Tables 15 & 17), knowledge use and production is prevalent in particular units which are defined by relatively high levels of cognitive skills, high expertise, and the use of a mixture of esoteric content, and common knowledge. The need for cognitive and innovative skills is dependent on the particular unit within the organization. More importantly the complexity of the tasks which the knowledge workers perform in these units is a

culmination of the use of experiential knowledge at an individual level as well as coordinated knowledge achieved through “joint problem solving, differentiation of decoupled specialized sub-systems and output exchange” (Ditillo, 2004, p. 410). In worker-driven KIOs inputs are brought together to create a team output and the knowledge worker tasks can be described as “coordinatively complex”, with precise contingencies of who, when, and where inputs (e.g., doctors performing surgery).

Worker-driven KIOs tasks can be grouped under the “coordinative complexity” dimension of knowledge complexity. Thus when choosing KMS in these organizations it should be reckoned that knowledge integration in these organizations “is not achieved by the transmission of tacit knowledge (and by its formalization) but through its coordination aimed at pursuing a common objective” (Ditillo, 2004, p. 409). This suggests the need for systems with more coordination mechanisms than codification processes (Grant, 1996; Ditillo, 2004). The research data therefore reveals that KMS deployed in worker-driven KIOs are results oriented with control mechanisms to allow the coordination and integration of knowledge. This is reflected in one participant’s comment:

I would define KMS as in terms of pragmatics it is a system that is capable of supporting decisions. I know decision support systems are the heart of KM – evidence based decision organized in a way that is they are accessible (P11).

In worker-driven KIOs, just as Firestone and McElroy (2003) observed, knowledge use occurs whenever a knowledge worker is required to make a decision as part of a business process. A worker-driven KIO choice of KMS stems from the need for the integration of knowledge tasks into business processes. Since knowledge is created during the execution of business processes, in order for a knowledge worker to find value in the knowledge, and use it to achieve a higher performance, knowledge must be embedded in the business processes (Han & Park, 2009; Nissen et al., 2000). As Han and Park (2009) observed, if knowledge is separated from the business process context, it does not result in the right action being taken for the targeted performance. Consequently, KMS deployed in worker-driven KIOs could be viewed as strategic enablers of efficient business processes. The primary focus of the KMS should be on supporting worker

processes with the knowledge needed to successfully perform their work activities as defined in workflow/process models. In general the tools or systems underlying the business process-oriented KM approaches rely on the existence of generic process models or workflow specifications, around which the knowledge capture and provision strategies are organized (Holz et al., 2005).

Nevertheless, it is also important to note that worker-driven KIOs provide a socially constructed context for worker actions and therefore, cannot sensibly be divorced from their contexts. And as workers perform their tasks they interpret and negotiate such contexts (Blackler, 1993). It can therefore be argued that in worker-driven KIOs routines or repetitive patterns of behaviour, enable coordination or co-operation, rather than conflict (Blackler, 1993). The data therefore revealed that KMS choices in worker-driven KIOs are influenced by the need to support knowledge worker complex task at an individual level as well as coordinated knowledge achieved through “joint problem solving. The features that are to the choice of the KMS are those that enable primarily the collective development of knowledge and the integration of contextual knowledge that accommodates the different perspectives of different roles into the workflow of organizational processes so that the knowledge is automatically captured when it is created and presented when it is needed.

6.3.2 A KMS for Organizationally-driven KIOs

Organizationally-driven firms, (see Tables 15 & 17) are exemplified by organizations such as management consulting, law, software development firms, computer consulting, and architecture firms. In these organizations the dominant workers exhibit high levels of innovative skills and complex cognitive skills. Most of the workers in these organizations “think for a living” to produce and sell knowledge. They are continually learning to upgrade their skills. They perform complex, unique, and dynamic tasks, and are highly accountable for their decisions. In other words their decisions have a strong impact on the success of the organization as a whole. As a result, the organizational form is less formal or controlling, with management ceding a high degree of autonomy to the individual workers in their work processes. In addition, these organizations are characterized by a

high degree of worker interdependence, arising from the experts' need to supplement each other's expertise in order to effectively analyze complex work problems. As Blackler (1995) concluded knowledge work in these organizations defies routinization and requires the use of creativity to produce idiosyncratic and esoteric knowledge.

The data reveal knowledge worker tasks in organizationally-driven KIOs as dynamic and complex and the production and use of knowledge as characterized by cognitional complexity. In some cases the processes involved are unique and new for the knowledge workers involved and in other cases they “entail innovative problem solving and are subject to many possible serendipities and unexpected outcomes” (Ditillo, 2004, p. 410). As Stenmark and Lindgren (2004) observed knowledge work in organizationally-driven KIOs can be described as “untidy in comparison with operational and administrative business processes, in which tangible inputs are acted on in some predictable, structured way and converted into outputs” (p. 2). In this regard systems such as process oriented systems, e.g., decision support systems and knowledge repositories, are found not to provide sufficient support for emergent knowledge work processes in these organizations (Stenmark & Lindgren, 2004). Moreover, for organizationally-driven KIOs change is dynamic and continuous and thus, the use of systems that rely, for instance, on codification, can be considered unwise since knowledge captured through codification is quickly going to be outdated; by the time knowledge gets codified it may be outdated. This is supported by one survey participant's remark on the use of KMS in their organization that:

Use currently is very sporadic and when used, the information is stored in locations that are difficult for the average user to find. However, data is often outdated!

Thus as Desouza & Awazu (2005) pointed out “in complex and dynamic environments, the KMS should ideally focus on creating an environment that fosters creative work, by facilitating the sharing of ideas and the combination of these ideas into possible innovations” (p. 188). Moreover for these organization it is wise not to codify because as Lee & Van den Steen (2010) argued “once a practice is codified, employees have less

incentives to experiment further with actions that could lead to even higher performance than the current best practice” (p. 271).

The sharing of knowledge in organizationally-driven KIOs is not viewed as involving the simple transfer of a fixed entity (explicit knowledge) but as involving knowledge workers actively inferring and constructing meaning from a process of interaction (Hislop, 2009). This involves an understanding of perspectives including a common understanding of values, assumptions, and tacit knowledge underpinning the organization’s knowledge base. As a result knowledge in these organizations is seen to be shared or transferred among workers “by means of common history, shared experiences and collective social and organizational frames” (Ditillo, 2004, p. 410). The following comment from one survey participant sums up this viewpoint:

Capturing an expert's knowledge of a complex body of knowledge is an exercise in futility. It is more important to make that expert's subject matter known, have them communicating about related subjects in an accessible way, and to have them be available and willing at the time when they can add the most value.

The data, therefore, suggested that organizational-oriented KIOs require KMS that enable the flourishing of rich conversations among team or CoPs members and also support knowledge workers’ continuous learning and growth. The enabling of conversation within the KIO’s extended community and the support of continuous learning in the organization should be achieved through self and group controlled regulated mechanisms such as participation in professional and academic conferences, workshops, discussion forums, and knowledge cafés. In other words, a KMS in organizationally-driven KIOs should enable the fostering of a sense of community in which both regulated self-control and knowledge integration are in place. The focus is on building social relationships and communication processes which underpin knowledge processes in these organizations.

