RISE OF INTELLIGENT ORGANIZATIONS: USING BI TOOLS TO BUILD KNOWLEDGE CAPITAL

by

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Dedication

This dissertation is dedicated to my mother, who has taught me the true meaning of sacrifice in life, commitment, and dedication. I credit her for teaching me that education is a lifetime learning journey and knowledge is the heart of our intellectual existence.

To my wife Christine and daughter Chelsea

for their unwavering support, copious love, and understanding.

Table of Contents

List of Tables

List of Figures

CHAPTER 1. INTRODUCTION

Framework

In the beginning, data was scarce, information supreme, and knowledge divine. Then came the transformation ages, with rapid information technology (IT) innovations we hastily went from the electronics age to the information age to the digital age. By the time the cyber age dawned, data was in the air, and unbounded numbers of bits are in every breath we take. Information overloads all our senses and yet knowledge is scarce and intelligence supreme. Suddenly people and organizations alike find themselves drowning in stormy oceans of data, choking on infinite bytes of information;

Knowledge is power and Knowledge rules.

Introduction

The growing challenges of hypercompetitive global economies across all industry sectors are progressively leading to the need for organizations to subscribe to knowledge management (KM) in an effort to create knowledge capital (KC) that reflects the value of organizational intelligence. Davenport and Prusak (1998) asserted that not withstanding the vagueness of KM, its potential overlaps with Information Management (IM), and its "still-developing" theoretical base in terms of building KC, more and more organizations are realizing that survival in the modern 'Knowledge Age' hinges on the strategy of leveraging value from KC and the ability to effectively and efficiently manage KC that assimilates both tacit and explicit knowledge as a valuable organizational asset. According to Zack (1999), KM and the building of KC can be viewed as the systematic management of intellectual capabilities in the organization and its organizational and technological infrastructures.

Consequently, knowledge activities, systems, and technologies establish the capacity to generate, integrate, transfer, and import new knowledge. This core capability enables human creativity and management of intellectual capital, resulting in differentiated processes and products (Clarke & Rollo, 2001). Nevis et al. (1995) noted that the most important knowledge that determines an organization's competence and its ability to achieve sustainable competitiveness often includes "the meaning and interpretation of information, and many intangibles such as the tacit knowledge of experienced people that is not well articulated." (p. 73). In this context, the loss of knowledge, particularity tacit knowledge (which is hard to articulate because it exists in the minds of participants) equals loss of Knowledge Capital. Hence, the organization's absorptive capacity to transform its tacit knowledge into explicit knowledge would lead to building the KC that is key to transforming intelligent organizations and sustaining competitive advantage.

Background of the Study

Many predictions about the role of knowledge and Knowledge Management (KM) are said to come true or are simply new business realities in today's knowledge age. Peter Drucker (1969) was the first to coin the terms "knowledge work" and "knowledge works." Later, Marguardt (1996), Davenport (1998), and Van Buren (1999) all predicted that acquisition, retention, and reuse of knowledge would become paramount and determine the survival of organizations in the future. Similarly, Drucker

(2002) later noted that knowledge will be the most sought-after resource in a future knowledge society. Drucker's (2002) prediction, along with many others such as Davenport (1998) and Van Buren (1999), that knowledge workers would dominate society is now a thing of the past. Yet the rise of intelligent organizations that build Knowledge Capital (KC) and organize intelligent knowledge to develop their organizational efficiency and improve the use of the broad skills, experiences, and the tacit knowledge of their work forces, has also not come to pass.

This ability to harness knowledge remains one of the toughest challenges for all organizations in today's knowledge age. Van Buren (1999) asserted that "measuring the value and the performance of knowledge assets ranked as the second most important challenge faced today by organizations." (p. 111). Mason (2004) further opined that a successful KM program has the potential to transform an organization.

Statement of the Problem

In spite of the increasing sophistication of data retrieval systems, knowledge overload remains a real problem. The need for better ways to navigate, filter, and push knowledge (not just hoard it) makes systems unmanageable unless organizations move to a level of creating almost individual portals and not just company-wide portals to capture, share, and reuse knowledge. According to Davenport and Prusak (1998), organizations are realizing that to remain competitive, they must explicitly manage their intellectual resources and working knowledge. To this extent, the loss of knowledge (particularly tacit knowledge) that exists in the minds of participants equals loss of Knowledge Capital (KC). Many organizations continue to struggle with building a KC that assimilates both tacit and explicit knowledge due to the challenge inherit in the collection, transformation, and reuse of tacit knowledge. Additionally, building an intelligent KC in today's knowledge age has been receiving tremendous interest as the key to building intelligent organizations and sustainable competitive advantage.

Importance of the Problem

The domain of Knowledge Management (KM), building Knowledge Capital (KC), and the phenomenon of tacit knowledge are receiving a great deal of attention from academics and practitioners alike. The nature of tacit knowledge has been explored by many researchers in several fields including psychology, business, and social science. According to Busch and Richards (2000), currently a great deal of literature exists on the phenomenon of tacit knowledge in the workplace (Johannessen et al., 1997; Lei, 1997; Nonaka et al., 1996; Raghuram, 1996; Nonaka, 1996). However, little in the way of methodology is available for the capture and measurement for such knowledge other than that proposed by Sternberg et al. (1995) and his Yale University research group. Thus, the loss of knowledge, particularly tacit knowledge that exists in the minds of participants, equals loss of knowledge capital. Additionally, an organization's KC that assimilates both tacit and explicit organizational knowledge is the key to building intelligent organization and a sustainable competitive advantage.

Purpose of the Study

The topic of this research is the transformation of a traditional organization into an intelligent organization by converting its participants' real-world experiences and skills that reside in their tacit knowledge into articulated and codified knowledge. This process is aimed at building knowledge capital (KC) brought to higher level of intelligence with the integration of business intelligence (BI) and the use of BI tools. The research is titled:

Rise of Intelligent Organizations: Using BI Tools to Build Intelligent Knowledge Capital

Rationale

The main obstacle to KM and any strategy to build KC remains the human dimension and the challenge of getting all participants to share their know-how. Cohen et al. (2001) noted, “Seems like KM hasn’t progressed much! The reason is that the ‘share’ is a social construct, and not an IT construct. One cannot simply put up a system and ask employees to share their knowledge, which, by the way, is highly personal. Rather, one should look into the building of social constructs, otherwise known as social capital.” (p. 63). While some people *are* willing to share and entrust other with their tacit knowledge, many fear the risks to job security and the human recognition factor.

This non-experimental research explored the phenomenon of tacit knowledge and the transformation of a traditional organization into an intelligent organization through the capture, conversion, and transformation of tacit knowledge and the use of Business Intelligence (BI) aimed at building intelligent KC through an interface with ETL tools and the integration of BI in knowledge management.

Objectives

Research has shown that people are more cooperative when there is a sense of camaraderie, the work environment is characterized by job stability, and social interaction is promoted. Similarly, Awad and Ghaziri (2004) asserted that knowledge transfer is not done solely from knowledge bases or repositories: "Knowledge can be transferred from repositories to people, from teams to individuals, and between individuals." (p. 73). In this respect, knowledge transfer and sharing are notions of social and people sharing, and hence a matter of communities practice or knowledge sharing, which is representative of KM.

It is on this basis that the Concern, Issue, Problem, and Opportunity (CIPO) model is proposed as the means to capture the concerns, issues, problems, and opportunities from organization's participants as a community practice. The output of the CIPO model in the form of a data repository is then integrated with BI using ETL to extract, transform, and load the CIPO data before applying BI tools to create intelligent knowledge that would be useful for all participants. Interviews and discussions with participants from the IT department and the Knowledge Solutions staff of a large organization X was conducted using a survey questionnaire and in-depth interviews to analyze this research's proposed model and answer the research question.

Research Questions/Hypothesis

The research poses the following question:

Can Business Intelligence (BI) be incorporated into building knowledge capital (KC) and what are some of the essentials requirements needed to use BI tools to create an intelligent KC that leads to a sustainable competitive advantage and transform a company into an intelligent organization?

The following hypotheses (Alternative and Null) were derived from the research objectives and the latter research question:

$H1_a$: The loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equate to loss of KC.

$H1_0$: The loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge does not equate to loss of KC.

$H2_a$: Loss of tacit knowledge and KC affect the organization's sustainable competitive advantage.

$H2_0$: Loss of tacit knowledge and KC does not affect the organization's sustainable competitive advantage.

$H3_a$: BI and some BI tools might be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization's KC.

$H3_0$: BI and BI tools cannot be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization's KC.

$H4_a$: There are specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.

$H4_0$: There are no specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.

Significance of the Study

The CIPO model integrated with BI outlines a knowledge management process designed for the capture of heuristics and expert knowledge that can be applied to optimize the factors of time and money. The latter concept depicts an intelligent organizational behavior that bears direct consequences on the organization's output. With the domains of KM and KC gaining tremendous interest from both practitioners and academics, the output of this research could also be used by both groups for further research on creating intelligent knowledge and the assimilation of both tacit and explicit knowledge toward building intelligent organizations.

Nature of the Study

This research is a non-experimental, exploratory study. The research process followed a mixed method of qualitative and quantitative methodologies. In the qualitative portion of the study, the grounded theory methodology was used to conduct the research following the Glaser (1998) approach. According to Glaser (1998), grounded theory begins with a research situation and the researcher seeking to understand what is happening in the research situation, and how the participants manage their roles. The quantitative data analysis consisted of a survey questionnaire aimed at how to operationally define the concepts and themes identified in this research subject and what theory can explain the data gathered from the survey. Two different research tools were used for data gathering and analysis:

1. Survey Questionnaires
2. In-depth interview

Assumptions and Limitations

This research makes the assumption that what constitute organizational tacit knowledge are the real-world experience, skills, and non-articulated knowledge that lives in the heads of the employees. The research also assumes that management of organization X will ultimately select the strategy that leads to transforming their organization with their choice of business intelligence practices to capture, filter, transform, and build an intelligent KC. Management will have to determine how much the company is willing to invest in the implementation of BI tools to accomplish this transformation.

Organization of the Remainder of the Study (Scope)

Initially, the paper outlined the definitions of knowledge as the fundamental element in building KC, and distinguishes between KM and IM. Second, the concepts of KC and organizational intelligence were introduced and the principles and processes of building KC were discussed. Next, the paper looked at how KC could be considered the most strategically important resource based on the assimilation of tacit knowledge. This section also details the role of BI and the integration ETL tools to extract, transform, and load tacit knowledge and then apply BI tools to create a more intelligent KC.

A Concern, Issue, Problem, and Opportunity (CIPO) model was considered as a mean to capture tacit knowledge and create a living and dynamic process of organizational know-how stored in a CIPO repository. The research looked at defining how this CIPO repository could be integrated with ETL and BI tools to farther build Intelligent Knowledge Capital (IKC) that could lead to a sustainable competitive advantage. The research then focused on analyzing the data collected from participants in an IT department and the Knowledge Management departments of a large organization X to address the research question and hypothesis.

CHAPTER 2. LITERATURE REVIEW

Introduction

To gain a better understanding of the topics discussed in this research and the undertaking of this project, a literature review was conducted. This literature review started with an in-depth look at the domain of knowledge and business intelligence. A search on knowledge management and knowledge capital began by looking at various publications in these topics including journals, research studies, articles, scholarly papers, and books. A search for publications on BI and BI tools was also conducted with a look at recent articles, white papers, journals, professional publications, and research studies related to this field. Although the main absorption of the literature review is depicted in this chapter, the overall review of the literature was also incorporated all through the entire research.

Overview

The literature review first began with a look at the importance of knowledge capital as a component of knowledge management and the concepts of knowledge and information in relation to knowledge management, knowledge capital, and information management. The essence of KM and the principles of building KC in relation to building intelligent knowledge giving rise to intelligent organizations were addressed. Next, understanding the phenomenon of tacit knowledge from a human nature and a culture perspective was covered. The literature review also explored loss of tacit knowledge and how it equates to loss of KC affecting sustainable competitiveness. A review of BI from birth to burst was covered within the context of KC and the significance of using BI and BI tools to build intelligent KC given the CIPO model as an organizational intelligence framework.

The Importance of KC in KM

According to Davenport and Prusak (1998), organizations are recognizing that their survival and competitive edge hinge on their ability to manage their capital knowledge and intellectual assets. To this end, Davenport and Prusak (1998) noted that many organizations have embarked in a myriad of KM initiatives and KC building projects. This paper argued that KC as the output of KM has the potential to be viewed as the most valuable and strategic resource of an organization. Additionally, using KC to directly address problems and opportunities can prove to be an invaluable tool leading to the creation and reuse of intelligent knowledge and ultimately a sustainable competitive advantage.

Knowledge and Information in Relation to KM, KC & IM

It is clear from looking at the literature on knowledge, information, knowledge management (KM), knowledge capital (KC), and information management (IM) that they all suffer from a certain degree of what one might call terminological ambiguity. This ambiguity is mainly attributable to the "synonymous" nature of these terms and concepts; they are often used interchangeably. Kakabadse et al. (2001) pointed out that while the literature distinguishes between knowledge and information, in the real world, the two notions are interchangeably used.

Bouthillier and Shearer (2002) asserted, “The distinction between KM and IM is not well articulated in the KM literature and this is compounded by the confusion surrounding the concepts of knowledge and information.” (p. 10). Kakabadse et al. (2001) wrote, “Information and data management are important pillars of knowledge management” (p140). However, KM is a much broader discipline that deals with the extraction and transformation of data into useful information and knowledge that can be shared across the organization (Kakabadse et al., 2001). It can further be argued that from conceptual viewpoint, both knowledge and information are not static but rather move through organizations in various ways, again suggesting the interrelated aspects of IM and KM in the creation of KC. Having noted the similarity between some of the common terms used in building KC with KM and IM, the focus is shifted to understanding knowledge as the fundamental element in building KC and how this relates to information.

What is Knowledge and How Does It Relate to Information?

Knowledge is a broad and abstract notion that has defined epistemological debate in western philosophy since the classical Greek era, according to Oluic-Vukovic (2001). Similarly, Awad and Ghaziri (2004) described knowledge as neither data nor information; although it is related to both. Awad and Ghaziri (2004) posited that knowledge is “the understanding gained through experience or study. It is ‘know-how’ or familiarity with how to do something that enables a person to perform a specialized task.” (p. 56). To Awad and Ghaziri (2004), knowledge may be an accumulation of facts, procedural rules, or heuristics. Once again, the relevant literature shows that many conceptual overlaps exist among all the terms of KM, KC, and IM. Nonetheless, knowledge and information are two distinctive elements and each is constructed under different parameters. While knowledge is prognostic and extremely useful in the decision-making process, information is, in essence, extrapolated and organized data. Knowledge should be viewed from a KM perspective and as the fundamental element in building KC within the scope of this paper.

Although the classification of knowledge remains a highly debatable subject, Haggie and Kingston (2003) noted that the most widely quoted approaches to classifying knowledge from a KM perspective is the 'knowledge matrix' of Nonaka and Takeuchi (1995). According to Nonaka and Takeuchi (1995), knowledge is very complex and is generated only in people's minds. Throughout the literature on KM and KC, many researchers have also agreed that knowledge is a complex and fluid concept.

In support of Nonaka and Takeuchi (1995), Gupta and McDaniel (2002) asserted that knowledge can be either explicit or tacit in nature. Whereas explicit knowledge is readily portable and transferable, tacit knowledge is personal and resides in people's heads. This explains why tacit knowledge "is very difficult to articulate, codify, and communicate. Hence, it is equally difficult to imitate" (Gupta & McDaniel, 2002).

Many researchers have also suggested that is difficult to transform tacit knowledge into explicit (Tsoukas & Vladimirou, 2000; Nonaka & Takeuchi, 1995). For Polanyi (1962), who believed that knowledge resides and remains in the human mind, tacit knowledge cannot be expressed because "we know more than we can tell."

Bouthillier and Shearer (2002) suggested that Nonaka and Takeuchi (1995) later opposed the latter view expressed by Polanyi (1962). According to Bouthillier and

Shearer (2002), Nonaka and Takeuchi (1995) would argue that tacit knowledge can be extracted and is therefore transferable. "Tacit knowledge can be transmitted through social interactions or socialization and made explicit through externalization, although they agree with the idea that tacit knowledge is somewhat hidden" (Bouthillier & Shearer, 2002). Other researchers such as Abram (1997) took a different approach, stressing that knowledge environment and how knowledge is shared and used are essentially the only controllable factors. In this context, it can be argued that the concepts of tacit versus explicit knowledge remain fuzzy in terms of their exclusivity. As such, this ambiguity in the relationship between tacit and explicit knowledge might be preventing researchers from grasping the intricacy in the process of building knowledge. Considering that the concepts of both IM and KM remain unsatisfactorily defined, coupled with the troublesome notion that tacit knowledge can be transformed into explicit knowledge, it is not the intention of this paper to argue the latter but rather to examine the essence of KM and the principles and processes of building KC fundamental to organizational intelligence.

The Essence of KM and the Principles of Building KC

Although the topic of KM has been around as long as there have been organizations, the formal study of KM and organizational design has exploded over the past decade. Peter Drucker (1988) set the stage with his description of the movement toward information-based organizations and knowledge specialists. In the early to mid-1990s, a significant amount of research was dedicated toward defining KM and describing its importance in gaining a competitive advantage (Badaracco, 1991; Nonaka and Takeuchi, 1995). Van Buren (1999) argued that knowledge resides in the user and not in the collection. It is how the user reacts to a collection of information that matters. On this basis, an organization's tacit knowledge would include relationships, norms, values, and standard operating procedures.

KM has also been enabled by the growth in IT. According to Awad and Ghaziri (2004), the rise of the information superhighway, coupled with growth of the Internet and other technological innovations, allowed KM to advance. Citing Martensson (2000), Bouthillier and Shearer (2002) mentioned that while some considered KM the business salvation, others see KM as the emperor's new clothes. Albeit, Daghfous (2003) posited, "Although KM has achieved a level of popularity among many firms worldwide, it has no unique or standardized definition." (p. 11). As such, attempts to define KM and KC processes in the literature are plenteous. Accordingly, the question that begs to be answered is: What is KM all about and how is it related to building KC?

KM and the Process of Building KC

New advances in today's technologies and innovation are making the processes of gathering, extracting, and transforming data very efficient. To this end, the creation of knowledge from the diagnosis and analysis of information extracted and transformed from readily available data has seen a significant increase. Accordingly, practitioners and researchers alike have been actively involved in identifying types of activities and ways and means involved in knowledge generation and capture from an organizational perspective aimed at building intellectual assets and knowledge capital.