6.3.3 A KMS for KROs

Knowledge-rich organizations e.g., accounting firms (see Tables 15 & 17) are defined as firms that rely on experts’ use of high degrees of specialized, professional and experiential knowledge. The experts in these organizations work in structural units or expert groups which accumulate, organize, and preserve deep professional knowledge in

their specific field. Knowledge tasks in these organizations are therefore characterized by the frequent consultation of codified specialized and professional knowledge e.g., blueprints, or accounting procedures. KRO knowledge task can therefore be linked to the component complexity dimension of knowledge complexity. As Ditillo (2004) noted “the component complexity of a task is determined by the number of distinct information cues that must be processed and the number of distinct acts that must be executed in performing the task” (p. 409). In other words knowledge in KROs is characterized by computational complexity, arising from the high number of distinct acts of searching for and retrieving codified professional and common knowledge.

For these organizations, therefore, how individuals store knowledge and how they retrieve this knowledge to make decisions is crucial. What is important is storage and retrieval of shared organizational memory, i.e., stored knowledge from the organization’s “history that can be brought to bear on present decisions” (Franco & Mariano, 2010). From a KMS perspective therefore, this suggests the need in these organizations for systems that provide searchable repositories or libraries of knowledge. This is confirmed by the data. The data from the study showed that in KROs the choice of KMS is predicated towards codified information technology repositories. To illustrate this idea consider the following comment from participant14 who works in a KRO.

Valuable knowledge storing is significant. We always try to have all our proprietary knowledge in our database. We created this in-house, the key problem is not capturing, it’s cataloguing, building taxonomy and retrieval with high precision (P14).

The codification and diffusion of knowledge as a mechanism for the integration of collective knowledge is the KMS focus in KROs. The rationale of such KMS is that if knowledge workers are looking for knowledge on a particular topic they can search the repository for it rather than develop their own solution (Hislop, 2009). On this basis the choice of KMS in KROs can be viewed as a fundamentally technology driven choice which is aligned mostly to the information systems approach of codification.

In brief the three KMS frameworks discussed above point to the fact that knowledge-intensive factors analysed together with knowledge task complexity dimensions should help inform choices of KMS deployed in KIOs and KROs.

6.4 SUMMARY TO CHAPTER 6

This Chapter presented Phase 2 study results. Also included is an interpretation and discussion of the results. A framework for KMS in KIOs is presented. Chapter 7 presents conclusions, study limitations, recommendations and reflections.

CHAPTER 7 CONCLUSION

7.1 DISCUSSION

What factors distinguish KIOs from non-KIOs? How do these defining factors relate to each other and contribute to knowledge intensity in KIOs? How do KIOs' defining factors relate to the choice of KMS? In what way do the KIO organizational knowledge attributes and knowledge worker activities inform the choice and application of KMS? A review of the current KM literature invites many questions that must be answered before we can make progress in determining best practices for KIOs. To explore these questions my study was conducted in two phases.

In KIOs knowledge is fundamental to the organization's distinct activities and attributes and the literature asserts it the key to success and the differentiating factor. The literature claims that the choice of tools or systems employed to manage knowledge in these organizations is fundamental to their success. It is also evident that making choices and investments in KMS cannot be fully understood in isolation from the organizational context of managerial decision. One would expect therefore to find ample research exploring KM and KMS in KIOs. However, little research and insight exist to guide the successful development, choices and implementation of KMS, or to frame expectations of the costs and benefits of such systems in KIOs. Further, the literature on KM practices in KIOs reveals diverse views on successful KM approaches in KIOs thus underscoring the need for an in-depth understanding of the knowledge elements unique to KIOs and how these elements relate to the KM initiatives that are possible and make sense in their organizational context. This dearth of literature on KMS in KIOs might be attributed to the lack of agreement among scholars and practitioners on what KIOs are or the factors distinguishing these organizations from other traditional organizations. In other words, to date there has been no unified framework for coming to terms with KIOs. Therefore without a unified framework it would be difficult to conduct research on these organizations. Hence, the main purpose for Phase 1 of the study was to empirically

explore KIOs as organizations and advance a unified framework of these organizations. Since the literature reveals confusion and inconclusiveness on the issue of KIOs, to identify a collective definition and conclusive factors, I surveyed a purposely-selected community of knowledge management professionals. For answers to my questions I turned to the KM professionals “who engage in a collective process of learning” (Wenger, 2000) by participating in KM COPs and thus are considered to have developed a communal understanding of what KIOs are. If one’s objective is to develop an understanding of what KIOs are one might expect KM COPs to be able to contribute insights. I considered KM COPs to be a reasonable place to start asking the questions for this study, recognizing that it is entirely possible that they might be wrong.

The focus for the second phase of my study was to assess the relationship between KIOs’ most salient defining factors as revealed in Phase 1 and the choice of KMS. To date, there have been no comprehensive studies to gain insight into the factors that drive the choices of KMS in KIOs. For this thesis the aim was to develop rather than to test a theory. As a result grounded theory, a research approach that allows themes and theories to emerge from the data, rather than from hypotheses or other research, was considered an appropriate choice. In other words I chose grounded theory, as the primary method, because it allowed for the conceptualization of the interlacing patterns of the KIO factors and choice of KMS with the use of multiple data sources in order to provide a more comprehensive perspective. Most importantly, for this phase of the study my interest was not to describe the environments in which participants make KMS choices through participant observation; rather, my interest was to analyze patterns and connections of core or central processes and factors transcending time and place (Corbin & Strauss, 2008). Hence in Phase 2 using primarily an open-ended approach of grounded theory (Glaser & Strauss, 1967; Corbin & Strauss, 2008) I examined how KIO defining factors, KIO organizational knowledge-intensity attributes and knowledge worker activities relate to the choice of KMS deployed in these organizations.

In Phase 1, the insights from a survey of knowledge management professionals support the assertion that organizations can generally be divided into two groups - KIOs and non-

KIOs. The knowledge management community of practice report that KIOs exist as a distinct organizational type and there are clear and outright factors that differentiate these organizations from non-KIOs. The study informants confirmed the view that KIOs are distinct organizations that are mostly exemplified by organizations such as management consulting firms, law firms, medical practices, drug discovery firms, software development firms, computer consulting firms, and architecture firms. This study provides evidence that some organizations such as accounting firms are not regarded as knowledge-intensive by the KM CoPs, thereby supporting the theoretical viewpoint that KIOs are a “product of structures, relationships, and dynamics in the organizations, not of the quanta of knowledge they contain” (Greenwood, 2009, p. 35). Furthermore the study results affirmed Robertson & Swan’s (1998) speculation that not all consulting firms can be identified as KIOs. Consultancies such as accounting firms that deal mainly with the diffusion of widely applicable, standardized and generic solutions cannot be characterised as knowledge-intensive. In other words the study findings provided evidence of the existence of knowledge-rich organizations, firms that rely on experts’ use of high degrees of specialized, professional and experiential knowledge.

The findings of this study also underscored the existence of distinct factors that aid in defining KIOs as an organization type. According to the community of practice, KIOs are positively associated with the factors: (i) *workers have high cognitive skills*, (ii) *workers use novel knowledge to solve complex problems*, (iii) *worker is held highly accountable for decisions*, (iv) *organization produces & sells knowledge*, and (v) *organization is accredited by a self-regulated body*. Interestingly, a number of factors highly cited in the literature as defining KIOs did not exhibit statistically significant relationships with KIO: (i) *a KIO is highly dependent on individual expertise*, (ii) *a KIO's organizational network can be defined as large & complex (extends both inside and outside the organization)*, and (iii) *in a KIO top and middle managers have fewer opportunities to exercise direct supervision and control*. Thus this study did not support the assertion that these factors are more likely to define (or not define) KIOs or to contribute (or not contribute) to knowledge-intensity in KIOs.

More importantly, with regard to the question of what factors contribute to knowledge intensity in an organization, the results pointed to two critical dimensions of knowledge intensity defining KIOs, i.e., the worker dimension and organizational dimension. As is presented in the conceptual model in Chapter 3 (see Figure 4) knowledge-intensity in organization can best be defined by the worker-related factors as well as organizational related factors. The results from the CCA Function 1 analysis, for instance, showed there are KIOs that are best defined by a somewhat 50-50 balance between organization and worker related factors as exemplified by law firms, management consulting firms, software development firms and medical practices which are depicted as the most relevant dependent variables. I therefore classified these organizations as the “organizationally-driven KIOs”. Function 2 of the canonical correlation analysis revealed a group of KIOs that can best be defined by mostly worker related factors, i.e., drug discovery firms and medical practices, organizations which I then classified under the group “worker-driven KIOs”. The study therefore empirically confirmed the theoretical view that knowledge-intensity in organizations can best be defined by two distinct groups of factors, namely, those related to knowledge workers’ activities and organizational needs. Thus drawing from the findings of this study I advanced a revised framework of KIOs that relates the various knowledge-intense elements to the organizations that fall within the two identified dimensions.

In Phase 2, using primarily grounded theory method, I discovered that both worker-related and organizationally-related knowledge-intense factors inform the choices of KMS in KIOs. The results revealed significant differences among participants in their choices of KMS, pointing to the fact that managers and practitioners in KIOs critically consider knowledge-intense factors defining their organizations in association with knowledge task complexity (i.e., component complexity, coordinative complexity, and dynamic complexity) when choosing and implementing KMS. Accordingly I found differences in choices of KMS among the participants from worker-driven KIOs, organizationally-driven KIOs, and knowledge-rich organizations (KROs), again qualifying the assertion that managers in these organizations when choosing KMS considered the knowledge-intense factors in conjunction with knowledge task complexity

dimensions defining the organization. In other words I was able to answer the question of whether knowledge attributes and knowledge worker activities inform the choice and application of KMS in KIOs and present a KMS in KIOs framework which focus on the association of knowledge-intensive related factors and the choice of KMS.

7.2 CONTRIBUTIONS

The findings of this study have both theoretical and practical implications. These implications are discussed below.

7.2.1 Implications for Theory

From a theoretical point of view my study has several implications. First, the study confirms that the community of KM professionals see KIOs as a distinct organizational type mostly exemplified by organizations such as management consulting firms, law firms, medical practices, drug discovery firms, software development firms, computer consulting firms, and architecture firms. The study findings reflect an important distinction that has not yet been addressed empirically in the literature: KIOs are distinct types of organizations.

Second, the study provides evidence that some organizations such as accounting firms cannot be regarded as knowledge-intensive, thereby confirming the viewpoint that KIOs are a “product of structures, relationships, and dynamics in the organizations, not of the quanta of knowledge they contain” (Greenwood, 2009, p. 35).

Third, this work suggests that not all organizations that use knowledge can be considered knowledge-intensive organizations. In sum, this research suggests that Abell and Oxbrow (2001), Brown and Duguid (1998), and others reached too far when they concluded that all firms are in essence knowledge-intensive organizations since they make use of knowledge to stay competitive. It revealed some firms as ‘knowledge rich’ but affirms that being knowledge rich does not necessarily mean that the organization can be regarded as knowledge-intensive. To my knowledge this is the first study that has empirically revealed the existence of knowledge-rich organizations.

Fourth, the study results affirm Robertson & Swan's (1998) speculation that not all consulting firms can be identified as KIOs. Consultancies such as accounting firms that deal mainly with the diffusion of widely applicable, standardized and generic solutions cannot be characterised as knowledge-intensive.

Fifth, the findings underscore the existence of distinct factors that aid in defining KIOs as an organization type. According to the community of study KIOs are positively associated with the defining factors: (i) *workers have high cognitive skills*, (ii) *workers use novel knowledge to solve complex problems*, (iii) *worker is held highly accountable for decisions*, (iv) *organization produces & sells knowledge*, and (v) *organization is accredited by a self-regulated body*. Interestingly, a number of factors highly cited in the literature as defining KIOs did not exhibit statistically significant relationships with KIO: (i) *a KIO is highly dependent on individual expertise*, (ii) *a KIO's organizational network can be defined as large & complex (extends both inside and outside the organization)*, and (iii) *in a KIO top and middle managers have fewer opportunities to exercise direct supervision and control*. Thus this study does not support the assertion that these factors are more likely to define (or not define) KIOs or to contribute (or not contribute) to knowledge-intensity in KIOs. Most important, to my knowledge this is the first study that has empirically aggregated the factors defining a KIO as assessed by the community of KM professionals.

Sixth, with regard to the question of what factors contribute to knowledge intensity in an organization, the results point to two critical dimensions of knowledge intensity defining KIOs, i.e., the worker dimension and organizational dimension. The study revealed that knowledge-intensity in organization can best be defined by separating these dimensions. As a result of this finding I was able to classify KIOs into 2 groups, namely, "organizationally-driven KIOs", denoting KIOs that are best defined by a somewhat 50-50 balance between organization and worker related factors as exemplified by law firms, management consulting firms, software development firms and medical practices, and "worker-driven KIOs" representing KIOs that can best be defined by mostly worker related factors as exemplified by drug discovery firms and medical practices. The results

therefore confirms the theoretical view that knowledge-intensity in organizations can best be defined by two distinct groups of factors, namely, those related to knowledge workers' activities and organizational needs.

Seventh, the four core themes that emerged from the data in Phase 2 of the study, i.e., *collective development theme, conversation theme, socio-technical focus theme, and organizational structure theme*, gave me a very useful lens to critically analyse and understand how the knowledge-intense related factors in KIOs relate to the choice of KMS. The data suggested differences in choices of KMS among the participants from worker-driven KIOs, organizationally-driven KIOs, and knowledge-rich organizations (KROs). An important distinction between this study and other investigations is the way it has gone beyond sheer associations to propose explanations for how and why certain choices for KMS are made, explanations that are grounded in the data rather than deduced from the literature. For instance the findings revealed KIO defining factors analysed in association with the knowledge task complexity dimensions provided insight into the managers' deliberations when choosing KMS in their organizations. Consequently, the core analytical dimensions of task complexity, component complexity, coordinative complexity, and dynamic complexity, were adapted as the core analytical dimensions of task complexity in KIOs and formed the basis for the development of a framework for KMS in KIOs presented in this study.

Furthermore, this research improves our understanding of knowledge management systems by extending the conceptualization of KMS from either a technological or non-technological unitary view to a wholistic conceptualization encompassing socio-technological considerations, knowledge-intense factors and knowledge task complexity dimensions. Such a rich conceptualization of KMS helps in the understanding of how different types of KMS affect knowledge worker activities and organizational capabilities to leverage the effective use and production of knowledge. I demonstrated empirically that choices of KMS deployed in KIOs should consider the related knowledge-intense factors and the dimension of knowledge task complexity defining these organizations. The KMS in KIOs framework advanced in this thesis can be used as the basis for future

research exploring KM in KIOs, particularly the design and choice of KMS in KIOs. This study is therefore a further step in developing useful models for KMS in KIOs. The findings will therefore aid in learning more about the importance of managing and using knowledge in KIOs and form the foundation for more empirical studies to validate and operationalize these concepts more deeply.