Hlupic et al. (2002), citing Ruggles (1998), pointed out that there are three categories in knowledge creation. According to Ruggles (1998), these categories include: 1) knowledge generation, 2) knowledge codification, and 3) knowledge transfer. On the other hand, Bouthillier and Shearer (2002) noted a different model that was proposed by Oluic-Vukovic (2001). The latter model listed five steps in the creation of knowledge: gathering, organizing, refining, representing, and disseminating. This model seems to be more closely aligned with the various actions performed by most organizations seeking to build KC.

Citing Seemann et al. (1999), Haggie and Kingston (2003) posited, "KC as an output of KM can be thought of as the deliberate design of processes, tools, structures, etc. with the intent to increase, renew, share, or improve the use of knowledge represented in any of the three elements (structural, human and social) of intellectual capital." (p.203). However, Gordon (1999) asserted that building KC is more like a process in KM defined as "an effort to capture or tap an organization's collective experience and wisdom – including the tacit know-how that exists in people's heads – and to make it accessible and useful to everyone in the enterprise." (p.14).

Gordon (1999) went on to declare that the heart of KM is not about technology; rather it is about culture change. Both Alavi and Leidner (2001) and Awad and Ghaziri (2004) also described building KC as part of the KM process and not as an event that takes place within a specific period of time.

Alavi and Leidner (2001) suggested, "KM involves distinct but interdependent processes of knowledge creation, knowledge storage and retrieval, knowledge transfer, and knowledge application." (p. 110). Awad and Ghaziri (2004) also discussed KM and

KC as a dynamic life cycle that starts with the capture and gathering of a firm's collective expertise, then moving to organize and refine it before sharing. Both sources agree that participants from an organization are involved at different levels and contribute knowledge on the basis and nature of their participation in the operations of the business. In this context, KC resides in the minds of the participants and is not synonymous with information. KC is then derived from the synthesis and organization of information resulting from data extraction and transformation within the organization through all of its participants.

This individualism in knowledge calls for the need to have some trust and organization to manage the knowledge and create KC. Alavi and Leidner (2001) described this process as a multiple knowledge management process chain. They stipulated: "As such, knowledge management is not a monolithic but a dynamic and continuous organizational phenomenon." (p.5). The two sources are also in agreement that the complexity in KM and building KC varies depending on the type, scope, and characteristics of the processes of managing the knowledge.

As the study of KM processes to create KC continued to grow in sophistication, the underlying nature of the knowledge in organizations came under investigation. Here, the concept of organizational intelligence has been receiving attention as a potential competitive differentiation resource. Consequently, the quest to capture and capitalize upon the knowledge to build KC within an organization is receiving attention around the world. Hyde and Mitchell (2000) noted the growing importance of the latter concept, stating that "...there is now widespread acceptance of the importance of organizational knowledge and recognition that it is different than data and information management." (p.

12). The next section further examines this growing phenomenon of KC in relation to organizational intelligence.

KC and Organizational Intelligence

Although knowledge capital can be acquired at the individual level, to maximize its usefulness it must become an integral part of the entire organizational knowledge base and be shared by a community of participants as an intellectual asset. In essence, this is also the primary aim of KM. To this end, many examples in the literature, including Gupta and McDaniel (2002), pointed to KM having a direct impact on the organization's strategy to capture and maintain a competitive edge. This is due mainly to the nature of the organization's most valuable intellectual asset characterized as tacit knowledge. Knowledge management can be viewed as the systematic management of intellectual capabilities in the organization and its organizational and technological infrastructure. According to Zack (1999), KM and the building of KC should be viewed as the administration of the organizational knowledge capital and intellectual assets using available technologies as means of organizing and managing an ongoing process. This ongoing process of organizing, managing, and building KC will eventually lead to the creation and transfer of new knowledge. This process of KC building is at the core of the human capability and creativity. By properly managing this process, organizations are able to capitalize on their intellectual assets to gain a sustainable advantage. To Empson (1999), the learning that can take place in the process of building KC makes the organization more prominent and with better capability to strategically position itself.

Holsapple and Joshi's (2001) direct approach to KM and the building of KC is in many ways similar to Awad and Ghaziri (2004) who argued that, "Knowledge management is getting the right knowledge to the right people at the right time so they can make the best decision." (p.76). In this context, Holsapple and Joshi (2001) focused on the concept of the possible kinds of "right knowledge," viewing the organization as a dynamic and knowledge-based activity system with a clear and well-defined taxonomy of KM. This taxonomy framework identifies four schematic resources – culture, infrastructure, purpose, and strategy – and two content resources – participants and artifacts. Here, KC as a resource is comprised of participants and artifacts, which have to do with knowledge being dependent or independent on the participants for existence. The organization's ability to capture and create new knowledge hinges on its ability to recognize the value of knowledge as a strategic asset and its capability to use it effectively.

This competency is antecedent to the organization's capability to share and transfer knowledge. Daghfous (2003) postulated, "It is a function of competency, which is the ability to evaluate valuable knowledge and use it, and motivation, which is the drive to do so. If employees are to achieve high performance in KM activities, both ability and motivation should be present." (p. 23). In this respect, KC should reflect the networks of knowers, not the chain of command with a general participation in order to lead to true organizational intelligence. Daghfous (2003) went on to point out, "A firm should realize that knowledge exists at all levels of the organization, hence the importance of empowering those knowers. This would contribute to the company's ability to generate timely and knowledge-based decisions to address problems and opportunities." (p. 24). Accordingly, Leonard-Barton (1995) promulgated that organizations should promote a culture of learning and innovation where thinking outside the box is welcomed and risk taking is acceptable. Citing Connelly (2002), Daghfous (2003) declared that the essence of distributed KM systems is recognizing that knowledge is an organizational capital and an asset that belongs to the entire company and not to a select few. This view of distributed KM and shared knowledge capital should go along with all the participants contributing to the creation of the shared knowledge. However, the efficacy of KC does not necessarily require the use of the shared knowledge as a communal asset since the expenditure of knowledge should be according to the participant's level of contribution within the organization. Citing McDermott (1999), Daghfous (2003) also mentioned that "the political system in the company should also emphasize that power is not a product of knowledge hoarding, but rather a product of knowledge sharing." (p. 26). Likewise, leaders should educate all participants within an organization on the benefits of building KC. These individuals would act as knowledge evangelists, again leading to the build-up of intellectual assets and knowledge capital and the transformation to an intelligent organization. Then the learning that happens over time will guarantee that the company is keeping pace with environmental changes. Szarka, Grant, and Flannery (2004) postulated that technology-focused corporations have little choice but to become enthusiastic adopters of a learning culture. These authors noted, "Organizations, like people, must be able to learn in order to adapt to new circumstances. The highly competitive environment of the current marketplace has added greater impetus for contemporary technology-intensive firms to become learning organizations. Companies have less time to take new products to market or to improve the features of existing products." (p. 7). It is in this context that KM and the implementation of a knowledge management system (KMS) to build and harness KC become a powerful strategy with the potential to lead to a sustainable competitive advantage, as the following section will illustrate.

KM Strategy to Build Intelligent KC

Today's organizations exist in a chaotic transition period, moving into a new age defined by global competition, rampant change, faster flow of information and communication, increasing business complexity, and pervasive globalization. To Mitchell (2000), companies that are fast to market and demonstrate an ability to move with and sustain speed view time and knowledge as assets that are as real as money in the bank. To many in today's business world, knowledge and its creation have become the most essential elements in an organization's decision-making, business planning, and strategy. Citing Penrose (1980), Zack (1999) wrote, "Companies with superior knowledge are able to coordinate and combine their traditional resources and capabilities in new and distinctive ways, providing more value for their customers than their competitors." (p. 114). In other words, organizations are better positioned to make the most of their other assets and resources by fully utilizing this "superior knowledge" created from building KC. To Grant (1996), "knowledge can be considered the most important strategic resource, and the ability to acquire, integrate, store, share, and apply it the most important capability for building and sustaining competitive advantage." (p. 65). Therefore, engaging in KM to build KC has more far-reaching outcomes. IT can enhance the organization’s fundamental ability to compete, but furthermore gain a sustainable competitive advantage.

Many would ask: How does KC lead to a sustainable competitive advantage? The answer may lay in the nature of the organization’s tacit knowledge, defined as all the real-world experience, expertise, skills, and know-how that is not codified or articulated but rather lives in the heads of the organization’s participants. This type of knowledge will be examined in the next section as a phenomenon that plays a significant role in building intelligent KC.

The Phenomenon of Tacit Knowledge

In today’s knowledge age, plentiful research and studies have been conducted on the phenomenon of tacit knowledge (Nonaka, 1991; Sternberg, 1995; Raghuram, 1996; Nonaka et al., 1996; Polanyi, 1967; Lei, 1997; Johannessen, 1997). Nonetheless, literature on how to capture, reuse, and measure tacit knowledge is scarce. Research has shown that very little has been recorded other than the methodology that was proposed by Sternberg et al. (1995). Sternberg (1995) at Yale University attempted to test the differences in tacit knowledge among people through a comparison of expert-novice.

What is perhaps more obvious is our familiarity with knowledge that has been codified and referred to as explicit knowledge. This type of knowledge has dominated organizations’ knowledge bases while tacit knowledge continues to be an elusive component in building an organization’s knowledge capital. To Polanyi (1967), this elusiveness is because tacit knowledge is the total of all that people know and use but cannot necessarily articulate easily. Dahlbom and Mathiassen (1999) succinctly noted:

"We have no idea how we do a lot of the things that we know how to do. Among those are the very fast feats of perception, recognition, attention, information retrieval, and motor control. We know how to see and smell, how to recognize a friend's face, how to concentrate on a mark on the wall… These are definitely tacit competencies. If there are rules involved, we have no idea what they might be." (p. 33).

The Culture of Tacit Knowledge

Although tacit knowledge is as old as humankind, its nature and what it could be said to constitute remains a matter of debate (Busch et al., 2001). Reuber et al. (1990) noted that "(Galotti, 1989; Perkins, 1985; Wagner and Sternberg, 1985) has led researchers to focus on the experientially-based, practical knowledge that is predictive of real-world success." Accordingly, Wagner and Sternberg (1985) referred to the latter knowledge as "tacit knowledge" and later went on to develop a methodology to capture and measure it. Other than the Wagner and Sternberg study, research on tacit knowledge has mostly focused on who has this type of knowledge rather than how to capture, transform, and reuse it by disseminating it throughout the organization. Takeuchi (1998) pointed out that from a western perspective, tacit knowledge has long been played down in organizational knowledge creation in comparison to eastern views. All things considered, Busch et al. (2001) argued that all of our explicit knowledge is nevertheless based on our tacit understanding of the technology underneath. Referring to the research of Colonia-Willner (1999), Stenberg (1999), Howells (1995), and Reber (1993), Busch et al. (2001) asserted, "More than strong evidence exists for the social nature of tacit knowledge, that is to say, the means of transferal is not through books, or electronic media so much, but overwhelmingly though human-to-human contact" (p.37).

The Nature of Tacit Knowledge and the Nature of People

Nonaka and Takeuchi (1995) argued that knowledge is something that evolves in people's minds. People process data into information in their own minds and when this is combined with their experience and personal skills then assimilated into their own individual intellect, this becomes knowledge. This is the type of knowledge that Nonaka and Takeuchi (1995) referred to as tacit knowledge and it is very complex by nature. To Davenport and Prusak (1998) the nature of this type of knowledge is described as "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information" (p. 5). To Murphy (2003) this type of knowledge includes all the valuable concepts and vital know-how that resides in the heads of employees and shape a business to be wanted and needed by customers. Churchman (1971) also postulated, "Knowledge resides in the user and not in the collection. It is how the user reacts to a collection of information that matters." (p. 67).

This individuality nature of tacit knowledge becomes even more problematic when combined with the nature of people. With knowledge taken into the context of what constitutes a person's personality, the potentials to influence people to participate in KM and in building knowledge capital become even more challenging. Davenport and Prusak (1998) also noted this added difficulty in KM when the tacit nature of knowledge is added to the nature of people. According to Davenport and Prusak (1998) passing one's knowledge to others also means enabling others to perform according tasks, thus making the originator more easily replaceable. In spite of building knowledge capital being the most strategically important resource and learning the most strategically important capability for an organization, Stecking (2000) pointed that employees as individual participants often tend to keep their knowledge for themselves because they fear that they would not be needed anymore after passing their knowledge to others. O'Dell and Grayson (1998) quoted a Baldrige-award winner who expressed this well by stating: "We can have two plants right across the street from one another, and it's the damnedest thing to get them to transfer best practices." (p. 5). Davenport and Prusak (1998) also warned “People do what seems rational for themselves based on their own agendas and goals, irrational as these might seem to outside observers" (p.5).

The combination of the individuality nature of tacit knowledge and the nature of people is perhaps what makes the successful capture and reuse of tacit knowledge a matter of some debate. While Tsoukas and Vladimirou (2000) argue that "tacit knowledge is not something that can be converted into explicit knowledge”, Nonaka & Takeuchi, (1995) believed that tacit knowledge can be transmitted through social interactions or socialization, and made explicit through externalization. For Polanyi (1962), tacit knowledge cannot be expressed because "we know more than we can tell". Polanyi (1962) was of the belief that tacit knowledge resides and remains in the human mind. To illustrate his claim, Polanyi (1962) used the example of a medical student learning how to read X-ray pictures by listening to experts reading them. Alternatively, Choo (1998) who viewed tacit knowledge as action-based entrained in individual practice and the fundamental type of knowledge on which organizational knowledge is built, hard to describe but not impossible to capture. Here it should be worth noting that while Polanyi is a philosopher concerned with individual knowledge, Nonaka and Takeuchi, Choo, and the others are organizational theorists interested in how knowledge circulates in organizations.

However, despite this challenging aspect of the nature of tacit knowledge combined with the nature of people, this combination is also a source of sustainable competitive advantage that in today's knowledge age, all organizations must recognize and integrate into their KM strategy. This interesting factor was also explained by Meyer (1998), "Because tacit knowledge is much harder to detail, copy, and distribute, it can be a sustainable source of competitive advantage... What increasingly differentiates success and failure is how well you locate, leverage, and blend available explicit knowledge with internally generated tacit knowledge." (p. 18). Literature shows a strong link between knowledge management and the creation of a sustainable competitive advantage, because of the tacit nature of an organization's knowledge (Gupta & McDaniel, 2002). Hence, it is imperative that all organizations adopt a strategy to overcome the challenging factors in capturing, sharing, and reusing tacit knowledge. In prior experience with organization X, the CIPO model was adopted on this basis along with many technologies such as e-mail, the company's portal, and web enabled applications useful in the creation of knowledge through the fusion of data from Concerns, Issues, Problems, and Opportunities captured from the various organizational participants and sources.

Loss of Tacit Knowledge Equates to Loss of KC

In the context of their day-to-day activities, participants in every organization use more than just the codified and articulated knowledge. This type of know-how knowledge is vital to the operations of any organization. If captured and articulated, this knowledge could prove to be a crucial organizational information asset that separates the dominant and best practices from the less dominant. In defining tacit knowledge, Saint-Onge (1996) highlighted people's intuition and ability to perform as a result of their experience. For this reason, participants draw upon their tacit knowledge to perform their day-to-day tasks before consulting any explicit or codified knowledge that may be available to them. As a result, tacit knowledge at the individual level becomes even harder to acquire and transfer. Polanyi (1966) argued that much experiential knowledge is unconscious and unarticulated; individuals "know more than they can tell." Consequently, the loss of participants from an organization (through normal attrition or gravitation to join a competitor's work force) results in loss of capital knowledge. Stewart (1997) noted that with knowledge increasingly renowned as one of the most vital organization's resource and a key differentiating factor in business today, any loss of knowledge would therefore affect the evolution, success, and longevity of an organization.

Tacit Knowledge as a Key to a Sustainable Competitive Advantage

A study conducted by Skyrme (1997) concluded that there are basically two significant KM practices. The first practice evolved around the dissemination and reuse of knowledge while the second and most significant in terms of challenge centered around the creation and capture of new knowledge. All the research seems to indicate that is the tacit knowledge that presents organizations with the toughest challenge. Tacit knowledge has long been viewed as personal knowledge that can not always be verbalized or articulated particularly when this knowledge is based on the life-time learning experience of the employees and lives in their memories. This would fit the definition of the Oxford English Dictionary that defines tacit as “Not openly expressed or stated but implied, understood, inferred…” Zack (1999) also observed that “knowledge, especially context-specific, tacit knowledge embedded in complex organizational routines and developed from experience, tends to be unique and difficult to imitate. And unlike many traditional resources, it is not easily purchased in the marketplace in a ready-to-use form.” (p. 24). Consequently, any capture and transformation of tacit knowledge that can be shared and reused could lead to productivity improvement and eventually improve the organization’s competitiveness. According to Grant (2000) the productivity gains through conversion of tacit knowledge into explicit knowledge, and its subsequent repeated use on a global scale are fundamental to rapid rates of economic growth during the past few decades.

The capture, reuse, and sharing of tacit knowledge are receiving tremendous interest from both practitioners and academics (Stewart et al., 2000). Agostini et al. (2003) also noted the rapid emergence of knowledge management as a key issue for improving the effectiveness of work practice. Casonato and Harris (1999) conducted a research study on implementing knowledge management. They concluded with 0.8 probability that more than 50 percent of the surveyed companies’ efforts in knowledge management will be devoted to cultural change and motivating participants to share their tacit knowledge.

In order to capture the same knowledge that its competition possesses, an organization would need to hire the same exact people with that knowledge or embark in reproducing the same actions and performing the same activities. Hence, it becomes clear that building KC through experience takes time. To this end, most organizations are restricted by the learning curve and the risk of investment should they attempt to reproduce a competitor's knowledge base. Citing Cohen and Leventhal (1990), Zack (1999) asserted, "Knowledge-based competitive advantage is also sustainable because the more a firm already knows, the more it can learn." (p. 28).

To Grant (1996), "Knowledge can be considered the most important strategic resource, and the ability to acquire, integrate, store, share and apply it the most important capability for building and sustaining competitive advantage." (p. 11). Therefore, engaging in the capture, reuse, and sharing of tacit knowledge to build KC has far-reaching outcomes. It can enhance the organization's fundamental ability to compete and moreover assure a sustainable competitive advantage. Echoing Johannessen et al. (1997) and Lei (1997), Busch et al. noted, "Tacit knowledge plays a direct role in enabling an organization to attain a competitive advantage as the knowledge is itself difficult to acquire" (p37).

Understanding the enterprise needs makes the development of performance measures easier, and the implementation of the measures becomes a way to reinforce and clearly communicate the KM strategy. Additionally, it is critical to understand and clearly define the strategy needed by the enterprise to successfully develop a beneficial KMS. Without that definition, the resulting KMS will not meet the needs of the knowledge workers in the organization. The following sections attempts to show that by integrating

BI with a model of knowledge gathering and codification to build KC (referred to as the CIPO model short for concern, issue, problem, and opportunity), an organization can achieve a successful KM strategy that will lead the to the sustainable competitive advantage previously discussed.

Business Intelligence (BI) and Knowledge Capital (KC)

Although BI is relatively a new term in the business world, the practice is not. The gathering, analysis, and transformation of data have been practiced by government intelligence agencies and been the focus of law enforcement information exchange systems for decades.

BI: The Birth

Driven by innovation and technology, a certain pattern has emerged in business operations and applications during the past few years. This pattern pops out particularly when we examine trends making the news: It's mostly about putting things together. Mergers, application integration, web-enabled distributed applications, and grid computing – these and other trends inherently deal with finding affinities and creating a whole that's worth more than the sum of its parts. This whole was identified as the most influential for intelligent enterprises and has led to the birth of Business Intelligence, or BI.

BI: The Burst

At its essence, BI is a notion of ontology as a conceptual information model that refers to the science of describing the kinds of entities in the world and how they are related. In BI, ontology describes data entities that exist in a problem domain and gives us a shared and common understanding of the business data structure, models, and processes to support the human understanding of information. These include properties, concepts, and rules, and how they relate one to another, supporting a standard reference model for information integration as well as analytic reporting and analysis.

Business structures, modeling, and processes make up the driving factors behind the data-based structural context with data mining, extract, and interchange. At the heart of BI is the ongoing striving to transform data into critical streams of information that can be refreshed in real time and filtered through performance metrics affecting strategic decision-making. Speeding up business-critical decision-making, winning the quest for substantial cost savings, and establishing and leveraging a single version of any given business process for a specific outcome or a desired output are the aims of today's intelligent enterprises. The latter strategic efforts are only attainable through Business Intelligence and data interchange solutions for data access, analysis, reporting, and integration.

In recent years, e-business has taken a sensible Internet-centric approach by gaining the power of extensibility for Web services and connectivity to portals that arises from a Web-centric architecture and the robustness, availability, and scalability of today's database servers and database management systems (DBMS). In addition, tight coupling with a significant growth in data mining, interchange, integration, extract, load, and transformation has led to sharp rise in BI applications such as CRM, ETL, and EAI. Projected growth of BI and BI applications is expected to further facilitate information-based access and information integration across very different information systems. This growth will no doubt lead to formalized business application semantics between intra- and inter-organizational information resources and the rise of more intelligent enterprises.

The BI Conundrum

Since its birth 15 years ago, BI has come along way by evolving into business performance management (BPM) driven by the organization's ever-pressing need to structure and analyze business processes and define and measure business performance. However, the essence of BI remains not in impressive analytic report in data mining and transformation and intelligent queries, but rather bringing intelligent knowledge to users to empower them to make intelligent business decisions. The question here becomes: Where does the intelligent knowledge come from?

The initial answer is that knowledge about data, or what the BI world refers to as Meta data and "data about data," is locked up in data warehouses (DW) and in BI documents. To this end, the DNA of intelligent reports is knowledge about data that is intelligently extracted from Meta data. This would also imply that Meta data is theoretically the appropriate place to store knowledge data. However, given that the organization's most valuable asset is not information but rather vital knowledge that is generally encapsulated in systems or locked in people's heads, this type of knowledge does not reside in BI tools nor does it reside in BI reports (even though BI tools and analytical reports do a wonderful job of extracting and transforming information in intelligent and digestible formats). Here lays the conundrum of BI – BI tools can transform and present information, but are unable to capture knowledge, particularly the tacit knowledge that resides in people's heads. BI tools are also incapable of reusing knowledge. Adding to the conundrum, the toughest challenge for BI becomes how to capture and manage knowledge efficiently and effectively in a way that leads to making sound business decisions. Recent research has shown that many organizations suffer from this type of frustration and challenge. The reason is not lack of metadata or impressive BI tools and applications but rather knowledge capture and management.

To this end, and in today's knowledge age, organizations are eager to discover and implement ways to leverage BI tools to search, capture, and reuse knowledge. Hence, based on the premises that acquisition, retention, and reuse of knowledge are essential to the successful implementation of BI and given that building intelligent KC must be all about generating, organizing, transforming and filtering, and extracting and distributing knowledge to the right users for the right purpose and at the right time, we see a perfect fit between BI and building KC. Combining the use of BI and BI tools with KC will allow organizations to go beyond knowledge pulling into knowledge pushing. According to Graff and Gabarro (1996), it is all about the necessary networking to identify hot topics, generate good ideas, and assemble and filter knowledge for ease of use that would ultimately lead to the transfer of tacit knowledge. The following section proposes a model that would be called CIPO, short for Concern, Issue, problem, and Opportunity, that could be used to tie BI to the transformation of tacit knowledge and the building of intelligent KC viewed in this paper as the fundamental concept of intelligent organization.

CIPO, an Organizational Intelligence Model

According to Szarka et al. (2004), KM not only acts as a catalyst for innovation and creativity but also provides the means by which "innovative ideas" can be captured, shared, and leveraged, leading to more new ideas. "Innovation comes only from readily and seamlessly sharing information rather than hoarding it" (Peters, 2002). To Probst and Buchel, (1997) the proper use of knowledge is fundamental to the organizational learning process. Probst and Buchel, (1997) asserted "Organizational learning is a process by which the organization's knowledge and value base changes, leading to improved problem solving and capacity for action" (p.11). A study by the Massachusetts Institute of Technology suggests that 80 percent of ideas that have led to breakthrough products and services originate from routine discussions. However, the main obstacle to KM and any strategy for building KC remains the human dimension – the challenge of getting all participants to share their know-how knowledge. Cohen et al. (2001) noted, "Seems like KM hasn't progressed much! The reason is that the 'share' is a social construct, and not an IT construct. One cannot simply put up a system and ask employees to share their knowledge, which by the way, is highly personal. Rather, one should look into the building of social constructs, otherwise known as social capital." (p. 98). While some people are willing to share and entrust other with their tacit knowledge, many fear the risk to job security and the human recognition factor. Research has shown that people are be more cooperative when there is a sense of camaraderie, the work environment is characterized with job stability, and social interaction is promoted. Similarly, Awad and Ghaziri (2004) asserted that knowledge transfer is not done solely from knowledge bases or repositories: “Knowledge can be transferred from repositories to people, from teams to individuals, and between individuals” (Awad & Ghaziri, 2004). In this respect, knowledge transfer and sharing is a notion of social and people sharing, hence a matter of community practice or knowledge sharing, which is representative of KM. It is on this basis that the CIPO model is proposed.

CIPO is short for concern, issue, problem, and opportunity depicted in (Figure 1).

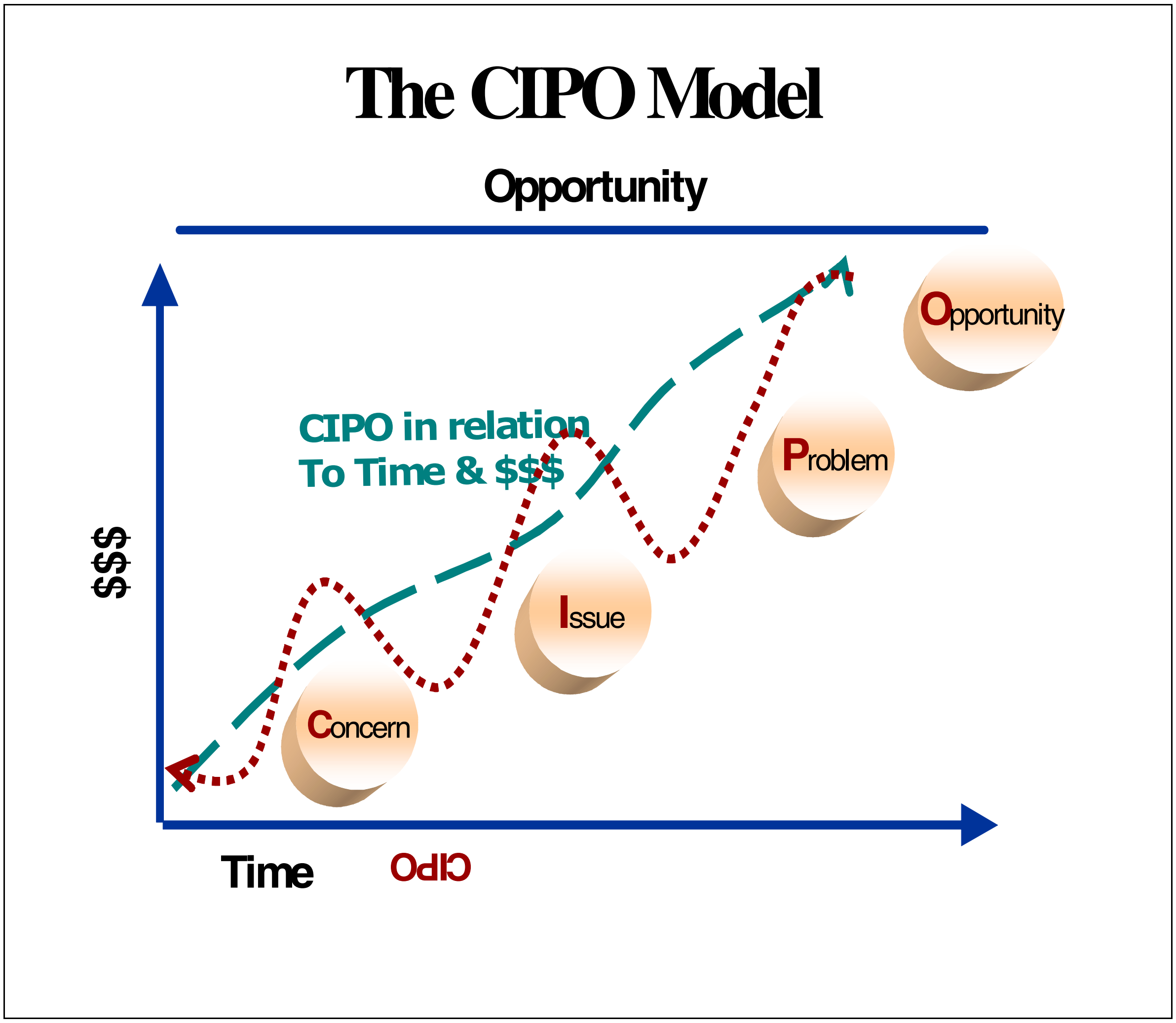


Figure 1. The CIPO Model.

This model addresses the capture of both tacit and explicit knowledge from all participants through elicitations, analysis, and interpretation in relation to two driving factors: money and time. CIPO as a system is a technology solution with an output designed to create a living and dynamic process of know-how including the capture of heuristics and expert knowledge that can be applied to optimize the factors of time and money. The four variables of the CIPO are defined as the following:

1. Concern: an issue in the making.
2. Issue: a concern that was not properly addressed.
3. Problem: an issue that was not properly resolved.
4. Opportunity: may be created by resolving any of the above factors or by avoiding their escalation. Opportunity may also be created by shared expertise and input from participants attempting to address or resolve the concerns, issues, or problems generated within the organization at various levels, ultimately leading to the creation of know-how or knowledge about the business operations, processes, and procedures.

The first three factors (concerns, issues, and problems) have an in-phase relationship with time and money as indicated in Figure 1, while the fourth factor, opportunity, has an inverse relationship (also illustrated in Figure 1). In this context, it takes an organization less time and less money to properly address a concern before it becomes an issue. Consequently, it takes more money and time to resolve a problem that has gone beyond the issue level. Any participant in the organization can generate CIPOs that are processed according to Figure 2 through e-mail, telephone, the Web, or the organization's dedicated portal. The essence of this CIPO system is building the organization's KC with the ultimate goal of positioning the organization to achieve sustainable competitive advantage by transforming itself into an intelligent organization.

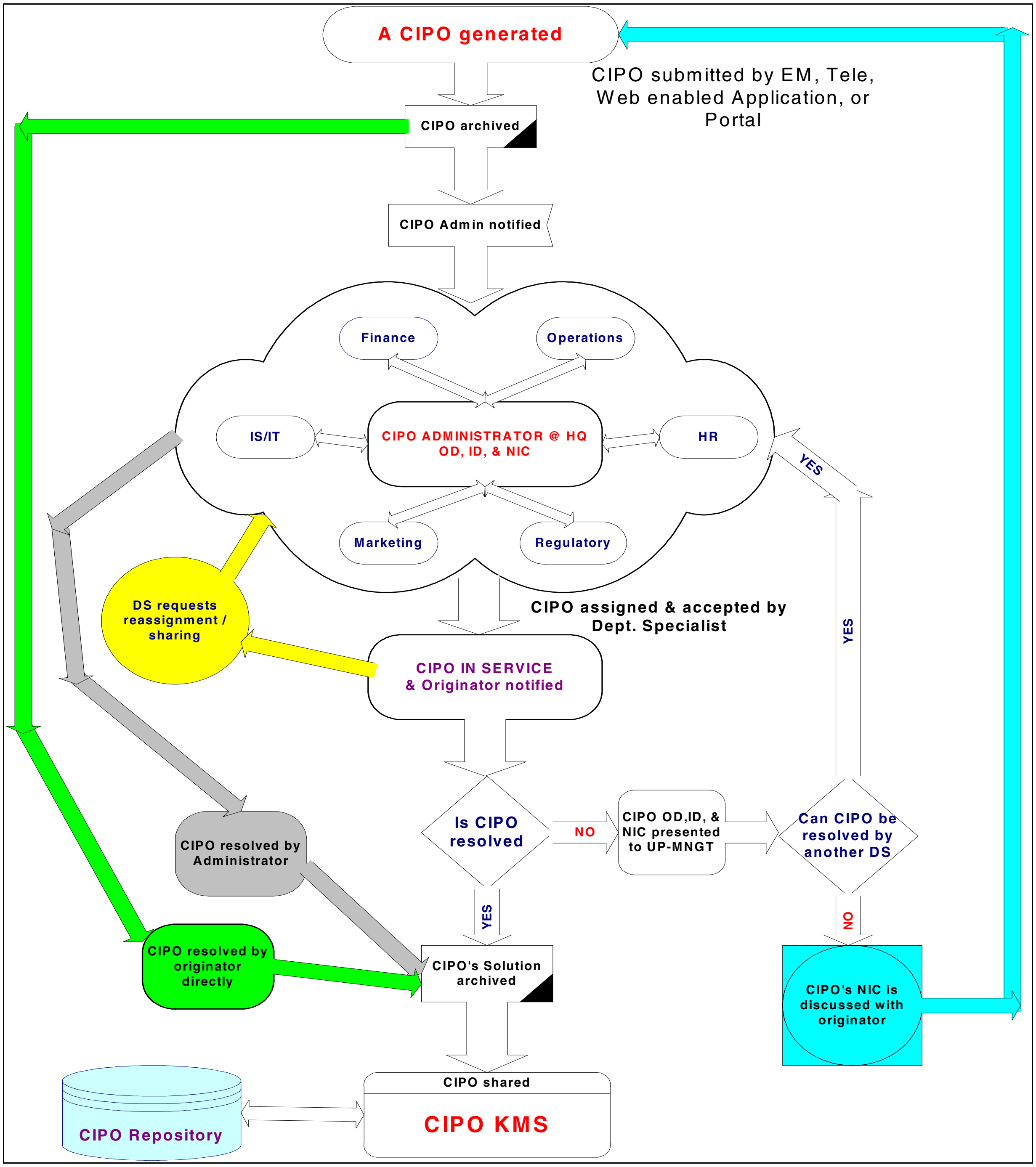


Figure 2. The CIPO KMS Diagram.

Any participant within the organization at any given time may generate a CIPO. If it generates a best practice or a resolution and a practical solution to a given entry by the participant generating the CIPO, this becomes an opportunity shared through the organization's system and stored in the CIPO repository for future reference. This also becomes a permanent part of the organization's living knowledge database, which is the fundamental component of the organization's KC. In cases where the participant is not generating an opportunity, sharing a best practice, or proposing new ideas but rather generating a CIPO, the latter is escalated through the system phases until it is resolved. CIPO system phases would include synthesis and resolution by various business function specialists or an escalation to upper-level management or executive involvement.

Once the CIPO is resolved, the solution or opportunity is validated, shared, and deposited into the CIPO repository. With all participants throughout the organization able to access this system based on well-established guidelines and protocols, knowledge can be collected from them not only through observation, but also through this direct system interaction. This also becomes a process by which the expert's thoughts and experiences are captured and deposited for future reference or used to extrapolate and extract from this data to help achieve sustainable competitive advantage.

To accomplish the latter goals, additional processing of the CIPO repository to create an intelligent knowledge capital is still needed. This would mean an integration of Business Intelligence (BI) with the CIPO model to further extrapolate and extract from this data deposit by using Extract, Transform, and Load (ETL) data handling tools. The outcome of this ETL process is then transformed into Meta Data stored in Data Marts and a Data Warehouse to which Business Intelligence (BI) tools can be applied to further mine this data and extrapolate and extract intelligent knowledge for the organizational users in the form of intelligent queries and reports. The outcomes of the BI tools, including these intelligent reports, are redirected to the CIPO repository to ultimately create an organization's knowledge capital that is dynamic and gathers more intelligence with every iteration and interface between the CIPO system, the ETL process, and the output of the BI tools illustrated in (Figure 3).