The findings of the study will therefore prove useful to advance knowledge within the field of knowledge management and use in organizations. This study makes a number of significant contributions to the body of literature on knowledge-intensive organizations, knowledge management systems, and knowledge management in general. With regard to future KM research, an important theoretical implication of my research is that knowledge management considerations in KIOs might be mediated by the knowledge-intensive factors, which are contingent on the fit between the organizational defining factors and worker elements. The identification of the two important dimensions defining knowledge-intensity supports the relevance of both worker and organizational related factors for advancing understanding regarding research on knowledge management in KIOs. Of critical importance to KM is the relationship between the knowledge-intensity defining factors and the systematic development and evaluation of KM tools in KIOs. Most importantly, from a knowledge management perspective, this underscores the importance of the relations between workers, the community (organization) in which they are members and the conceptions the workers have of their activities as presented in the theory of organizations as activity systems (Blackler, 1993). While the importance of knowledge has often been demonstrated within work groups or for particular organizational processes, here it is regarded as a basis for analyzing the organization as an organization.

7.2.2 Implications for Practice

There are a number of implications of this study for practicing KM professionals and managers in knowledge-intensive organizations looking into the implementation of KMS. This research would also have practical value for vendors and systems designers who are

looking at assessing user demand for new KMS design ideas and for managers within KMS who would like to evaluate the vendor offering.

The literature reveals that for KIOs, the benefits of knowledge management are well pronounced and knowledge management strategies that work best in KIOs are different from those in traditional organizations (Amar, 2002). Despite this awareness our understanding has lagged on which KM approaches or practices can best spell KM success in KIOs. For practice therefore, this study informs understanding of how knowledge-intense organizational factors relate to choice of KMS, a process necessary for infusing systems into business functions and processes. In other words knowledge-intense factor exploration as part of the process for choosing KMS is important because knowledge driving factors are a widely acknowledged source of competitive advantage, i.e., business production, innovation, diffusion, and differentiation in KIOs. Thus, understanding the knowledge-intense factors underlying the choice decisions for KMS may be an important concept for those designing and selling KMS related technology products and for those managing KMS adoption and diffusion efforts in organizations.

To design KMS for the effective management of knowledge processes and activities in KIOs, researchers and system designers require sound theoretical models that adequately capture the determinants of a manager's or knowledge worker's motivation to choose and use such systems. The development of a framework of KMS in KIOs comprising of three parts: *A KMS for worker-driven KIOs*, *A KMS for organizationally-driven KIOs*, and *A KMS for knowledge rich organizations (KROs)*, provide application to practice and research. Future research should apply this framework to a variety of KIO and KMS choice scenarios to assess its ability to detect potential KMS improvement areas and to guide the development of recommendations for improvement in those areas. Moreover, the study provides a validated framework to assess the influence of individual, technological, organizational, and community network characteristics on potential KIOs likelihood to use a KMS, even before the KMS is fully developed and implemented.

Furthermore, research reveals that the management strategies for knowledge should be informed by the nature of the business (Hansen, et al., 1999). In other words a “company's choice of knowledge management strategy is not arbitrary - it must be driven by the company's competitive strategy how it creates value for customers, how that value supports an economic model and how the company's people deliver on the value and the economics” (Hansen, et al., 1999, p. 107). This recognition translates well to the choice and implementation of KMS. For instance another implication of this research for managers and KM professionals is the identification of the two dimensions defining knowledge-intensity. This paper reiterates the importance of considering the strategic fit between the knowledge-intense factors defining these organizations and KM practices. This discussion comes at a time when extant literature does not concur on the different types of KM approaches that best suit KIOs.

Executives in KIOs will therefore find the identification of the two dimensions defining knowledge-intensity very useful. By distinguishing these two dimensions in the analysis and evaluation of KM effectiveness for a given KIO it is possible to quickly diagnose and adjust strategies and policies in a much more effective way. Further the results of this study have shown that KIOs are differentiated by unique knowledge-intense attributes. For example the results underscore the key characteristics of KIOs as worker-directed innovations, which suggest effective KM in KIOs should take into account the differences in unit needs and knowledge-intensive processes and practices. The appropriate focus in these organizations is therefore not knowledge in general or knowledge workers but the management of expertise. Expertise, as presented by Blackler (1993) is “effective activity”. Accordingly, the management of effective activity in the KIO units and the organization as a whole is crucial to KM success. Nevertheless to be successful in their KM initiatives managers in KIOs should be cognizant of both the worker related and organizational related factors driving knowledge-intensity in their organizations. Of critical importance to successful KM in KIOs, is the relationship between the knowledge-intensity defining attributes and the systematic development and evaluation of KM strategies in KIOs? However from the results of this study it is

impossible to reason out the way in which these factors interlace with managerial KM strategy decisions. This is the subject of further research.

7.3 LIMITATIONS AND FUTURE RESEARCH

It should be noted that this research has some limitations. The study focused on a few of the types of organizations drawn from the literature which may limit the generalizability of the results. However, restricting the study to the core organizations identified in the literature provided me with leverage for an in-depth empirical exploration of these organizations' characteristics. Future research might extend this research to other types of organizations, and perhaps focus on representative samples of both service organizations and manufacturing organizations. Future research will also determine the extent to which the KMS in KIOs framework advanced in this study aid in bringing together the diverse viewpoints and ideas pertaining to KIOs and their choices of KMS. For instance each of the two identified dimensions can be analysed in greater detail. I therefore, consider the framework as a starting point for gaining a deeper understanding of KMS in KIOs. Moreover, worker related as well as organizational related knowledge-intensive activity issues have been identified that deserve consideration by KM researchers and practitioners.

Furthermore, although respondents to this research were drawn from a global population, analysis by geographic region was considered beyond the scope of this research. Future research might explore data by geographic region and maybe compare and contrast data from specific countries, e.g. USA and Japan. I also acknowledge the limitations of my study in that my review of the literature only covered the academic English language publications. Future studies might critically explore literature emanating from non-English speaking countries which are based on a different understanding of knowledge and skilled work. Considering its limitations, a major strength of this study is that I was able to collect data from professionals from all over the world provided the respondent was able to communicate in English, thus reducing the threat of single-country bias. I also note that the use of a single group of key informants, i.e., people who consider

themselves to be knowledge management professionals and are familiar with the concept KIO, provides an important advantage to the study, a “high probability that the most knowledgeable informant is providing data” (Doty et al., 1993, p 1210).

This study focused only on knowledge-intensive related factors and did not consider other variables, such as organizational culture, organizational history, and systems cost that might inform the choices of KMS. As Pan and Scarbrough (1998) noted knowledge management systems do not develop spontaneously or in a vacuum. They emerge out of the context and history of the organization and their impact is conditioned by the subjective perceptions of employees whose experience is governed by that history. Further research can therefore explore a larger set of variables that affect KMS choices in KIOs. Also, future research will investigate the extent to which the size of the organization e.g., small to medium sized businesses, might influence the organization’s preference to seek out certain KMS and not others.