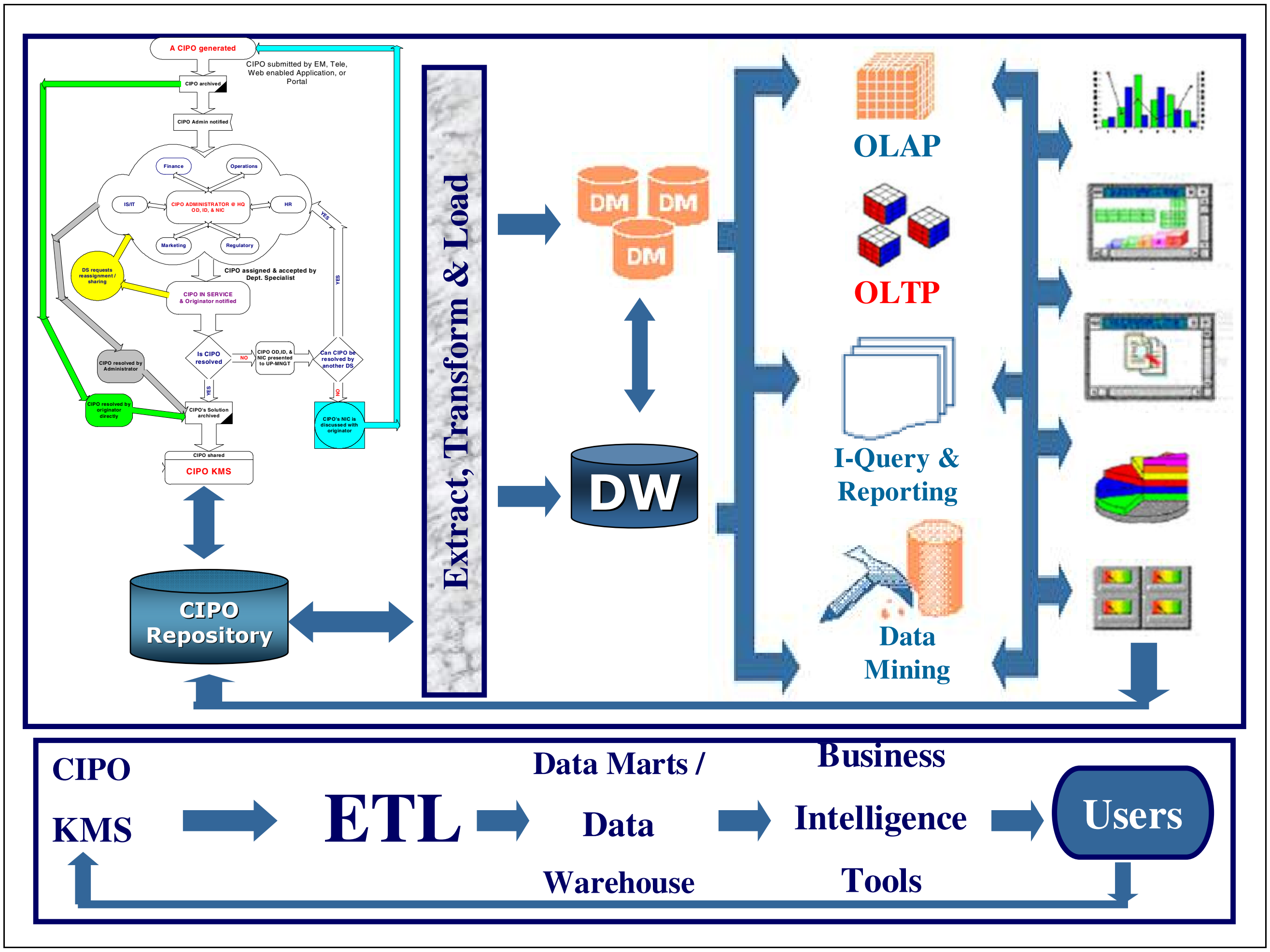


Figure 3. The CIPO KMS and BI Tools.

Example of Using the CIPO as a KMS Strategy to Capture Tacit Knowledge

Organization X is a national company with more than 80 locations in 34 states all operated by the national headquarter office. With the organization continuously subject to regulation and compliance issues and challenges at the federal and the state level, the home office has adopted a strategy of standardization of operations in all of its functional departments including finance, IS/IT, marketing, regulatory, human resources, and operations. However, with its wide distribution, the organization was constantly facing new and ongoing challenges in the execution and rollout of any plans devised at the corporate level and executed at the local level. The business interrelations and the interdependencies between the various departments at the corporate level and in each location, coupled with the nature of people and the nature of tacit knowledge mentioned previously, presented this organization with tremendous challenges and in some cases led to significant loss of productivity and competitiveness. The most common of these challenges was always refereed to as the "right hand does not know what the left hand is doing" or "the corporate office is an ivory tower completely out of touch with the realties in the field." Efforts to address certain issues or resolve some problems from one location to the next varied and were often duplicated at the cost of allocating additional resources and more direct involvement from the upper management. The share of best practices, problem resolutions, and opportunities from sharing the participants' tacit knowledge was literally unheard of. The CIPO model was adopted as a strategy and a knowledge management system at that time to bridge the gap between the various departments, the field, and address the loss of knowledge and the duplication of efforts as well as contribute more to the standardization of the company's operations to remain compliant with the various government and state agencies.

Using a helpdesk and a web enabled application; this CIPO system was designed to also interface with the e-mail and telephone systems to input concerns, issues, problems, and opportunities from the field. The data structure of the CIPO system consisted of relational tables that included the following data elements for every CIPO:

1. Originator information including (OD):
    a. Name
    b. Functional department
    c. Location
    d. District
2. Date and time of the CIPO entry
3. A system assigned CIPO identification number for tracking (CIPO-ID)
4. Description of the CIPO (NIC)
    a. Nature of the CIPO
    b. Impact of the CIPO
    c. Consequences of the CIPO

Before submitting the CIPO, the user may choose to search the CIPO repository database by key words from the nature of the CIPO and by department to locate an existing resolution or best practice. If the search returns a positive match, the user may accept it or else proceed with submitting his or her CIPO. The CIPO can be submitted through the company's portal or generated from an e-mail or a telephone message. Once submitted, the CIPO is viewed by the CIPO administrator and directed to a department specialist (DS) based on the nature and the functional department of origin. This distribution is also logged and tracked by the system. The CIPO originator is notified and a tracking and resolution status is assigned to the CIPO. Any department specialist may request to share the CIPO with another DS where cross functional and interdependencies between functional departments may exist. The sharing or reassignment of the CIPO must approved and completed by the CIPO administrator The latter must be very knowledgeable about the company's mission and objectives, and have some knowledge and a minimum essential understanding of all the company's functions and operations and the interrelations and interdependencies between all the functional departments. In cases where the CIPO could not be resolved by the admin and the department specialist, an escalated CIPO is created and presented to the upper management to decide if the CIPO will have to be readdressed and resolved by a designated DS with more guidance from upper management or discussed with the originator directly. At that point the CIPO may be resubmitted with new information or resolved directly by upper management before being archived and added to the CIPO data repository. CIPO's may also be resolved directly by the administrator and archived particularly when the CIPO is an opportunity submitted as a best practice, a suggestion, or an idea for business or process improvement or a possible resolution to an existing issue or a problem.

To encourage the employee to participate and promote the sharing of their tacit knowledge, a new program was designed to sponsor employees to formally submit their suggestions, ideas, and best practices. The program consisted of collecting and reviewing all employees' entries and evaluating them at the end of each year to make a final selection of the best ideas that can be implemented to improve the organization's operations and output as well as best practices that can be readily replicated system wide. All final selections were recognized and rewarded. This reward included monetary award for best of the best selection from the best practices from all locations and an individual monetary reward and recognition for each idea selected, adopted, and implemented by the company.

Summing it up, the output of the CIPO model as a KMS is in line with what Birkinshaw, (2001) pointed out as key component of the infrastructure of a KMS. According to Birkinshaw, (2001) employee skills and prior knowledge are considered key, given that there has to be minimum knowledge about knowledge building before the initiative can be undertaken. In comparison, the CIPO implementation with organization X was initiated with seeding the CIPO repository database with some existing best practices and experiences that was solicited from current employees with the support of the IT infrastructure. The process of codifying and storing this initial tacit knowledge was conducted through e-mail and face to face meetings with focus groups and task committees taking into account relationships, norms, values, and standard operating procedures. This approach is also in line with what Seemann et al. (1999) thought of as the deliberate design of processes, tools, structures, etc. with the intent to increase, renew, share, or improve the use of knowledge represented in any of the three elements [Structural, Human and Social] of intellectual capital. Consequently, the use of the CIPO model as a KMS in the form of activities, systems, and technologies led to the capacity to generate, integrate, capture and reuse knowledge. To many in the domain of KM, this is the essence of building knowledge capital and the organization's intellectual assets.

Clarke and Rollo (2001) uttered that the organization's ability to articulate, generate, and capture and reuse its tacit knowledge is the core capability that enables human creativity and management of intellectual assets, resulting in differentiated processes and products.

BI and the Transformation of Tacit Knowledge

We all are familiar with the saying "knowledge is power." However, as stated previously, the benefit comes not from hoarding knowledge but rather from capturing and sharing tacit knowledge for widespread reuse. To this end, the concept of knowledge as power must be interpreted not as "personal knowledge is personal power" but rather must be examined in context of an intelligent organization. As noted by Weske et al. (2004), with more organizations evolving into collaborative structures where the reuse of tacit knowledge from a team-oriented environment has become fundamental, the concept of shared knowledge becomes the driving force behind intelligent organizations. Although the need and desire to share knowledge is obvious by all counts, tacit knowledge is unlikely to be shared unless it is easily captured and transformed to a reusable format. To this end, both business and IT staff may come together to integrate networking technologies, hardware platforms, database management systems, data warehousing, and BI tools including ETL (Extract, Transform and Load) to get knowledge out of people's heads and capture their insight that is not normally explicitly documented. As such, participants in any organization would spend countless hours searching information, mining, and manipulating data, trying to extract trends to point out anomalies. However, the 'aha' moments that are the fruition of their analysis is the insight or tacit knowledge, not linked to specific reports or charts, that is often hard to capture, share, and reuse.

The primary concern (and what is most imperative in capturing this insight) is the tacit knowledge in people's heads can only be stored for reuse if it is extracted and transformed as part of the natural process of building intelligent KC. Gathering this insight of participants and integrating the organizational tacit knowledge into its existing locked-up metadata would also add to organizational capital knowledge the needed intelligence to turn business intelligence into higher intelligence. Hence the use of ETL tools becomes the vital part of the CIPO model when it comes to using BI in the transformation of tacit knowledge to build intelligent KC as the next section attempts to show.

The Role of ETL in Building Intelligent KC

ETL the Birth

ETL was first introduced as sets of data handling tools with the first intent to populate data warehouses in basically three steps:

1) Pulling data from relational databases RDBMS (Extract)

2) Manipulating and massaging the data to convert it into standard formats of records and fields (Transform)

3) Finally uploading the massaged data into data warehouses or data marts

This threes step approach to handling data came to be known as ETL and software companies rushed to engineer and develop GUI application and software tools designed to extract, transform, and load data. With the expansion of BI into analytical business support systems and with BI evolving into a Business Performance Management BPM, came the need to integrate ETL and interface these tools with various data sources from different heterogeneous systems including ERP systems, CRM, legacy systems, and various other database sources that are often incompatible. This had to be done to meet the growing appetite of BI users for intelligent reports and intelligent queries. Hence, the focus of ETL shifted from a data mart-centric to BI-centric driven by this growing need for analytical data reporting used in business decision making and enterprise operations. According to Golfarelli et al. (2004) this support for bottom-up extraction of information from data bridged a gap and marked a turning point in the history of BI. Consequently, “BI is no more perceived as a set of techniques for information extraction and processing, but also as an active and concrete approach to business management” (Golfarelli et al., 2004, p.2). Research has shown that with this shift in the BI approach to BPM, the demand for ETL software with data integration capability grew. With this growth the industry has been showing tremendous progress in the sophistication of the ability of ETL tools to scrub data clean by purging phony records, duplicates, and ensure data integrity and quality (Figure 4). This also led to the creation of more powerful Meta data management for better reporting and data restructuring capabilities.

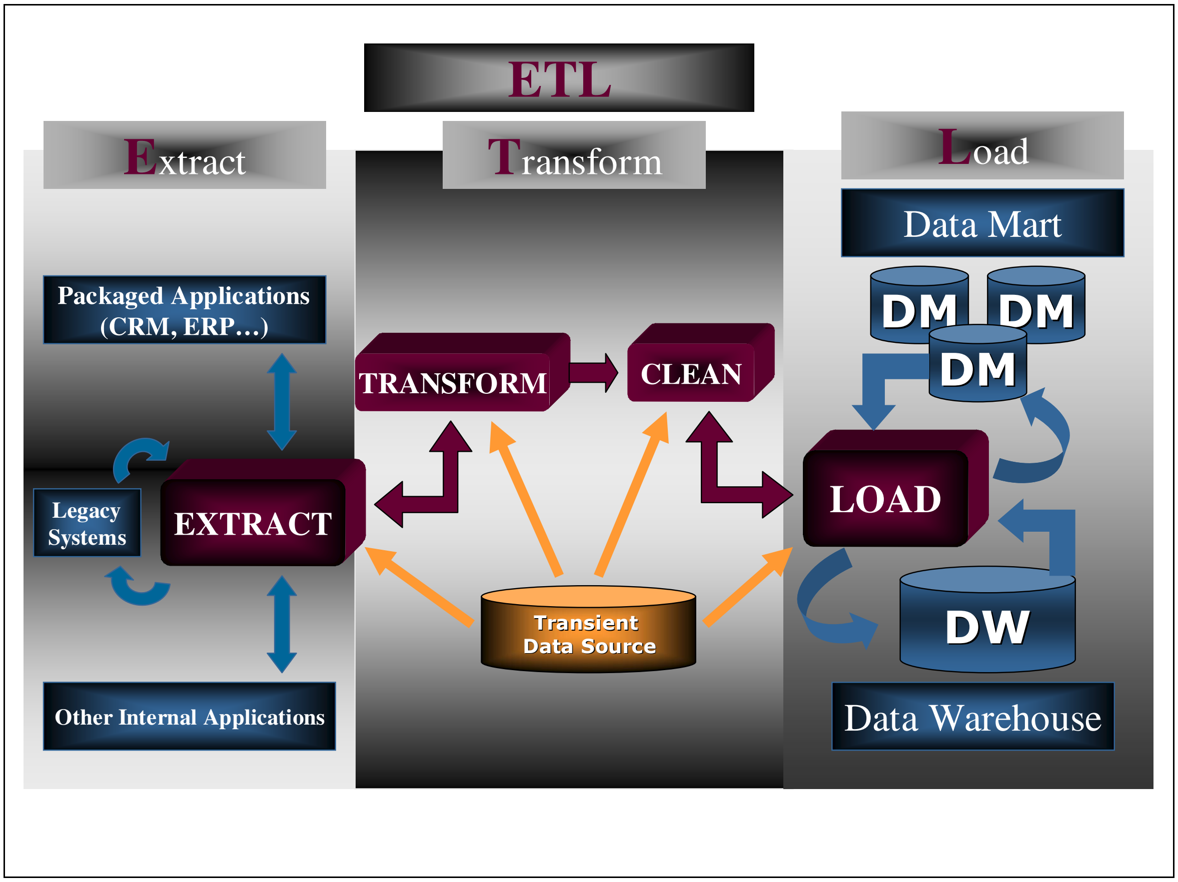


Figure 4. The ETL Diagram.

ETL and Building Intelligent KC

Golfarelli et al.(2004) argued that at the heart of BI is the process of turning data into information and then into knowledge. To this end BI is all about bringing data to users and empowering them with tools and techniques for converting the data into rich business information as coined by Weske et al. (2004). This information extraction and processing can be accomplished by ETL tools. According to Nguyen et al. (2005), advances of modern technologies in various domains has accelerated the intensity of competition, increased the volume of data/information available, and shortened decision-making cycles considerably. Nguyen et al. (2005) conducted their research on Real-Time BI and concluded their study with introducing an enhanced BI architecture that covers the complete process to sense, interpret, predict, automate and respond to business environments. Nguyen et al (2005) asserted that data from various data sources can be extracted, transformed and loaded into the Data Warehouse via ETL components. Additionally, Nguyen et al (2005) also concluded that the traditional ETL tools are only designed to handle batch operations in the form of updates to the DW while offline. However, while real-time ETL components are readily available, using them to extract and transform data outputted from the data collection and gathering module of the CIPO system will not be possible. This type of data extraction and transformation will be limited to offline operations given the nature of the data and its raw format.

According to Graff and Gabarro (1996), for many organizations, their competitive advantage hinges on harnessing their employees real-life experience, talents, and skills in ways that are much superior to competitors, thus allowing for better knowledge sharing and faster organizational learning. The proper implementation of ETL would consist of an interface with the CIPO repository database to extract, transform, and load the data and information gathered by the CIPO system into a data warehouse and data marts as shown in (Figure 3). This approach will lead to the transformation of the real-life experiences of employees and their tacit knowledge and insights culminating from their 'aha' moments as well as the outcomes and the resolution of all concerns, issues, problems and opportunities into new forms of metadata. The interface between the CIPO repository database and the ETL tools will ensure that the data is scrubbed clean of any bogus records and duplicates as part of a data integrity check. The data is then transformed uniformly into a recognizable format by the target repository prior to being loaded to be exploited. This newly articulated form of data and information would become subject to additional data mining and extrapolations using additional BI tools before the outcomes are stored back into the CIPO repository to be shared and reused. With every additional iteration of the data and information generated from the CIPO system and the interfaces with the ETL and the BI tools, the output is turned into more intelligent knowledge. This process illustrated in (Figure 5), will farther augment the organization's KC and moreover turn the business intelligence into higher intelligence ultimately leading to the transformation into an intelligent organization.