7.4 CONCLUSION

This dissertation serves to broaden the scope of knowledge-intensive organizations to examine factors differentiating these organizations and how these factors relate to the choices of systems employed to manage knowledge processes and activities in KIOs. The research expands the discussion on the efficacy of knowledge management systems to a holistic level of analysis which encompasses both organizational-related and worker-related knowledge-intensive elements. Both quantitative and qualitative results indicate the key characteristics of KIOs as innovation and knowledge workers’ creativity, suggesting that there are systems, norms and expectations specific to worker knowledge, skills and actions guiding effective activity and innovation. In particular, the appropriate focus in these organizations is therefore, not knowledge in general or knowledge workers but the management of expertise. Accordingly, the management of effective activity in the KIO units and the organization as a whole is crucial to KM success. More important, this research has highlighted the importance of exploring knowledge not just within the context of work groups or organizational processes but also through the wide lens of the organization as a whole.

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APPENDIX A Phase 1 Survey Recruitment Letter & Consent Form

Knowledge Management in Knowledge-Intensive Organizations: An investigation of factors influencing choices of knowledge management systems

Dear Knowledge Management Professional:

You are invited to complete a survey of the factors that differentiate Knowledge-intensive Organizations (KIOs) from traditional organizations. As an Interdisciplinary PhD student in the Faculty of Graduate Studies at Dalhousie University, I am currently conducting research on knowledge-intensive organizations (KIOs). This voluntary survey is the first phase in a research study to explore and relate KIOs as an organization type to the choice of knowledge management systems (KMS) employed in these organizations. The purpose of this phase of the research is to understand what a KIO is, and extend a typology of “knowledge-intensive organizations” as a preliminary step to conducting research on these types of organizations. The contribution of this study is to provide a basis of distinguishing KIOs from other organizations, and also to allow researchers to perform comparative organizational analysis. The study will also help researchers and practitioners identify which of the organizations are knowledge-intense, and the nature of their knowledge-intensity, thereby helping researchers and practitioners in designing appropriate knowledge management tools for organizations.

The survey will take about 20 minutes of your time. This survey will be active until November 30, 2009.

Your participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time. Additionally, if you begin entering responses to the survey and then choose not to complete, the information that you have already entered will not be transmitted to me. It is important for you to know that any information that you provide will be confidential. All of the data will be summarized and no individual could be identified from these summarized results.

If you have any questions regarding the study and/or your involvement in it, please feel free to contact Joyline Makani at 902.494.2726.

This research is supervised by Dr. Sunny Marche, Associate Dean, Faculty of Graduate Studies and Professor of Management Information System in the School of Business Administration at Dalhousie University.

This study has been reviewed by the Dalhousie Social Sciences and Humanities Research Ethics Board. However, in the event that you have any difficulties with, or you wish to voice concern about any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration, at (902) 494-1462 patricia.lindley@dal.ca.

Please click on the following link if you wish to participate:
file:///C:/Documents%20and%20Settings/jmakani/ Consent%20Form.htm

The link above will take you to the consent form and by clicking on the “I consent” button at the bottom of the consent form you acknowledge that you voluntarily agree to be a respondent and you will be automatically taken to the survey available at <https://surveys.dal.ca/opinio/s?s=6108>

Thank you for your participation!

Investigator: Joyline Makani,
Doctoral candidate in Knowledge Management
Dalhousie University
(902).494.2726 makani@dal.ca

Consent Form

Knowledge Management in Knowledge-Intensive Organizations: An investigation of factors influencing choices of knowledge management systems

Principal Investigator: **Joyline Makani**
Interdisciplinary Ph. D. student, Dalhousie University
(902) 494-2726 makani@dal.ca

Supervisor: **Dr. Sunny Marche**
Associate Dean, Faculty of Graduate Studies
Professor, Management Information System, School of Business
Administration, Dalhousie University

Dear Knowledge Management Professional:

We invite you to take part in a research study being conducted by Joyline Makani who is a graduate student at Dalhousie University, as part of her Interdisciplinary PhD studies. Your participation in this study is voluntary and you may withdraw from the study at any time. Your employment performance evaluation will not be affected by whether or not you participate. The study is described below. This description tells you about the risks, inconvenience, or discomfort which you might experience. Participating in the study might not benefit you, but we might learn things that will benefit others. You should discuss any questions you have about this study with Joyline Makani.

The purpose of this research is to understand what a KIO is, and extend a typology of “knowledge-intensive organizations” as a preliminary step to conducting research on these types of organizations. The contribution of this study is to provide a basis of distinguishing KIOs from other organizations, and also to allow researchers to perform comparative organizational analysis. The study will also help researchers identify which of the organizations are knowledge-intense,

and the nature of their knowledge-intensity, so that they help these organizations in designing appropriate knowledge management tools.

This survey asks for your opinion about beliefs, expectations, and practices about knowledge-intensive organizations. Because it asks for your judgment, there are no right or wrong answers. Please respond to the questionnaire based on your own judgment, regardless of what you think others expect or what is socially acceptable. The survey does not ask for any identifying information about you unless you specifically choose to enter such information. Your responses will be held in strict confidence.

All information you provide will be considered completely confidential; indeed, your name will not be included or in any other way associated with the data collected in the study. All of the data will be summarized and no individual could be identified from these summarized results. Furthermore, you will not be identified individually in any way in any written reports of this research. **Data collected during this study will be electronically archived after the completion of the study, on a password-protected computer database, for five years after the research study has been completed.** Only the student and her supervisor will have access to this data.

You may participate in this study if you consider yourself a knowledge management professional and are familiar with the concept knowledge-intensive organization or knowledge-intensive firm. The survey will take about 20 minutes of your time. Your participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time. Additionally, if you begin entering responses to the questionnaire on the Web and then choose not to complete the questionnaire, the information that you have already entered will not be transmitted to us. It is important for you to know that any information that you provide will be confidential. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding the study and/or your involvement in it, please feel free to contact Joyline Makani at 902.494.2726.

This research is supervised by Dr. Sunny Marche, Associate Dean, Faculty of Graduate Studies and Professor of Management Information System in the School of Business Administration at Dalhousie University.

If you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration, for assistance at (902) 494-1462, patricia.lindley@dal.ca

To participate please read the statement below and by clicking on the "I consent" button you acknowledge that you voluntarily agree to be a respondent and you will be automatically taken to the survey available at <https://surveys.dal.ca/opinio/s?s=6107>

Thank you for your participation!

Investigator: Joyline Makani,
Doctoral candidate in Knowledge Management
Dalhousie University
(902) 494 -2726 makani@dal.ca

Signature Page

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at any time.

I also understand that this project has been reviewed by, and received ethics clearance through, the Office of Research Ethics Administration at Dalhousie University, and that I may contact this office if I have any concerns or comments resulting from my involvement in the study.

I consent.

APPENDIX B Knowledge-intensive Organizations Survey

WELCOME

This survey aims to explore the factors that differentiate knowledge-intensive organizations (KIOs) to traditional organizations. The aim is to extend a typology of “knowledge-intensive organizations” as a preliminary step to conducting research on these types of organizations. It is hoped that the findings of this survey will provide a basis of distinguishing KIOs from other organizations, thereby allowing one to perform comparative organizational analysis. The study will also help researchers identify which of the organizations are knowledge-intensive, and the nature of their knowledge-intensity, so that they help these organizations in designing appropriate knowledge management tools.