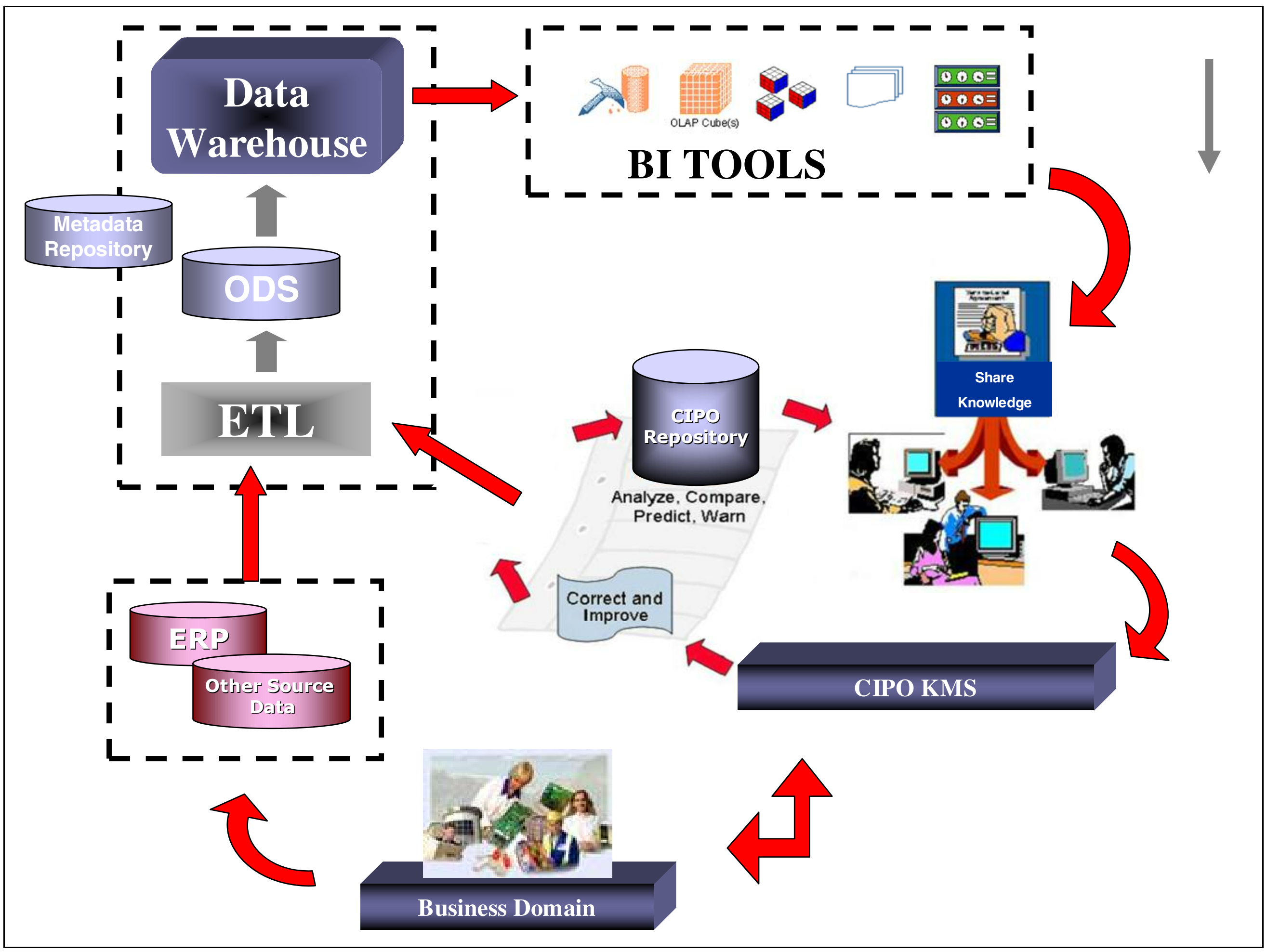


Figure 5. Applying BI Tools.

Summary

According to Mason (2004), a successful KM program has the potential to transform an organization. Van Buren (1999) also asserted that measuring the value and the performance of knowledge assets is the second most important challenge all organizations are facing in today's knowledge age.

The CIPO system is introduced as a way to build KC by gathering and capturing both tacit and explicit knowledge. This CIPO system should be integrated into a database management system with a dynamic repository of all CIPOs generated and a web-enabled application to share and broadcast all the CIPOs to all users. This knowledge broadcast and sharing should be on the basis of predetermined protocols and user access rights set by the organization. This system should completely interface with all other existing applications, including legacy systems, within the company's intranet or portal to create a KMS that is referred to as the "CIPO Knowledge Management System."

In summary, the main function of the CIPO KMS is to first capture knowledge as a natural extension to existing organizational processes (Figure 5). The second step, as recommended by Mason (2004), should streamline and unencumber the knowledge review process as much as possible. Therefore, review of information value should rapidly ascertain importance and applicability within the CIPO system. The third step requires employing standards to enhance knowledge quality. In this step, all CIPOs should be subject to a standardization that contributes to quality, and all CIPOs should be subjected to a streamlined review of submissions. If all workers understand the requirements for these knowledge entries, the postings will adhere to common and standard formats and, for the most part, contain relevant content deemed valuable to building the organization's KC that would ultimately lead to achieving sustainable competitive advantage.

With organizations waking up to the need to define, measure, and analyze business processes, the need to combine BI in building KC has never been greater. We close this paper by adding that applying BI tools to CIPO KMS is a process-oriented enterprise that depicts true convergence between business management and IT applications.

CHAPTER 3. METHODOLOGY

Research Question/Hypothesis

The research question is:

> Can Business Intelligence (BI) be incorporated into building knowledge capital (KC) and what are some of the essentials requirements needed to use BI tools to create an intelligent KC that leads to a sustainable competitive advantage and transform a company into an intelligent organization?

Research Hypothesis

The following hypothesis (Alternative and Null) were derived from the research objectives and the latter research question:

$H1_a$: The loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equate to loss of KC.

$H1_0$: The loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge does not equate to loss of KC.

$H2_a$: Loss of tacit knowledge and KC affect the organization's sustainable competitive advantage.

$H2_0$: Loss of tacit knowledge and KC does not affect the organization's sustainable competitive advantage.

$H3_a$: BI and some BI tools might be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization's KC.

$H3_0$: BI and BI tools cannot be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization's KC.

$H4_a$: There are specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.

$H4_0$: There are no specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.

Research Process

Overview

In toady's knowledge age, the need to capture, extract, transform, and reuse both tacit and explicit knowledge to build KC has never been greater as organizations continues to struggle to cope with information overload and an overwhelming growth of data. Consequently, organizations must research and apply every solution or tool available at their disposal to ensure the success of their operations and remain competitive. Given that the integration of BI and building capital knowledge was never attempted before as a knowledge solution with the use of the CIPO model, the research was conducted to determine how business organizations view and use knowledge building. This research introduces the concept of integrating the CIPO model with BI to capture, transform, and convert tacit knowledge to articulated knowledge. The research also aimed at using knowledge managers and IT directors and information systems analysts and users to identify any specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge. An international organization with global operations in several continents was selected for this case study research. This International Company will be referred to as "Organization X" to ensure the confidentiality of this organization and the research participants.

Mixed Methodology Research Design

The principles of mixed methods research was used as the base of this research design. According to Tashakkori and Teddlie (2003) the mixed method research approach allowed the researcher to become perceptive of the participants experience and gain a good understanding of their behavior in a condensed timeframe. Using the latter approach, the understanding of the organization was also accelerated. A methodological congruence was assured through conducting a survey questionnaire that was based on the findings of the in-depth interviews with the key participants. The survey questionnaire was hosted online and an invitation to participate with instructions was e-mail to the entire KM managers and IT/IS directors and analysts at Organizations X. A procedural overview was conducted to depict the combination of inputs and findings from the qualitative interviews and the quantitative survey results. Accordingly these results were analyzed to derive some conclusions and draw from a set of interpretations.

Organizations and Participants

To preserve the rights of the participants and ensure the organization's confidentiality, the following steps were implemented:

1. A formal proposal outlining the entire research was submitted to the doctoral committee at Capella University
2. Upon acceptance of the proposal by the doctoral committee, a formal request was submitted to the Capella University Institutional Review Board (IRB).
3. A request for exemption from federal and university regulations was submitted since this research did not involve any state or federal funding, all the participants are over the age of 18, and there was no insidious use of human subjects.

Description of Participating Organization

Organization X was selected for this research based on several factors and in accordance with certain criteria needed for this research and offered by Organization X. The learner is not employed by the selected organization X and holds no personal interest in this organization. First the latter is an international firm conducting projects and operations around the globe that require use and reuse of knowledge, personal skills, and experience from different participants at different levels and in several different areas and disciplines. The competitive edge and success of Organization X is dependent on how well information and knowledge is extracted, used, shared and protected. To accomplish this goal, organization X has invested heavily in its IT infrastructure and Information systems and recently embarked on a knowledge management initiative.

The selected organization X is a leading innovation-driven international corporation publicly held company for over 35 years. According to this organization's mission, the company is committed to developing a growing portfolio of best-in-class medical products that help people live longer, healthier, and more active lives. Organization X has had a long history of meaningful medical innovation, most notably in the treatment of infectious diseases and depression. According to recent figures, there are more than 20,000 people working for this organization worldwide. Organization X has sales offices in 45 countries and markets its products in approximately 150 countries. As an Intercontinental company, organization X relies on the output and internetworking efforts of its various business functions and entities including research and development, marketing, manufacturing, engineering, information systems, management, regulatory affairs for legal and compliance, and telecommunications in addition to its global operations divisions. This organization continues to employ several thousands around the globe and its revenues are totaled in billions of dollars. The organization structure is depicted in (Figure 6). The culture of organization X was observed to be informal and the company values its human assets above all. Organization X offers its participants excellent benefits and sponsors many family and social events and activities to promote family and organizational values. All the facilities and buildings of organization X are state of the art and security is a very high priority.

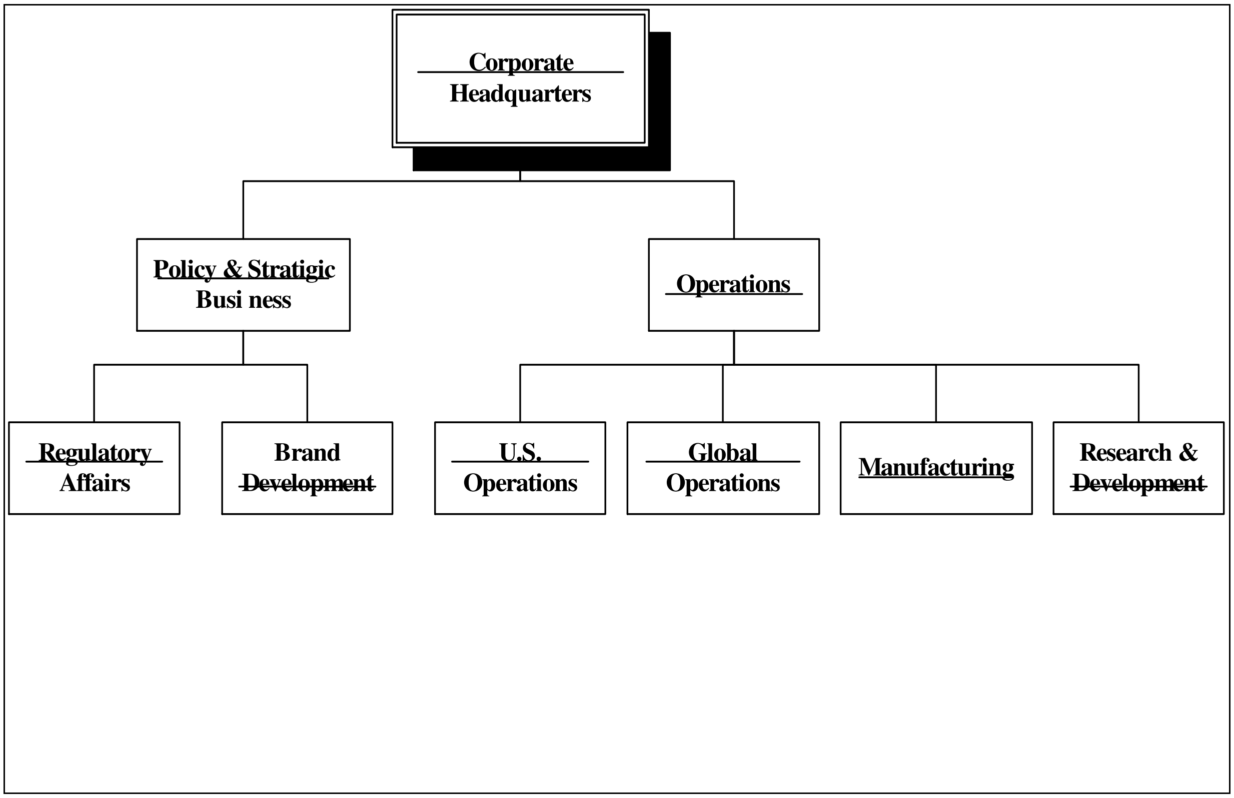


Figure 6. Corporate Structure.

The participants in this research were selected based on three main criteria:

1. Participants must belong to one of the two departments; IT group or the KM group and the corporate and executive management.
2. The participants must be an active employee of organization X performing one of the following functions:
   a. Knowledge dissemination and KMS user support.
   b. Information Systems design, development, analysis, and user support.
   c. IT infrastructure and strategic planning.
   d. Corporate management and strategic planning.

3. All participants must be approved by management and given enough support including time off and access to the online survey during the collection of data.

Since only one organization was selected for this research and this same organization is small enough, there was no need to select a random sample for the survey group. All participants from both the IT and the KM departments were used along with the management group.

Supporting Documentation

To better understand the current KM initiative and how the organization defines KM and the methods used to collect and share knowledge within organization X, corporate documents and applications such as the company's portal, KMS, and reports used to gather and disseminate information were examined. Analysis of the latter documents and information allowed the researcher to identify and understand the difference between the organization's view of what constitutes knowledge building and the use of BI to farther build intelligent knowledge capital taking into account the organization's internal and external business environment data, the company's business process management, and how participants view the company's collection and share of knowledge.

Research Design Instruments and Strategy

Pilot Study

Mason (2004) asserted that when conducting a qualitative inquiry that test intellectual concerns, a pilot study is needed particularly when the researcher is unsure of the proposed effects of the research questions and whether the proposed strategy would work in the field. According to Mason (2004), it is absolutely necessary to pilot sampling strategies, data generation, and analytical techniques. By the same token, Light et al. (1990) also suggested the need to conduct pilot studies given that the full spectrum of the research design and all aspects are more likely to be realized by performing small-scale exploratory studies beforehand. Light et al. (1990) noted that carrying a pilot as a preliminary study, would result in systematically examining specific facets of the design, and ultimately leading to further refining and making improvements before the main study is conducted. Within this context, the researcher conducted a pilot study intended to detect any flaws in the design and any potentialities for improving and refining the data collection instrument.

A pilot study was conducted under the same conditions using respondents from organization X and the same in-depth interview questions designed for this study. The number of respondents selected for this pilot study was four participants also identified as part of the same population used in this research. The four respondents consisted of a senior manager, the head of a global division, the lead project manager of the organization's KM initiative, and a project manager from the IT department. The researcher interviewed the four participants in this pilot attempting to address not only issues of validity and reliability, but also any administrative procedures that allowed this study to move forward. The results of the pilot study proved to be very constructive in refining the instrument used for the data collection. As a result, several questions from the initial survey questionnaire were omitted while several other questions were revised and reworded according to the feedback and evaluation gained from the pilot study. Another key value gained from conducting the pilot study was giving the researcher the opportunity to practice interviewing and doing follow-up with participants from organization X.

In-Depth Interview

In-depth interviews consisting of 12 questions were conducted with the directors and managers of the IT/IS and the KM departments. This choice of 12 questions in-depth interviews (Appendix J) is based on comparable studies conducted by experts such as J.M. Morse in designing funded qualitative research (Morse, 1994). The in-depths interviews were designed to be used in conjunction with the supporting data and documents to gain an insight into the participants' perceptions of how tacit knowledge could be best captured, transformed, extracted t, and shared throughout the organization (see Table 1). This method allowed the researcher to also identify the organization's current KM and KC realities and the needs for a better system and tools to build intelligent knowledge capital that would ensure sustainable competitiveness.

The in-depth interviews were held at the organization's corporate office in sessions. Each session did not exceed 60 minutes to minimize the interference with the participant's job tasks and performance. The interviews were recorded to allow the researcher to cross reference and to have a backup audio to use for farter analysis and reporting. Each interview session was conducted in a professional but friendly and open manner. All participants were given an overview of the CIPO model and how it could be used to capture tacit knowledge within an organization.

Table 1. In-Depth Interview Questions

1) How do you and your organization define and use Knowledge Management and building Capital Knowledge?
2) How do you and your organization define tacit knowledge and what tools and systems are there currently used to capture and reuse this type of knowledge?
3) How does your organization define success with your current KM initiative in terms of building and sharing knowledge?
4) How do you and your organization define BI and the use of BI tools?
5) Describe the current use of BI within your organization and who are the main participants and their roles?
6) Based on your experience, what do you think is needed to integrate BI tools with building knowledge capital?
7) Given the CIPO model as a mean of gathering and storing tacit knowledge in a data repository, how do you and your organization define the integration of this model into your Knowledge Management System?
8) How do you and your organization see the use of BI and BI tools integrated with the CIPO model contributing to building intelligent knowledge and ultimately a sustainable completive advantage?
9) How do you and your organization define the transformation of tacit knowledge captured in the CIPO repository into data elements fit for a meta-data format?
10) Do you believe data structures and systems requirements could be identified to support the transformation, extract, and loading of tacit knowledge into meta data cubes and what would be the nature of the interface between the CIPO method of gathering tacit knowledge and the integration of BI?
11) How do you and your organization go about to identify such requirements?
12) How do you and your organization view building intelligent knowledge capital through this integration of the CIPO model and BI leading to the transformation of your company into an intelligent organization?

Survey Questionnaire

In the area of the design and evaluation of information and knowledge management systems similar to the topic of this research, the case study research method is particularly well suited, since the overall object of this discipline is the study of knowledge management systems in organizations "interest has shifted to organizational rather than technical issues" (Benbasat et al. 1987). The data pool for this research came from an empirical inquiry that investigates methods to build knowledge capital as a contemporary phenomenon within its real-life context in organization X with several different locations geographically dispersed across the globe. The technique chosen for collecting the research data and other empirical materials consisted of a survey questionnaire and documentary materials from organization X. This written data sources included the organization's published and unpublished documents, company reports, memos, reports, e-mail messages, and newsletters on the organization's initiatives on knowledge management and attempt at building KC.

Questionnaire Design

Generally research is driven not by the choice of the researcher's paradigm of research or choice of research methodology but rather by the nature of the data being captured and the problem being addressed. Spradley (1979) asserted that with quantitative methods such as surveys, the researcher is primarily concerned with gathering data known about a problem that will allow formulating and testing a hypothesis. To this extent, this research is concerned with observable, objective, measurable facts, physical characteristics and the outside world something that does qualify it as a quantitative data analysis with the aim to operationally define the concepts of research subject and what scientific theory can explain the data gathered. A survey of 30 questions was administered to the IT and KM staff and managers online (Appendix A). The questions were first revised based on feedback from the pilot study, then from the themes and paradigms gained from the literature review and the in-depth interviews. One part of the survey addressed the perceived performance of the system and attempted to gather key requirements for transforming tacit knowledge. Another part of the survey addressed the perceived value of a knowledge base management system that uses BI tools integrated with the CIPO model and their intention, or willingness, to use it. The format of the survey questionnaire was also based on research methods outlined in the work of Pamela L. Alreck & Robert B. Settle, The Survey Research Handbook.

Questionnaire Target Population

The selected population consisted of the IT managers of all locations and the IT directors along with the staff and managers of the organization's Knowledge Management department at the corporate office. Since the total population is less than 100, there was no need to perform a sample selection and the entire population was used.

Qualitative Methodology

In this qualitative portion of the study, the grounded theory methodology was used to conduct the research following the Glaser (1998) approach. According to Glaser (1998), grounded theory begins with a research situation and the researcher seeking to understand what is happening in the research situation, and how the participants manage their roles. Both Strauss and Corbin (1990) and Glaser (1998) also noted that while exploring the research situation in grounded theory is mostly done through observation, focus groups, and conversation, interviews are commonly the foremost source of information used to develop a theory from. It was noted that the themes to be discovered in this research situation were contained within the participant's theories and grounded in the issues, problems, challenges, and relevance of knowledge building and management the participants are also facing in their business domain. Hutchinson (1988) also argued that "Grounded theory offers a systematic method by which to study the richness and diversity of human experience and to generate relevant, plausible theory which can be used to understand the contextual reality of social behavior" (pp. 126 - 127). According to Cooper and Schindler (2003) interviewing has several strengths such as: the interviewer can do more things to improve the quality of the information received than with other method; they can note conditions of the interview, probe with additional questions, and gather supplemental information through observation; interviewers also have more control than with other kinds of interrogation. To this end, using a grounded theory methodology in the form of in-depth interviews to explore and discern the possible relationships between building knowledge capital, use of BI and BI tools in knowledge management, business process management, and organization intelligence, was considered the best setting to produce a relevant framework to guide this research.

The use of grounded theory at the qualitative stage of this research, allowed the research to conduct interviews with a total of eleven participants, including executives, managers, and employees from the IT and KM departments, and perform constant comparisons to use the data to generate main themes, topics, concepts and their variations as dependent and independent theories (Appendix D). Lahey (2003) defined concepts as "Categories of things, events, and qualities that are linked together by a common feature or features, in spite of their differences" (p.273). Furthermore, the researcher was interested in discovering patterns of action and interaction between the participants and among the various level and types of their organizational and social status baring effect on their theories and the most important features held within their theories, including any evolving dependences. Strauss and Corbin (1994) postulated that this consists of "Plausible relationships proposed among concepts and sets of concepts....... researchers are also much concerned with discovering process - not necessarily in the sense of stages or phases, but in reciprocal changes in patterns of action/interaction and in relationship with changes of conditions either internal or external to the process itself" (p.274). The in-depth interviews questions (Appendix I) used in this grounded theory method, afforded the researcher an opportunity to explore and categorize the participants' theories on building knowledge capital, organization intelligence, and some of the relationships noted or observed by the interviewees involving dependent and independent variables. The main themes and concepts recognized from the constant comparison of the interviews notes and data were further used in the design and development of the questionnaire employed as the data collection instrument in the following quantitative phase of this research.

Inductive reasoning was the driving factor in this research. A case study model was used to examine and identify any possible relationships between the various variables including the integration of the CIPO model with BI, the transformation of tacit knowledge, and the gathering of key data structures and system's requirements needed for the extraction, transformation, and loading of tacit knowledge in its rough data element and information state. The case study approach is believed to be the best choice for this type of research since the primary objectives are to discern existing relationships between the variables and requirements that need to be outlined to address the research questions. According to Glaser and Strauss (1999), case study is described as "In discovering theory, one generates conceptual categories or their properties from evidence; then the evidence from which the category emerged is used to illustrate the concept" (p.23). As stated earlier, the main objective of this research is to identify some of the requirements needed to transform tacit knowledge into a Meta data format that will allow users to apply BI tools to further extract intelligent knowledge, hence build an intelligent knowledge capital.

Quantitative Methodology

As part of this quantitative method, statistical measurements and comparison of data were used from beginning to end. The survey data was coded, loaded, and analyzed using SPSS to extract results that were presented by numerical data or graphs and charts. Given the latter approach, various statistical tools and methods from the SPSS package could have been applied to this research. However, considering the multivariate nature of data collected using the survey, the multivariate analysis method was used instead of a simple regression analysis. Empirical research is almost invariably done with more than two variables and as reported by Lattin et al. (2003) this would be the essence of Multivariate Analysis defined as the analysis of data with three or more variables, that is, where there are a minimum of three measures for each variable or individual under consideration.

With 29 different variables resulting from the survey, the multivariate analysis with Factorial Analysis techniques was the best fit method to analyze the collected data and results of this research. Essentially as noted by Huberty (1992) the various techniques may be classified as either hierarchical (linear composite), where one variable affects another as in Factor Analysis (FA); or clustering, where we attempt to predict group membership based on similar measures, as in Cluster Analysis (CA). To this extent, asserted Huberty (1992) these statistical techniques and methods are used to predict a criterion variable (as in Multiple Regression); group membership (as in Discriminant Analysis); group comparison (as in Analysis of Variance); and structure (for example Factor Analysis). According to Lattin et al. (2003), "Principal components analysis is a method for re-expressing multivariate data." (p. 52). Similarly, Stevens (1986) postulates the basic goal in PCA is to reduce the dimension of the data. According to several authorities including Cooley and Lohnes (1971); Harman (1976); Kim and Mueller (1978a, 1978b); Lawley and Maxwell (1971); Lindeman, Merenda, and Gold (1980); and Morrison (1967), PCA is a procedure for transforming a set of correlated variables into a new set of uncorrelated variables. In other words, PCA is a way to identify patterns in data and to express the data in such a way as to highlight their similarities and differences.

From the SPSS tools available, the Principal Components Analysis (PCA) as an FA statistical method was the selected technique to identify patterns in data and to express the data in such a way as to highlight their similarities and differences. This technique also allowed the researcher to re-express the multivariate data and reduce the 28 coded variables to a more manageable number. The Multiple Regression Analysis was selected as another statistical method to aid in sorting out the interaction effect of the constructs and to identify the support or rejection of the research hypotheses. Prior to executing the multiple regression procedure the variables that applied directly to the research question and hypotheses were classified based upon the subjective measures and the Likert scale items used with some of the variables in the data collection method.

The other main advantage of using PCA in this data analysis is the identification of patterns of association among the coded 28 variables. Once certain patterns are found in the data, it can be compressed by reducing the number of dimensions and without much loss of information. Overall, PCA involves a mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components. The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible. According to Lattin et al. (2003), "using a single dimension to capture and convey most (if not all) of the information contained in the variables, is what principal components analysis is all about: finding a smaller number of dimensions that will account for a sufficient amount of the information in the original variables." (p. 56).

The overall framework for the data gathering and coding from the survey questions consisted of conducting the survey online. Additionally, all respondents were contacted in person to make sure that enough responses are received. E-mail correspondence and telephone contacts were also used to follow up with the respondents. The data from the survey questionnaire responses for analysis was properly documented in an Excel sheet from the online survey results then organized and uploaded into an access database before being converted to an SPSS data file. This data formatting and organization made it easier for the researcher to save more time during the analysis stage when SPSS was used.

To maximize potential respondents' participation, in collaboration with the organization, initial contacts of all the respondents took place by writing an introductory letter through an e-mail to explain the survey questionnaire, introduce them to the CIPO model, and give them additional instructions on how to access and complete the survey. To further develop trust with the potential respondents and maintain it through the data gathering stages, an information sheet was developed and shared with the respondents to disclose the purpose and objectives of the survey as well as the expected research findings and assure anonymity by holding the response information in strict confidence. This practice resulted in a higher rate of response. Of the 82 participants invited to complete this survey, 63 took the survey within the specified timeframe, resulting in a 77% rate of return.

Addressing the Research Hypothesis

The in-depth interview and the survey questions were designed to collect data that can be analyzed to first address the basic assumption made by this reasearch that loss of knowledge, particularly tacit knowledge that exists in the minds of participants, equals loss of knowledge capital. The data collected was used to identify any correlation between the particpant's perception of the value of tacit knowledge and how important it is for organizations to capture and reuse this type of knowledge. The multivariate data analysis helped identify the effect of loss of tacit knowledge on the organization's ability to compete and allowed the researcher to determine any correlation between sustainable cometitive advantage and the need for organization to explicitly manage their intellectual resources and working knowledge particularly tacit knowledge that exists in the minds of participants. Both the in-depth interview and the survey aimed at identifying the awarness of IT and knowledge managers and workers of the possibility to use BI and some BI tools to transform and convert tacit knowledge.

Initially, the collected data was analyzed from the scoring model survey received from the participants. According to both Maltin (1989) and Buss (1983) the scoring model is a quick and compelling method for arriving at the evaluation of alternatives. It gives alternative systems a single score based on the extent to which they meet selected objectives. When using the scoring model, one would use a column to list the criteria and requirements according to which BI tools or systems are noted by the respondents. Another column is then included that contains the weight attached to the criteria or requirement. The model includes other columns (depending on the number of systems and BI tools) that contain a 1-to-5 scale (lowest to highest) used to express the judgments of participants on the relative merits of each system or tool. For example, concerning the data accuracy need that each system meets, a score of 1 argued that this system is low in meeting data accuracy needs when compared to the others being considered.

A mean value analysis was performed. The mean for each of the BI tools and systems, measured in the questionnaire, was determined. The determined mean value for each of the BI tools and systems was plugged into a spreadsheet. A standard deviation bar charts were also produced using the mean scores form the scoring model. The graph conveyed the IT/IS managers' and KM administrators' perceived value of the BI tools and the automated knowledge base management system proposed. Furthermore, IT/IS and

KM managers' responses were separated by educational level and field experience in knowledge management KM and use of BI tools then analyzed separately. This insured the consistency of results among all work experience levels of the respondents. The data collected from the in-depth interviews and the survey allowed the research to identify and gather some of the fundamental requirements for data design and strcuture that will make the extrcation and transformation of tacit knoweldeg feasible. In terms of data analysis, both descriptive and inferential statistics were used to accomplish the following:

1. Analyze professional knowledge of the respondents in KM and BI,
1. Analyze knowledge and expertise of the organization to use BI to build KC,
2. Establish and prioritize criteria for measuring knowledge management success and use of BI to build KC,
3. Analyze relationship between criteria and various requirements needed to use BI tools to build KC, and
4. Test hypotheses associated with the research questions.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

Qualitative Phase

The use of grounded theory at the qualitative stage of this research allowed the researcher to conduct interviews with a total of eleven participants, including executives, managers, and employees from the IT and KM departments, and perform constant comparisons to use the data to generate main themes, topics, concepts and their variations as dependent and independent theories. Lahey (2003) defines concepts as "categories of things, events, and qualities that are linked together by a common feature or features, in spite of their differences" (p.273).

Furthermore, the researcher was interested in discovering patterns of action and interaction between the participants and among the various levels and types of their organizational and social status baring effect on their theories and the most important features held within their theories, including any evolving dependences. Strauss and Corbin (1994) postulate that this approach consists of “plausible relationships proposed among concepts and sets of concepts…researchers are also much concerned with discovering process - not necessarily in the sense of stages or phases, but in reciprocal changes in patterns of action/interaction and in relationship with changes of conditions either internal or external to the process itself” (p.274). The in-depth interview questions (Appendix J) used in this grounded theory qualitative method afforded the researcher an opportunity to explore and categorize participants' theories on building knowledge capital, organization intelligence, and some of the relationships noted or observed by the interviewees involving dependent and independent variables. The main themes and concepts recognized from the constant comparison of the interview notes and data were further used in the design and development of the questionnaire employed as the data collection instrument in the following quantitative phase of this research.

Quantitative Phase

Spradley (1979) asserts that with quantitative methods such as surveys, the researcher is primarily concerned with gathering data about a problem that will allow formulating and testing of a hypothesis. In this quantitative data analysis portion of the research, the aim is to operationally define the concepts and themes identified in this research subject and determine what scientific theory can explain the data gathered from the survey. In this quantitative phase, all aspects of the study were carefully designed before data was collected.

The data collection and measurement tool consisted of a questionnaire with 30 questions (Appendix A) hosted online. Of the 82 participants invited to complete this survey, 63 took the survey within the specified timeframe, resulting in a 77% rate of return. The questionnaire was designed to collect data using contained intervals. This design also resulted in 30 different variables creating multiple factors and categories. Here, as noted by Spradley (1979), the objective of the researcher using the quantitative method is then to examine and identify paradigms that provide baseline descriptive understandings of the relationship among the concepts, and of their relation to indicators that are in agreement or disparate with the research hypothesis and questions on building knowledge, integrating BI in KM, and organization intelligence.

From the 30 questions, the researcher was able to construct a database and import 28 into an SPSS data file resulting in the loading of 28 different variables. This large number of variables and factors suggested the need for a multivariate analysis (analysis where more than one variable, observation, or measurement is obtained from each individual or sampling unit) in order to ascertain the nature of paradigms within the data. By a simple dictionary definition "Multivariate Analysis: analyses where more than one variable, observation, or measurement is obtained from each individual or sampling unit." According to Cooper et al. (2003), multivariate analysis refers to those statistical techniques that focus upon, and bring out in bold relief, the structure of simultaneous relationships among three or more phenomena. In this case, the multivariate analysis would focus on the dependency and the interdependencies among the variables involved in understanding the concepts of integrating BI tools in KM to building knowledge capital as well as examine the phenomenon of organization intelligence.

Given the large number of variables, the researcher opted to use Factor Analysis (FA) as the statistical method to reduce this large number of variables to a smaller number of factors that would be more manageable. According to Lattin et al. (2003), factor analysis is used to uncover the latent structure or dimensions of a set of variables. Overall, factor analysis reduces attribute space from a larger number of variables to a smaller number of factors and as such is a non-dependent statistical procedure.

The researcher also opted to use the Principal Components Analysis (PCA) as the statistical technique to conduct the data analysis. By far the most common form of factor analysis, PCA is mainly a statistical concept that revolves around the basic idea that when given a large set of data, one would want to analyze this set in terms of the relationships between the individual points in that data set. Since patterns in data can be hard to find in data of high dimension where the luxury of graphical representation is not available, PCA is a powerful tool for analyzing data. Lattin et al. (2003) point out that whenever the size of the data set becomes unwieldy (in terms of the number of variables), principal components might be useful in reducing its dimensionality.

To accomplish this dimension reduction of the research multivariate data using the PCA technique, the researcher needed to determine the fundamental dimensions by addressing two main questions: 1) How many components should be retained? 2) How can the validity of the PCA solutions be assessed? While Kaiser (1974) recommends retaining all factors with eigenvalues greater than one, Cattell (1966) advocates the use of screen plot graph of eigenvalues and argues that the cut-off point for selecting factors should be at the point of inflexion of the curve. In this study, the researcher needed to take several steps:

1. An Excel spread sheet was created to compile the notes and data gathered during the interviews using variables that were noted to have a correlation as shown in the frequency analysis in Appendix C.
2. A factor extraction was performed using the Principal Components method to extract the correlation and covariance matrixes for analysis.
3. An orthogonal method of rotation using the Varimax technique in SPSS was executed to rotate the variables and maximize the variance of the new factors through attempts to maximize the dispersion of loading within the factors (Field, 2000). The Varimax technique tries to load a smaller number of

variables highly onto each factor, resulting in more interpretable clusters of factors (Field, 2000).

4. An SPSS data dictionary was extracted and new factors were calculated. The correlation matrix showed that the data being analyzed is highly enough correlated and with the number of variables less than 30, after the extraction, the resulting communalities are greater than 0.7 for the most part as shown in (Table 2. Communalities). This result justified the choice of using the factorial analysis method and the PCA statistical technique for dimension reduction in this research.

Table 2. Communalities

	Initial	Extraction
Organizational role	1.000	.727
Time of service with Org	1.000	.793
Highest education level	1.000	.719
Gender	1.000	.710
Age bracket	1.000	.735
Familiarity with KM and KMS	1.000	.811
Familiarity with BI, BI tools, and BPM	1.000	.809
Organization use of KM	1.000	.793
Organization use of BI and BI tools	1.000	.816
Organization use KMS to build KC	1.000	.698
Organization use KMS to share K	1.000	.604
Participation in study helping Org with KM	1.000	.735
Does IT or KM use BI tools	1.000	.524
Can BI tools be used to transform tacit K	1.000	.806
Importance of ETL and BI tools to capture K	1.000	.918

Importance of integrating ETL and BI to build KC	1.000	.933
Nature of BI tools to integrate with KMS	1.000	.651
Does IT and KM staff has knowledge and exp	1.000	.710
Integrating BI,ETL, and KMS provide more IK	1.000	.922
Loss of tacit K equate loss of KC	1.000	.734
Loss of TK and KC affect Org Scompetitiveness	1.000	.836
Can CIPO be used to build knowledge base	1.000	.603
How BI tools might be used with CIPO	1.000	.488
Holding focus groups and employee mtgs	1.000	.883
Employee's likelihood to share and purpose	1.000	.919
Employee share for monetary gain	1.000	.890
Employee share for recognition	1.000	.914
KC and EI affecting Org Ops efficiency	1.000	.942

Extraction Method: Principal Component Analysis.

The use of the SPSS statistical application allowed the researcher to determine and present the analyzed data in a more user-friendly format. Graphs, tables, charts, and extracted outputs from SPSS were used in the data presentation. The questionnaire topics and factors are depicted below in Table 3 preceding the data analysis.