The survey is completed anonymously, can be saved part way through, and takes around 20 minutes to complete. This survey will be active until November 30, 2009.

1. Are you familiar with the concept knowledge-intensive Organization or Knowledge-intensive Firm?

If your answer is 'No', you will be taken to the end of the survey. Thank you for your participation.

- Yes
 No

2. Name (Optional):

3. Company, Agency and Division (Optional):

4. Where are you located?

Africa
Asia
Australia
Europe
Canada
Mexico
USA
South America

5. Job Title/ Rank:

6. Position Level (Choose 1)

- Executive
- Manager/Director
- Technical Staff
- Support Staff
- Other, please specify

7. What is your length of experience with Knowledge Management?

- Under 12 months
- 1 to 2 years
- 3 to 4 years
- 5 to 6 years
- 7 to 8 years
- 9 to 10 years
- 10 years +

8. Do you think that the most defining factors of a Knowledge-intensive Organization lie within ...

- People (workers)
- Organization
- Both

If you answered 'Both': In evaluating your selection, what weighting would you give to 'People' and 'Organization' within the relationship (For example, is it a 50-50 split or would you one or the other)?

Worker Related Factors

Please respond to each question in this section in terms of how descriptive it is of a KIO -- where "KIO" refers to the whole organization and not just a department or unit within the organization. If a question does not fit your description of a KIO, or you are otherwise unable to answer, please respond N/A (not applicable).

1 = Strongly disagree
 3 = Slightly disagree
 5 = Slightly agree
 7 = Strongly agree

2 = Moderately disagree
 4 = Neither agree nor disagree
 6 = Moderately agree
 N/A = Not Applicable

- | | | | | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------------------|
| 9. The majority of workers in KIOs are considered experts of their domain | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |
| 10. The majority of workers in KIOs perform complex, unique, and dynamic tasks | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |
| 11. The majority of workers in a KIO use novel knowledge to solve complex problems | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |
| 12. The majority of workers in KIOs have high worker autonomy (independence) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |
| 13. In a KIO a worker is held highly accountable for their decision | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |
| 14. The majority of workers in a KIO have high cognitive skills | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |
| 15. The majority of workers in a KIO have formal education and experience equivalent to a doctoral | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |
| Strongly disagree | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly agree <input type="radio"/> |

degree.

16. The majority of workers in a KIO belong to or are accredited by a professional group. 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

Organization Related Factors

Please respond to each question in this section in terms of how descriptive it is of a KIO --where “KIO” refers to the whole organization and not just a department or unit within the organization. If a question does not fit your description of a KIO, or you are otherwise unable to answer, please respond N/A (not applicable).

1 = Strongly disagree
 3 = Slightly disagree
 5 = Slightly agree
 7 = Strongly agree

2 = Moderately disagree
 4 = Neither agree nor disagree
 6 = Moderately agree
 N/A = Not Applicable

17. A KIO produces and sells knowledge 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

18. A KIO is highly dependent on individual expertise 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

19. A KIO's core assets are its people 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

20. A KIO's organizational network can be defined as large & complex (extends both inside and outside) 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

21. A KIO's core factor for success is innovation 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

22. In a KIO an expert worker's decision highly impacts the organization's success 1 2 3 4 5 6 7 N/A
 Strongly disagree Strongly agree

23. A KIO is accredited by a self-regulated body 1 2 3 4 5 6 7 N/A

	Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree	<input type="radio"/>
24. In a KIO top and middle managers have fewer opportunities to exercise direct supervision and control	1	2	3	4	5	6	7		N/A	
	Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree	<input type="radio"/>
25. A KIO's production consists of complex non-standardized problem solving	1	2	3	4	5	6	7		N/A	
	Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree	<input type="radio"/>
26. A KIO acquires status and power from creative achievements	1	2	3	4	5	6	7		N/A	
	Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree	<input type="radio"/>

When thinking about factors you consider as defining KIOs could you rank the following organizations in order of their level of knowledge-intensity using the scale between 1 and 3 (**1 = least knowledge-intensive, 3 = moderately knowledge-intensive, 5 = most knowledge-intensive**).

If an organization does not fit your description of a KIO, or you are otherwise unable to answer, please respond N/A (not applicable).

27. landscaping firms	1	2	3	4	5		N/A
least knowledge-intensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	most knowledge-intensive	<input type="radio"/>
28. law firms	1	2	3	4	5		N/A
least knowledge-intensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	most knowledge-intensive	<input type="radio"/>
29. drug discovery firms	1	2	3	4	5		N/A
least knowledge-intensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	most knowledge-intensive	<input type="radio"/>
30. management consulting firms	1	2	3	4	5		N/A
least knowledge-intensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	most knowledge-intensive	<input type="radio"/>
31. software development firms	1	2	3	4	5		N/A
least knowledge-intensive	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	most knowledge-intensive	<input type="radio"/>
32. construction firms	1	2	3	4	5		N/A
least knowledge-intensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	most knowledge-intensive	<input type="radio"/>

33. medical practices
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
34. call centres
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
35. accounting firms
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
36. manufacturing company
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
37. bio-tech research firms
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
38. oil & mineral exploration companies
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
39. architecture firms
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive
40. computer consulting firms
- 1 2 3 4 5 N/A
- least knowledge-intensive most knowledge-intensive

41. How would you briefly define a Knowledge-intensive Organization?

Optional follow-up information

48. Would you like to be informed of the findings of this survey? *(Optional)*

Yes

No

If yes, please provide your email address

49. If needed, may we contact you to clarify your answers? *(Optional)*

Yes

No

If yes, please provide your email address

Thank you for taking the time to complete this survey.

If you wish to contact the survey creator you may do so through the following email address
makani@dal.ca

APPENDIX C Phase 2 Consent Script

Knowledge Management in Knowledge-Intensive Organizations: An investigation of factors influencing choices of knowledge management systems

Principal Investigator: **Joyline Makani**
Interdisciplinary Ph. D. student, Dalhousie University
(902) 494-2726 makani@dal.ca

Supervisor: **Dr. Sunny Marche**
Acting Dean, Faculty of Graduate Studies
Professor, Management Information System, School of
Business Administration, Dalhousie University

Dear IM/KM Executive:

We invite you to take part in a research study being conducted by Joyline Makani who is a graduate student at Dalhousie University, as part of her PhD studies. Your participation in this study is voluntary and you may withdraw from the study at any time. Your employment performance evaluation will not be affected by whether or not you participate. The study is described below. This description tells you about the risks, inconvenience, or discomfort which you might experience. Participating in the study might not benefit you, but we might learn things that will benefit others. You should discuss any questions you have about this study with Joyline Makani.

The face-to-face or telephone interviews are part of the second phase in a research study to explore and relate knowledge-intensive organizations (KIOs) as an organization type to the choice of knowledge management systems (KMS) employed in these organizations. The focus is to understand the way in which factors that differentiate KIOs from traditional organizations interlace with managerial decisions, specifically managerial choice of KMS in KIOs. This work will help in building a more robust theoretical underpinning to knowledge management (KM) generally and KMS specifically. It may also help managers and practitioners in organizations to arrive at how best to select KMS in order to achieve organizational KM success.