Table 3. Survey Topics

Questionnaire Topics for Analysis		
BI, KM, KMS, KC, BPM, BI Tools, and CIPO	Organization's familiarity with BI, KM, KMS, BPM, BI Tools	Use of BI and BI tools in building KC

Role in organization - BI, KM, KMS, KC, BPM, BI Tools, and CIPO	Organization use of BI, KM, KMS, BPM, BI Tools	Integrating BI and BI tools in KC and KMS
Time of service with organization - BI, KM, KMS, KC, BPM, BI Tools, and CIPO	Organization use of BI, KM, KMS, and BI Tools to build KC	Integrating BI and BI tools with CIPO model in KMS
Highest education level - BI, KM, KMS, KC, BPM, BI Tools, and CIPO	Organization use of BI, KM, KMS, and BI Tools to share K	Integrating BI and BI tools in KMS for organization intelligence
Gender - BI, KM, KMS, KC, BPM, BI Tools, and CIPO	Organization Intelligence and effect of KC on operational efficiency and competitiveness	Tacit knowledge in KC and building KC
Age bracket - BI, KM, KMS, KC, BPM, BI Tools, and CIPO	Organization's benefit from study in KC and KMS	Tacit knowledge in building KC and employee participation

All through the qualitative and quantitative phases of this research, the inductive and deductive reasoning approaches were both used to identify the variables, classify their features, count them, and construct a statistical model in an attempt to explain what is observed and identify the relations and interdependencies among the factors. Following this approach, the researcher was able to identify the paradigms within the data and persistently pose questions and examine the outcomes to discover the relationships among the variables and topics raised by this study.

Research Themes

Following the in-depth interviews and survey data collection, a matrix was completed to depict the core areas, topics, and themes identified by the participants. During the qualitative phase of this research and in conducting the interviews, the researcher followed the interpretive paradigm where the reality is viewed as subjective and socially constructed. It is in this context that the researcher was integrated in this research himself as the data gathering instrument to question the participants, collect their stories, record their conversations, and compare and analyze their accounts to identify the themes of this research.

Table 4 summarizes the topics and areas of analysis noted by the participants and also depict the core themes of this study.

Table 4. Participants' Areas and Topics Summary

Topics and Areas of Analysis					
Themes	**Main Topics Raised By Participants**				
Building Knowledge Capital	Management support, commitment, and participation	Types of knowledge and understanding Knowledge Management and Knowledge Management Systems	Organizational culture and employee participation	Sharing knowledge enterprise-wide essential in building KC	Technical requirements and system design in knowledge management systems

BI and BI Tools in KC	Management support and coordination among IT, KM, and other operations and all departments	Applying BI in business processes and management	Understanding the use of BI and BI Tools	Knowledge transformation and sharing	Training the right people for the right task in BI and the use of BI Tools
Integrating CIPO with BI	Management support and participation in building knowledge	Managing employee's expectations from BI and Knowledge Management	Organizational culture and employee participation	Understanding the CIPO model and use of BI	System planning and gathering requirements
Organizational Intelligence	Management support and participation in building knowledge	Aligning organizational goals and business needs with Knowledge Management and IT	Strategic planning and aligning business goals and needs with knowledge management	Tying knowledge capital with business performance	Building and sharing knowledge effecting business performance and sustainable competitiveness

As noted previously, the essence of grounded theory is the constant comparative method that provides the working framework for identifying topics, sub-topics, and overall themes. According to Glaser and Strauss (1999), the constant comparative method consists of four fundamental steps:

1. The researcher continuously compares the data elements and incidents that are related to the study categories.
2. The researcher constantly attempts to incorporate the categories and their characteristics.
3. The researcher must encircle every theory with the concepts discovered.
4. The researcher turns the elements or matrix of categories and theory into text.

To follow these four steps described by Glaser and Strauss (1999), an Excel spreadsheet with a built-in matrix was created and used as the data repository to capture all the topics, sub-topics, and themes discussed and suggested by the participants. During the first step, the interview was subdivided into as many subcategories as possible. Every subcategory was then compared to all categories and subsequently merged wherever there was a matching or a relationship fit based on shared elements. During the in-depth interviews, the researcher noticed some confusion coupled with a lack of knowledge and basic understanding of some of the concepts and their use within the organization, including BI, KC, BPM, KM, KMS, and EI. After applying this constant comparison approach to the elements of BI, KC, BPM, KM, KMS, and EI, the researcher succeeded in breaking these occurrences and including them into their appropriate categories.

During the second step, the researcher attempted to incorporate the categories and their characteristics by converting each of the data elements to the lowest common denominators. This allowed the researcher to progressively move from comparing incidents to evaluating their characteristics and determining any shared commonalities. Here all the data elements and characteristics of the concepts of BI, KC, BPM, KM, KMS, and EI were identified in detail and with constant comparison of the incidents, the researcher was able to move these concepts into an appropriate theme, including Building Knowledge Capital, Integrating BI and BI tools in KC, Integrating CIPO in KC, and Organizational Intelligence.

During the third step, the researcher made sure to encircle every theory with every concept discovered. Consequently, by using the constant comparison during this third step, newly discovered concepts from the in-depth interviews data decreased gradually and eventually the overall themes were also reduced. At this point, the researcher was able to summarize the topics and list them in accordance with the participants' grouping and repeated themes. As an example, the four themes of Building Knowledge Capital, Integrating BI and BI tools in KC, Integrating CIPO in KC, and Organizational Intelligence were identified and organized in a way that made it easy to categorize and organize the data elements and sub-elements into expressive topics and sub-topics, i.e. Building Knowledge Capital perceived relationship to management support, commitment and participation (Table 2. Participants' Areas and Topics Summary).

In step four, all the elements were finalized into topics and the matrix of categories and theory was turned into text. This step was the most crucial and was designed to provide the theoretical framework of the research. This step was also critical in terms of setting the stage for the researcher to move forward with the interview data, notes, and identified themes to construct the overall concepts behind the study. During this step, the researcher finalized the research themes, topics, and areas of analysis later used to contend or support results from the Principal Component Analysis method used in this research.

From the very start of the first in-depth interview, the researcher initiated the analysis of the collected data following the constant comparative methodology. The collected data during this grounded theory phase was immediately analyzed to identify the data element, sub-elements, and the themes prior to doing additional follow-up with the participants to address additional questions that in some instances resulted in additional data element reduction. In other instances where the follow-up resulted in additional data, the four constant comparative steps were repeated accordingly. This process of collapsing, comparing, and organizing data elements was carried out until a limited set of major themes emerged. The constant comparison method is depicted in Figure 7.

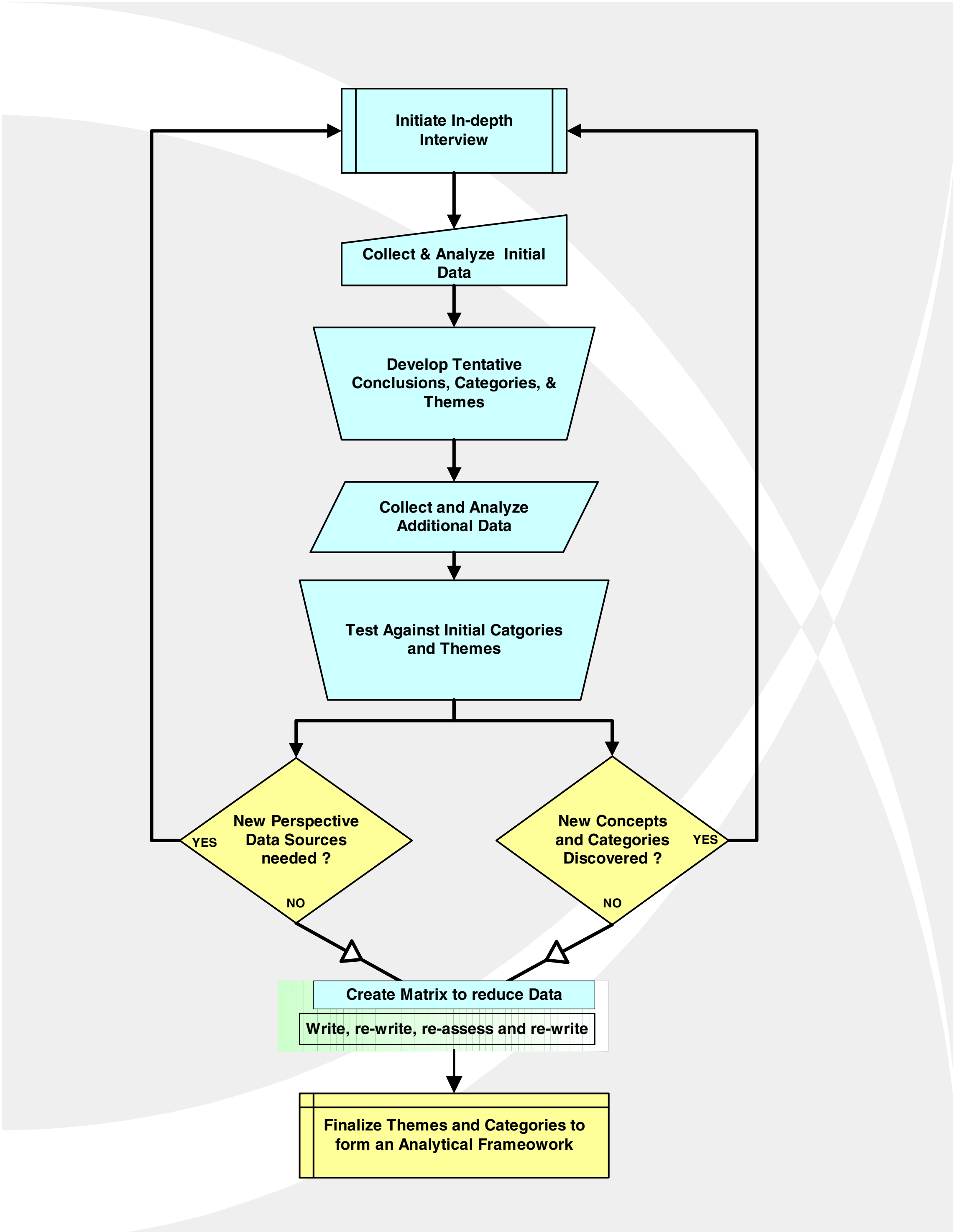


Figure 7. Constant Comparison Model.

Data Coding

The survey questionnaire was administered online using a professional survey service. A summary of the survey results and analysis from the surveyor database management system was provided (Appendix E). However, the researcher also extracted the results and exported them into a database that was imported into SPSS to recode the data. The ranking order method was available through the survey service and was used when the questionnaire was designed for the online delivery ranking the answers and options starting with the largest and most positive response. All questions were given an acronym to represent each variable with a brief description of the concept being tested built into the SPSS data file (Appendix F).

The Descriptive Statistics and Frequencies techniques from the SPSS application were used to transform and output the survey data set. Detailed set of the Frequency Statistics and distribution tables are provided in (Appendix C). The Frequency Distribution table and summary are depicted below in Table 5.

Table 5. Frequency Distribution Table

Frequencies Statistics				
Organizational role	Familiarity with KM and KMS	Can BI tools be used to transform tacit K?	Does IT or KM use BI tools?	Can CIPO be used to build knowledge base?
Time of service with organization	Familiarity with BI, BI tools, and BPM	Loss of tacit K equate loss of KC	Does IT and KM staff has knowledge and experience?	How BI tools might be used with CIPO

Highest education level	Organization's use of KM	Loss of TK and KC affect Org Scompetitiveness	Nature of BI tools to integrate with KMS	Holding focus groups and employee mtgs
Gender	Organization's use of BI and BI tools	KC and EI affecting Org Ops efficiency	Integrating BI,ETL, and KMS provide more IK	Employee's likelihood to share and purpose
Age bracket	Organization use KMS to build KC	Participation in study helping Org with KM	Importance of ETL and BI tools to capture K	Employee share for monetary gain
	Organization use KMS to share K		Importance of integrating ETL and BI to build KC	Employee share for recognition

Data Analysis

In this section, results from the questionnaire data collected from 63 respondents will be analyzed using tables and outputs extracted from the loaded SPSS file. Initial data analysis from the survey site with tabulations of results will also be examined along with the SPSS tables from the Factor Analysis (FA) and the extractions Principal Component Analysis (PCA). The FA outputs extracted will include examining and analyzing the correlations matrix, descriptive statistics, inverse correlation matrix, communalities, variance matrixes with eigenvalues, and rotated components of the loaded factors.

The responses from the 63 participants accounted for the 28 variables loaded in SPSS, representing 43 respondents from the IT department (68.3%), 7 from the Knowledge department (11.1%), 7 from Management (11.1%), and 6 Executive Managers (9.5%) from the SPSS Frequencies extraction depicted in the Organizational Role (Table 6) and Figure 8.

Table 6. Organizational Role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Information Technology (IT)	43	68.3	68.3	68.3
	Knowledge Management (KM)	7	11.1	11.1	79.4
	Management	7	11.1	11.1	90.5
	Executive Management (EM)	6	9.5	9.5	100.0
	Total	63	100.0	100.0	

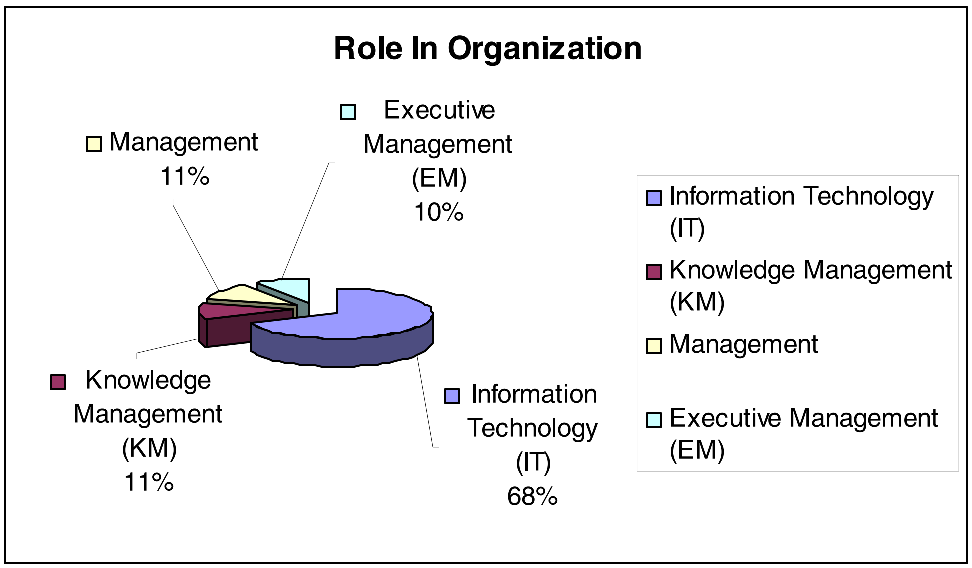


Figure 8. Role in organization.

Using the SPSS statistical application, the data analysis consisted mainly of Descriptive Statistics, Correlation, and Data Reduction methods using a Factor Analysis. The Principal Component Analysis (PCA) was selected as the type of FA technique based on the nature of the data and the high correlation noted. The PCA technique allowed the researcher to converge the data from the 63 respondents imported into the

SPSS file from the online survey database and load 28 categories resulting in 7 factors representing the 28 variables. The Kaiser (1960) principal that states that all factors with eigenvalues greater than one should be retained was used as the basis for the decision point in this PCA to combine a minimum of two variables into a single factor. Moreover, as noted earlier in this research, the Kaiser option is considered to be a good fit for this study because there are fewer than 30 variables involved. Additionally, the calculated average of the extracted communalities for all 28 variables is 0.772, above the threshold of 0.700. According to Kaiser (1974), this rule reflects the common-sense notion that any principal component, because it is a measure of common variance, should account for at least as much variation as any one of the original variables X. Kaiser's rule thus calls for an absolute judgment regarding the amount of variance accounted for by each principal component (Kaiser, 1974). In relating Kaiser's criteria to the Total Variance Explained table extracted from the PCA, the researcher learned that there seven factors with a Rotation Sums of Squared Loadings between 4.436 and 1.499 and a variance of 15.841 to 5.352. This reduction of factors from 28 to 7 with the noted percent of variance allowed the research to use these seven factors for the remainder of this analysis. The PCA factor reduction method is also supported by the results shown in the extracted Total Variance Explained chart since the seven factors would account for 77.23% or roughly 80% of the total variance viewed as a satisfactory level. The Total Variance Explained chart (Table 7) also revealed that more than 80% of the total variance would be represented just by adding the eighth factor, which also has an Eigenvalue value of 0.941. The six columns in the Total Variance Explained chart only showed data on the Extraction Sums of Squared Loadings and the Rotation Sums of Squared Loadings for the seven selected factors. This is in relation to Kaiser's Criterion where the Eigenvalues drops below the cut-off or desired value of one starting from the eighth factor in this table with an Eigenvalue of 0.941. Only the factors with an Eigenvalue greater than one were used in the calculation of the Rotation Sums of Squared Loadings.

Table 7. Total Variance Explained

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.995	21.410	21.410	5.995	21.410	21.410	**4.436**	**15.841**	**15.841**
2	5.471	19.541	40.951	5.471	19.541	40.951	**4.025**	**14.374**	**30.215**
3	3.656	13.056	54.007	3.656	13.056	54.007	**3.923**	**14.010**	**44.225**
4	2.160	7.713	61.719	2.160	7.713	61.719	**3.591**	**12.826**	**57.051**
5	1.741	6.216	67.935	1.741	6.216	67.935	**2.378**	**8.494**	**65.545**
6	1.405	5.017	72.952	1.405	5.017	72.952	**1.773**	**6.332**	**71.878**
7	1.198	4.278	77.230	1.198	4.278	77.230	**1.499**	**5.352**	**77.230**
8	0.941	3.361	80.591						
9	0.887	3.169	83.760						
10	0.813	2.904	86.663						
11	0.671	2.395	89.058						
12	0.521	1.860	90.918						
13	0.500	1.787	92.705						
14	0.397	1.417	94.122						
15	0.343	1.224	95.346						
16	0.296	1.056	96.402						
17	0.214	0.763	97.165						
18	0.189	0.674	97.839						
19	0.139	0.495	98.334						
20	0.137	0.488	98.822						
21	0.093	0.334	99.155						
22	0.077	0.275	99.430						
23	0.055	0.196	99.625						
24	0.048	0.170	99.795						
25	0.026	0.094	99.889						
26	0.018	0.063	99.952						
27	0.009	0.033	99.985						
28	0.004	0.015	100.000						

Extraction Method: Principal Component Analysis

Cooper et al. (2003) note that in a multivariate analysis, a primary concern is the validity of the sample. To ensure the validity of the PCA, the SPSS was used to extract a reproduced correlation and a residuals matrix. A closer look at the results revealed that the reproduced correlation matrix, residuals were computed between observed and reproduced correlations and the results showed 99 (26.0%) nonredundant residuals with absolute values greater than 0.05. The extracted matrices also allowed the researcher to inspect the residuals for negative values. In addition to the 99 nonredundant residuals with absolute values greater than 0.05, a high degree of negative residual values was also noted. On this basis, the researcher concluded that the reliability of using PCA in this data analysis is valid. The computation of the correlation matrix and the corresponding residuals verified that all components were extracted and loaded by using the principal component analysis. According to Kline, (2000), this reproduction of correlations is computed by using "Function rxy = rx1y1 + rx2y2 + rx3y3 + rx4y4 + rx5y5 + rx6y6, where rxy is the correlation of variables x and y; rx1y1 is the cross production of the factor loading of variables x and y on factor 1; rx2y2 is the cross production of the factor loading of variables x and y on factor 6; rx3y3 is the cross production of the factor loading of variables x and y on factor 3; rx4y4 is the cross production of the factor loading of variables x and y on factor 4; rx51y5 is the cross production of the factor loading of variables x and y on factor 5; and rx6y6 is the cross production of the factor loading of variables x and y on factor 6" (pp. 39-40). This computation of the reproduced correlations and residuals is described in Tables 6 and **7** of Appendix D.