All interviews will be conducted in person or by telephone and participation is entirely voluntary. In the interview I will be asking your opinion about beliefs, expectations, and practices about knowledge management, knowledge management systems and knowledge-intensive organizations. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time. Your responses will be held in strict confidence. To ensure the accuracy of your input, I would ask your permission to audio record the interview. It is important for you to know that any information you provide will be considered confidential unless otherwise agreed to. All

of the data will be summarized and no individual could be identified from these summarized results. Your name and the name of your organization will not appear in any thesis or publication(s) resulting from this study unless you provide express consent to be identified and have reviewed the thesis text and approved the use of the quote. After the data have been analyzed, you will receive a copy of the executive summary. If you would be interested in greater detail, an electronic copy (e.g., PDF) of the entire thesis can be made available to you. **Data collected during this study will be electronically archived after the completion of the study, on a password-protected computer database, for five years after the research study has been completed.** Only the student and her supervisor will have access to this data.

The interview would last about one hour and would be arranged at a time and place convenient to your schedule. There are no known or anticipated risks to you as a participant in this study.

If you agree to participate, I will contact you to schedule the interview. I will be scheduling interviews commencing (Date).

If you have any questions regarding the study and/or your involvement in it, please feel free to contact Joyline Makani at 902.494.2726.

This research is supervised by Dr. Sunny Marche, Acting Dean, Faculty of Graduate Studies and Professor of Management Information System in the School of Business Administration at Dalhousie University.

If you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration, for assistance at (902) 494-1462, patricia.lindley@dal.ca

If you wish to participate, please complete and sign the signature page below and send it back to me via fax at (902) 494-2062 or email an attachment scanned PDF to makani@dal.ca.

Thank you for your participation!

Investigator: Joyline Makani,
Doctoral candidate in Knowledge Management
Dalhousie University
(902) 494 -2726
makani@dal.ca

Signature Page

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at any time.

I agree to have the interview and any follow-up telephone conversations audio-recorded.
 Yes No

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.
 Yes No

I agree to the use of direct quotations attributed to me only with my review and approval.
 Yes No

Participant Name: _____ (Please print)

Participant Signature: _____ Date: _____

Investigator Signature: _____ Date: _____

APPENDIX D Phase 2 Study Survey

WELCOME

This voluntary survey is the second phase in a research study to explore and relate knowledge-intensive organizations (KIOs) as an organization type to the choice of knowledge management systems (KMS) employed in these organizations. The focus is to understand the way in which factors that differentiate KIOs from traditional organizations interlace with managerial decisions, specifically managerial choice of KMS in KIOs. This work will help in building a more robust theoretical underpinning to knowledge management (KM) generally and KMS specifically. It may also help managers and practitioners in organizations to arrive at how best to select KMS in order to achieve organizational KM success.

The survey is completed anonymously, can be saved part way through, and takes around 20 minutes to complete. This survey will be active until April 30th, 2011.

KIOs

1. Name (Optional):

2. Age range

Under 30

- 30–39
- 40–49
- 50–59
- 60 or over

3. Company, Agency and Division (Optional):

4. In your organization the main activity is:

- manufacturing
- services
- Other (Please specify)

5. What is the core business or primary focus of the overall organization?

Core business

6. Where are you located?

Africa

Asia

Australia

Europe

Canada

Mexico

USA

South America

7. Position Level (Choose 1)

Executive

Senior Manager/Director

Manager

Other, please specify

8. Do you define your organization as a Knowledge-intensive organization (KIO) or non-KIO? Please select from the options given below.

KIO

Non-KIO

Don't know

Comment

9. Using no more than a couple of sentences define knowledge management systems:

10. What has been your experience in the following areas? Please select the ones that apply to you and indicate length of experience in the comment box.

Choosing Knowledge Management Systems (KMS)

Implementing KMS

Using KMS

N/A

Comment:

11. In your organization the relative number of knowledge workers, relative to the total number of employees is?

- under 33% (a third)
- 33% - 49%
- 50% - 66%
- over 66%

Comment

Considering the successful exploitation of knowledge in your organization, using the scale between 1 and 5 (1=strongly insignificant & 5=strongly significant) please indicate which issues are the most significant issues and challenges.

1= Strongly Insignificant

2 = Insignificant

3 = Unsure

4 = Significant

5 = strongly significant

N/A = Not Applicable

12. Sharing knowledge outside the organization

1	2	3	4	5	N/A
Strongly insignificant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly significant

13. Capturing internal knowledge

1	2	3	4	5	N/A
Strongly insignificant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly significant

14. Creating new knowledge

1	2	3	4	5	N/A
Strongly insignificant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly significant

15. Acquiring knowledge externally

1	2	3	4	5	N/A
Strongly insignificant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly significant

16. Locating expertise

1	2	3	4	5	N/A
---	---	---	---	---	-----

- Strongly insignificant Strongly significant
17. Processing the knowledge
1 2 3 4 5 N/A
- Strongly insignificant Strongly significant
18. Updating knowledge
1 2 3 4 5 N/A
- Strongly insignificant Strongly significant
19. Retrieving the right knowledge at the point of need
1 2 3 4 5 N/A
- Strongly insignificant Strongly significant
20. Re-using the knowledge
1 2 3 4 5 N/A
- Strongly insignificant Strongly significant
21. Applying the knowledge to create new knowledge for sell.
1 2 3 4 5 N/A
- Strongly insignificant Strongly significant
22. Sharing knowledge internally
1 2 3 4 5 N/A
- Strongly insignificant Strongly significant

Using the scale between 1 and 5, (1=strongly disagree & 5=strongly agree), please indicate whether you agree or disagree with the following series of statements.

- 1 = strongly disagree
2 = Disagree
3 = neither Agree nor Disagree
4 = Agree
5 = Strongly Disagree

23. Knowledge possessed by key people (experts) should be captured & shared in the wider organization

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

24. In my organization work coordination is done via hierarchy

1 2 3 4 5 N/A

strongly disagree strongly agree

25. In my organization choosing KMS that enable the matching of worker practices (practice

analysis) and the current business environment is a prerequisite for success.

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

26. In my organization technology is the only enabler in ensuring that key knowledge is available to the right people at the right time

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

Comment

27. My organization produces and sells knowledge

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

28. My organization is highly dependent on individual experts' knowledge

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

29. In my organization highly creative solutions are the norm, i.e., every problem has a high chance of being a "one off" and unique problem

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

30. In my organization intra-firm networking is encouraged

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

31. My organization employs extensive use of temporary teams/projects/task forces to get the work done.

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

32. In my organization most of the knowledge lies in the heads of certain people

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

33. In my organization acquiring knowledge is easy; using/re-using it effectively is the issue

1 2 3 4 5 N/A

Strongly Disagree Strongly agree

34. Experts knowledge is 'hidden' and not easily identifiable

1 2 3 4 5 N/A
 Strongly Disagree Strongly agree

35. In my organization choosing KMS that address knowledge worker activities is the key to KM success

1 2 3 4 5 N/A
 strongly disagree strongly agree

Using the scale between 1 and 5, (1=no plans to use at all & 5=used extensively), indicate the types of systems your organization presently use or plan to use in the near future:

- 1 = no plans to use at all
- 2 = plan to use in the near future
- 3 = unsure
- 4 = used to a certain extent
- 5 = used extensively

36. collaborative systems

1 2 3 4 5
 no plans to use at all used extensively

37. Expertise location/yellow pages

1 2 3 4 5
 no plans to use at all used extensively

38. Process oriented systems (process description databases)

1 2 3 4 5
 no plans to use at all used extensively

39. Lessons learned systems

1 2 3 4 5
 no plans to use at all used extensively

40. Enterprise portals

1 2 3 4 5
 no plans to use at all used extensively

41. Web conferencing systems

1 2 3 4 5
 no plans to use at all used extensively

42. Document repositories (knowledge repositories)

1 2 3 4 5
 no plans to use at all used extensively

43. Social forums supporting Communities of practice

1 2 3 4 5
 no plans to use at all used extensively

44. e-learning modules

1 2 3 4 5

no plans to use at all used extensively
45. Interactive networks e.g. CRM, supply chain mgmt. system, etc. (Please specify)
1 2 3 4 5

no plans to use at all used extensively

If you use or plan to use these systems please specify:

46. Integrative solution – what & what (please specify e.g. best practice, expert finder etc., sales)
1 2 3 4 5

no plans to use at all used extensively

If you use or plan to use these systems please specify:

47. In the box below please list any other knowledge management systems currently used in your organization

Optional Follow-Up Information

48. Would you like to be informed of the findings of this survey? (*Optional*)

Yes

No

If yes, please provide your email address

49. If needed, would you be willing to be contacted to clarify your answers? (*Optional*)

Yes

No

If yes, please provide your email address

Thank you for taking the time to complete this survey.

If you wish to contact the survey creator you may do so through the following email address makani@dal.ca

APPENDIX E Phase 2 Survey Recruitment Letter & Consent Form

Knowledge Management in Knowledge-Intensive Organizations: An investigation of factors influencing choices of knowledge management systems

Dear Knowledge Management Professional:

This letter is an invitation to participate in a research study. As an Interdisciplinary PhD student in the Faculty of Graduate Studies at Dalhousie University, I am currently conducting research on knowledge management systems (KMS) in knowledge-intensive organizations (KIOs). This voluntary survey is the second phase in a research study to explore and relate KIOs as an organization type to the choice of KMS employed in these organizations. The focus is to understand the way in which factors that differentiate KIOs from traditional organizations interlace with managerial decisions, specifically managerial choice of KMS in KIOs. This work will help in building a more robust theoretical underpinning to knowledge management (KM) generally and KMS specifically. It may also help managers and practitioners in organizations to arrive at how best to select KMS in order to achieve organizational KM success.

The survey will take about 20 minutes of your time. This survey will be active until April 30, 2011.

Your participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time. Additionally, if you begin entering responses to the questionnaire on the Web and then choose not to complete the questionnaire, the information that you have already entered will not be transmitted to me. It is important for you to know that any information that you provide will be confidential. Your name and the name of your organization will not appear in any thesis or publication(s) resulting from this study unless you provide express consent to be identified and have reviewed the thesis text and approved the use of the quote. All of the data will be summarized and no individual could be identified from these summarized results. After the data have been analyzed, you will receive a copy of the executive summary. If you would be interested in greater detail, an electronic copy (e.g., PDF) of the entire thesis can be made available to you.

If you have any questions regarding the study and/or your involvement in it, please feel free to contact Joyline Makani at 902.494.2726.

This research is supervised by Dr. Sunny Marche, Associate Dean, Faculty of Graduate Studies and Professor of Management Information System in the School of Business Administration at Dalhousie University.

This study has been reviewed by the Dalhousie Social Sciences and Humanities Research Ethics Board. However, in the event that you have any difficulties with, or you wish to

voice concern about any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration, at (902) 494-1462 patricia.lindley@dal.ca.

Please click on the following link if you wish to participate:
file:///C:/Documents%20and%20Settings/jmakani/ Consent%20Form.htm

Thank you for your participation!

Investigator: Joyline Makani,
Doctoral candidate in Knowledge Management
Dalhousie University
(902).494.2726 makani@dal.ca

Consent Form

Knowledge Management in Knowledge-Intensive Organizations: An investigation of factors influencing choices of knowledge management systems

Principal Investigator: **Joyline Makani**
Interdisciplinary Ph. D. student, Dalhousie University
(902) 494-2726 makani@dal.ca

Supervisor: **Dr. Sunny Marche**
Associate Dean, Faculty of Graduate Studies
Professor, Management Information System, School of
Business Administration, Dalhousie University

Dear Knowledge Management Professional:

We invite you to take part in a research study being conducted by Joyline Makani who is a graduate student at Dalhousie University, as part of her Interdisciplinary PhD studies. Your participation in this study is voluntary and you may withdraw from the study at any time. Your employment performance evaluation will not be affected by whether or not you participate. The study is described below. This description tells you about the risks, inconvenience, or discomfort which you might experience. Participating in the study might not benefit you, but we might learn things that will benefit others. You should discuss any questions you have about this study with Joyline Makani.

This voluntary survey is the second phase in a research study to explore and relate KIOs as an organization type to the choice of KMS employed in these organizations. The focus is to understand the way in which factors that differentiate KIOs from traditional

organizations interlace with managerial decisions, specifically managerial choice of KMS in KIOs. This work will help in building a more robust theoretical underpinning to knowledge management (KM) generally and KMS specifically. It may also help managers and practitioners in organizations to arrive at how best to select KMS in order to achieve organizational KM success.

This survey asks for your opinion about beliefs, expectations, and practices about knowledge management, knowledge management systems, and knowledge-intensive organizations. Because it asks for your judgment, there are no right or wrong answers. Please respond to the questionnaire based on your own judgment, regardless of what you think others expect or what is socially acceptable. The survey does not ask for any identifying information about you unless you specifically choose to enter such information. Your responses will be held in strict confidence.

Your participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time. Additionally, if you begin entering responses to the questionnaire on the Web and then choose not to complete the questionnaire, the information that you have already entered will not be transmitted to me. It is important for you to know that any information that you provide will be confidential. All of the data will be summarized and no individual could be identified from these summarized results. Your name and the name of your organization will not appear in any thesis or publication(s) resulting from this study unless you provide express consent to be identified and have reviewed the thesis text and approved the use of the quote. After the data have been analyzed, you will receive a copy of the executive summary. If you would be interested in greater detail, an electronic copy (e.g., PDF) of the entire thesis can be made available to you. **Data collected during this study will be electronically archived after the completion of the study, on a password-protected computer database, for five years after the research study has been completed.** Only the student and her supervisor will have access to this data.

You may participate in this study if you consider yourself a knowledge management professional and are familiar with the field of knowledge management either in theory or in practice. The survey will take about 20 minutes of your time. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding the study and/or your involvement in it, please feel free to contact Joyline Makani at 902.494.2726.

This research is supervised by Dr. Sunny Marche, Associate Dean, Faculty of Graduate Studies and Professor of Management Information System in the School of Business Administration at Dalhousie University.

If you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration, for assistance at (902) 494-1462, patricia.lindley@dal.ca

To participate please read the statement on the signature page below and by clicking on the “I consent” button you acknowledge that you voluntarily agree to be a respondent and you will be automatically taken to the survey available at <https://surveys.dal.ca/opinio/s?s=6108>

Thank you for your participation!

Investigator: Joyline Makani,
Doctoral candidate in Knowledge Management
Dalhousie University
(902) 494 -2726 makani@dal.ca

Signature Page

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at any time.

I also understand that this project has been reviewed by, and received ethics clearance through, the Office of Research Ethics Administration at Dalhousie University, and that I may contact this office if I have any concerns or comments resulting from my involvement in the study.

I consent.