The communalities described in Table 2 were calculated in the PCA method using the square summation of the factor loadings. All the variables are identified by name in the first column of the communalities SPSS extraction while the second column lists the initial communality for each variable. SPSS made the assumption that all 28 variables would start with an initial communality of 1.000 because the variance of all variables is initially common. Hence, the second column of this chart shows a 1.000 associated with all 28 variables. The last and third column in the communalities chart represents the extraction variance communality for each factor. This value in essence represents the computed percentage of each variable from the loaded factors showing the remaining variance of the extracted factors. The result as shown in column three for all variables is usually less than 1.000 since extracted factors are also usually smaller than their initial variables. The sixth variable that asked respondents about their familiarity with KM and KMS has an extracted communality of 0.811 or 81.1%, while the seventh variable, "Familiarity with BI, BI tools, and BPM," has a communality of 0.809. Both are examples where the communality value is less than 1.000 because of the loss of factors resulting from the PCA extraction method used to reduce the number of factors to a more manageable and less complicated set of variables that can also be interpreted more easily. The PCA data extractions and analysis are shown in Table 2. By applying this type of factor analysis, the researcher was able to compute the approximate and inverse correlation matrices. This computation is based on the Eigen function. According to Field (2000), the eigenvalue tells us about what percent each variable accounts for from the variance across all variables. The latter function is noted as RV=o V, where R is the matrix for which the solution is sought, V is the eigenvector to be found, and o is an eigenvalue (Field, 2000).

SPSS used this Eigen function to produce The Total Variance Explained chart shown in Table 7. The chart lists all the variables in the first column labeled Component and numbered from 1 to 28. The eigenvalue representing the total variance associated with each component from the initial data set is listed in the second column. The third column lists the percent of variance that is associated with each component's initial eigenvalue while the fourth column shows the cumulative percent. The remaining six columns list the diminishing total variance from the Extraction Sums of Squared Loadings and the Rotation Sums of Squared Loadings. Table 7 indicates that the first factor in this PCA analysis accounts for 21.410% of the total variance. The second factor accounts for less variance than the first 19.541%, bringing the total to 40.951%. The chart shows the variance contribution of each factor to this running total until all the eigenvalues total variance for all 28 factors are accounted for and the last factor shows the 100% total.

The Rotation Sums of Squared Loadings section of the chart shows eigenvalues, percent of variance, and cumulative percent of total variance for only seven factors. This is due to the SPSS' PCA reduction method and the Varimax rotation process. Table 7 shows that before the rotation process, the first seven variables on the chart account for the total variance of 21.410%, 19.541%, 13.056%, 7.713%, 6.216%, 5.017%, and 4.278%, respectively. Following the Varimax rotation, the same seven factors are now associated with new variance values of 15.841%, 14.374%, 14.010%, 12.826%, 8.494%, 6.332%, and 5.352%. According to Field (2000), the new values in the Rotation Sums of Squared Loadings are attributed to the Varimax rotation attempt to maximize variance by forcing a more even distribution of the total percent of variance. A closer look at Table 7 reaffirms the latter redistribution of total variances and reveals that some variance was moved from the top four variables and redistributed to the bottom three. As such, the cumulative percent of total variance for the first component was 21.410% and the eighth component 4.278% in the unrotated matrix. Following the rotation, the first component decreased to 15.841% and the total variance for the eighth component was increased to 5.352%.

Field (2000) suggests that the process of identifying the rotated factors to use in a research study using the PCA method to reduce variables and form an uncorrelated linear combination of the observed variables is generally a subjective approach. However, Kline (2000) notes three criteria that can be used as boundaries in selecting the research factors: "(a) there are k common factors, (b) underlying factors are orthogonal to each other, and (c) the first factor accounts for as much variance as possible, the second factor accounts for as much variance as possible based on the variance left unexplained by the first factor…and so on" (p 49). In examining the SPSS extracted output, it was determined that the "k common" criterion is applicable to the Unrotated Component Matrix of the factors extracted in Table 8 and by the same token, this restriction is also applicable to Rotated Component Matrix found in Table 9. However, the second and third limitations described by Kline (2000) become subjective when applied to the Rotated Component Matrix. To make the redistribution of the coefficients and the process more straightforward, it was suggested that one or both restrictions could be removed. By following this approach, the researcher was able to identify the factors that will be used for additional analysis and will become the focus of this research.

Table 8. Unrotated Component Matrix

Component Matrix(a)							
Factor Analysis	**Unrotated Components**						
	Bi and BI Tools in KC	Organization Intelligence	Building KC	Organization use of BI, KM, and KMS	Integrating CIPO in KC	CIPO and BI Tools	Employee Participation
Organizational role	-0.097	**0.596**	0.037	**0.546**	0.061	-0.232	0.070
Time of service with Org	0.187	**0.488**	-0.064	**0.611**	0.361	0.107	0.043
Highest education level	0.036	**0.758**	-0.100	0.084	0.284	0.155	-0.147
Gender	-0.037	-0.014	-0.200	-0.147	0.145	**0.528**	**0.589**
Age bracket	0.153	**0.691**	0.097	0.329	0.311	0.099	0.104
Familiarity with KM and KMS	**0.432**	**-0.507**	-0.065	**0.529**	-0.113	-0.252	0.089
Familiarity with BI, BI tools, and BPM	0.236	**-0.548**	0.082	**0.624**	-0.192	-0.085	0.113
Organization use of KM	**0.465**	-0.720	0.183	0.073	0.052	0.013	-0.129
Organization use of BI and BI tools	0.370	**-0.755**	0.316	0.033	0.046	0.035	-0.068
Organization use KMS to build KC	**0.408**	**-0.631**	0.204	0.056	0.155	0.136	-0.213
Organization use KMS to share K	0.139	**-0.747**	0.132	-0.071	0.057	-0.013	-0.029
Participation in study helping Org with KM	**0.444**	-0.251	-0.105	0.083	0.048	**0.653**	0.169
Does IT or KM use BI tools	-0.103	-0.021	**0.632**	0.102	0.130	0.085	0.282
Can BI tools be used to transform tacit K	**0.497**	0.311	0.270	0.010	0.035	0.265	**-0.564**
Importance of ETL and BI tools to capture K	**0.826**	0.291	0.238	-0.253	0.131	-0.108	-0.046
Importance of integrating ETL and BI to build KC	**0.850**	0.281	0.205	-0.245	0.126	-0.102	-0.047
Nature of BI tools to integrate with KMS	**0.588**	-0.130	0.183	0.340	-0.170	-0.212	0.257
Does IT and KM staff has knowledge and exp	**0.614**	-0.287	0.314	-0.076	0.329	0.127	0.146
Integrating BI,ETL, and KMS provide more IK	**0.759**	0.326	0.270	-0.283	0.148	-0.240	0.088
Loss of tacit K equate loss of KC	**0.596**	0.311	0.167	-0.318	0.069	-0.254	0.290
Loss of TK and KC affect Org Scompetitiveness	**0.512**	**0.434**	0.055	-0.125	**-0.567**	-0.054	0.206
Can CIPO be used to build knowledge base	0.329	0.296	**0.416**	-0.007	**-0.457**	0.160	0.026
How BI tools might be used with CIPO	**0.472**	0.106	-0.148	0.269	-0.134	0.321	-0.197
Holding focus groups and employee mtgs	0.171	**0.429**	0.210	0.100	**-0.731**	0.274	-0.077
Employee's likelihood to share and purpose	**0.584**	0.099	**-0.747**	0.097	-0.012	-0.026	-0.025

Employee share for monetary gain	0.398	-0.257	**-0.742**	-0.320	-0.085	0.070	0.028
Employee share for recognition	**0.643**	0.158	**-0.653**	0.123	0.107	-0.084	-0.126
KC and EI affecting Org Ops efficiency	0.310	-0.156	**-0.893**	-0.012	-0.088	-0.087	0.097

Extraction Method: Principal Component Analysis.
a Residuals are computed between observed and reproduced correlations. There are 99 (26.0%) nonredundant residuals with absolute values greater than 0.05.
b Reproduced communalities

Table 9. Rotated Component Matrix

Rotated Component Matrix(a)							
Factor Analysis	**Rotated Components**						
	Bi and BI Tools in KC	Organization Intelligence	Building KC	Organization use of BI, KM, and KMS	Integrating CIPO in KC	CIPO and BI Tools	Employee Participation
Organizational role	-0.037	-0.014	-0.085	**0.786**	0.128	-0.149	-0.246
Time of service with Org	0.062	0.107	0.058	**0.854**	-0.060	0.174	0.104
Highest education level	0.155	-0.477	0.073	**0.637**	0.026	0.237	0.008
Gender	-0.040	-0.149	0.048	0.009	-0.038	-0.201	**0.801**
Age bracket	0.247	-0.163	-0.095	**0.783**	0.057	0.107	0.102
Familiarity with KM and KMS	0.018	**0.865**	0.231	0.008	-0.008	-0.054	-0.079
Familiarity with BI, BI tools, and BPM	-0.192	**0.875**	0.015	0.005	0.074	-0.027	0.005
Organization use of KM	0.170	**0.678**	0.020	**-0.431**	-0.167	0.293	0.060
Organization use of BI and BI tools	0.149	**0.662**	-0.144	**-0.488**	-0.166	0.247	0.092
Organization use KMS to build KC	0.140	**0.553**	-0.032	-0.367	-0.216	**0.423**	0.104
Organization use KMS to share K	-0.007	**0.479**	-0.064	**-0.537**	-0.263	0.087	0.075
Participation in study helping Org with KM	0.060	0.283	0.189	-0.070	0.093	0.346	**0.695**
Does IT or KM use BI tools	0.117	0.150	**-0.668**	0.083	0.003	-0.071	0.170
Can BI tools be used to transform tacit K	0.354	-0.054	-0.016	0.152	0.238	**0.764**	-0.122
Importance of ETL and BI tools to capture K	**0.899**	0.049	0.102	0.068	0.147	0.266	-0.017

Importance of integrating ETL and BI to build KC	**0.899**	0.063	0.141	0.067	0.150	0.272	-0.007
Nature of BI tools to integrate with KMS	0.378	**0.647**	0.053	0.123	0.248	-0.102	0.006
Does IT and KM staff has knowledge and exp	**0.566**	**0.402**	-0.112	-0.131	-0.181	0.241	0.326
Integrating BI,ETL, and KMS provide more IK	**0.943**	0.024	0.041	0.090	0.116	0.080	-0.050
Loss of tacit K equate loss of KC	**0.824**	-0.036	0.059	0.059	0.137	-0.162	0.038
Loss of TK and KC affect Org Scompetitiveness	**0.465**	-0.031	0.190	0.067	**0.750**	-0.129	-0.001
Can CIPO be used to build knowledge base	0.289	0.041	-0.217	0.036	**0.669**	0.149	0.022
How BI tools might be used with CIPO	0.069	0.208	0.320	0.202	0.294	**0.434**	0.149
Holding focus groups and employee mtgs	-0.009	-0.081	-0.060	0.107	**0.913**	0.167	-0.022
Employee's likelihood to share and purpose	0.198	0.122	**0.902**	0.186	0.038	0.069	0.097
Employee share for monetary gain	0.104	0.000	**0.835**	-0.352	-0.060	-0.018	0.233
Employee share for recognition	0.299	0.127	**0.842**	0.264	-0.035	0.169	0.005
KC and EI affecting Org Ops efficiency	-0.045	0.104	**0.934**	-0.063	-0.072	-0.181	0.124

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
A Rotation converged in 10 iterations.

The Unrotated Component Matrix depicted in Table 8 lists the factor analysis for the 28 variables used and their extracted unrotated variance values. In SPSS, these are the same values that are used to construct the rotated factors and compute their correlation coefficients for the Rotated Component Matrix shown in Table 9. Furthermore, the coefficient values in Table 9 also depict the covariance found between the extracted factors in relation to each of the 28 variables listed in the Factor Analysis column. By the same token, the coefficient values listed in Table 9 allowed the researcher to verify the factor loadings difference between unrotated and rotated components once the Varimax Rotation and Kaiser Normalization are applied. To that end, the results shown before the rotation of the components indicated the highest value is found in the first cell interaction between the variable and the extracted factor in the Unrotated Component Matrix, while the rest of the values are smaller. This is not the case for the values found in the Rotated Component Matrix intersections. This difference, according to Field (2000), is attributed to linear determination of diminishing amounts of variance used to compute the squared factor loadings. For example, the intersection of the factor loadings in the second column and the Organizational Role variable is a coefficient of 0.596 with the unrotated components, whereas the highest value of 0.786 associated with the Organizational Role variable is found in the intersection with the fourth factor in column four. By analyzing these extracted outputs from the Principal Component Analysis in Appendix D and the results in Table 9, the researcher was able to confirm that the extracted factors and their rapport with each of the 28 loaded variables correctly correlate with the research themes and topics. The Reproduced Correlation, Total Variance, Communalities, Unrotated Component, and Rotated Component Matrixes and tables showing the steps taken to perform and interpret the relationships between the extracted factors and variables are all included in Appendix D.

The Rotated Component Matrix shows the first factor as BI and BI Tools in KC. The second factor is Organization Intelligence, the third factor is Building KC, the fourth factor is Organization Use of BI, KM, and KMS, the fifth factor is Integrating CIPO in KC, the sixth factor is CIPO and BI Tools, and the seventh factor is Employee Participation. Each factor is displayed with coefficient values corresponding to its correlation to each of the 28 variables. For example, the first factor is shown to have a significant positive correlation with the six variables. The cut-off value that marks the correlation coefficient of rotated components in Principal Component Analysis is commonly set to a threshold greater than or equal to negative -0.400 and positive +0.400. This cut-off value was applied to identify the corresponding variables for the selected factors. It was also noted that the presence of many negative coefficients that significantly exceed the threshold would indicate an adverse influence; such is the case for the fourth factor, which will be explained subsequently. On this basis, every factor that meets or exceeds the threshold on the Rotated Component Matrix was identified and highlighted to be incorporated in this data analysis.

Based on Field's (2000) instructions on Principal Component Analysis, the use of the Varimax rotation and Kaiser's normalization in FA basically requires three steps:

1) Summing the coefficient columns
2) Normalizing the coefficient values
3) Repeating the steps to normalize the coefficients of all factors until each eigenvector has been completed and a component matrix is extracted.

Applying the Varimax rotation and Kaiser's normalization in the Principal Component Analysis resulted in the variables converging and the Rotated Component Matrix constructed after 10 iterations. Table 9 depicts this Rotated Components Matrix with the highlighted values meeting the threshold of $\geq$ -0.400 and $\geq$0.400.

The first factor on the Rotated Component Matrix, BI and BI Tools in KC, indicated a significant positive affiliation with the following six variables:

1. Importance of ETL and BI tools to capture Knowledge (0.899)
2. Importance of integrating ETL and BI to build KC (0.899)
3. Does IT and KM staff have knowledge and experience? (0.566)

4. Integrating BI, ETL, and KMS provide more IK (0.943)
5. Loss of tacit K equates loss of KC (0.824)
6. Loss of TK and KC affects organization's sustainable competitiveness (0.465)

A graph was constructed to represent the correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the six variables that are greater or equal to the threshold of -.0400 and +.0400. All 28 of the PCA variables are also shown in Figure 9 (BI and BI Tools in Building KC).

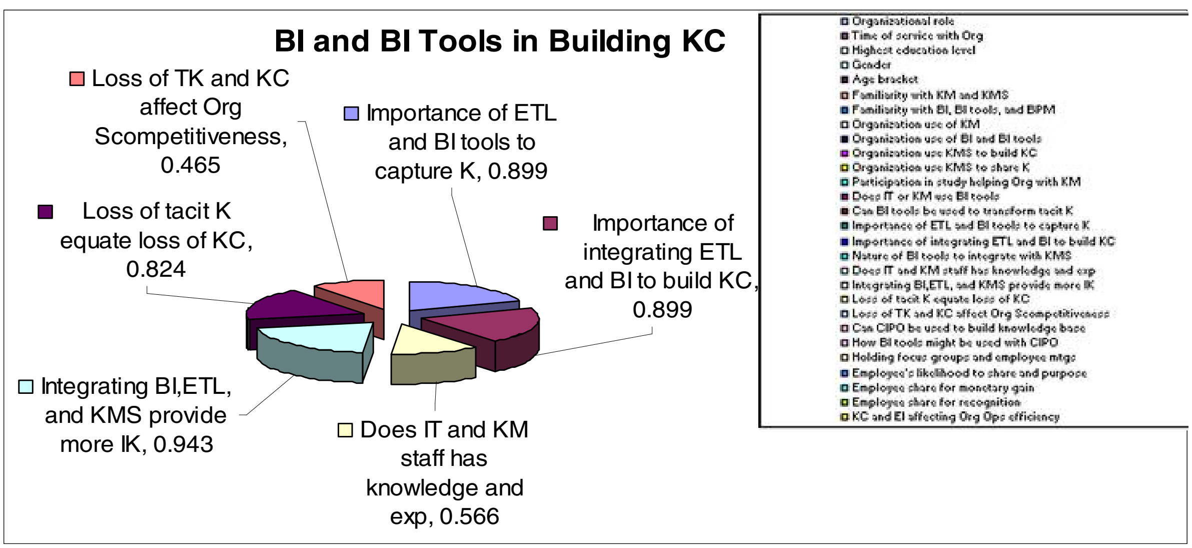


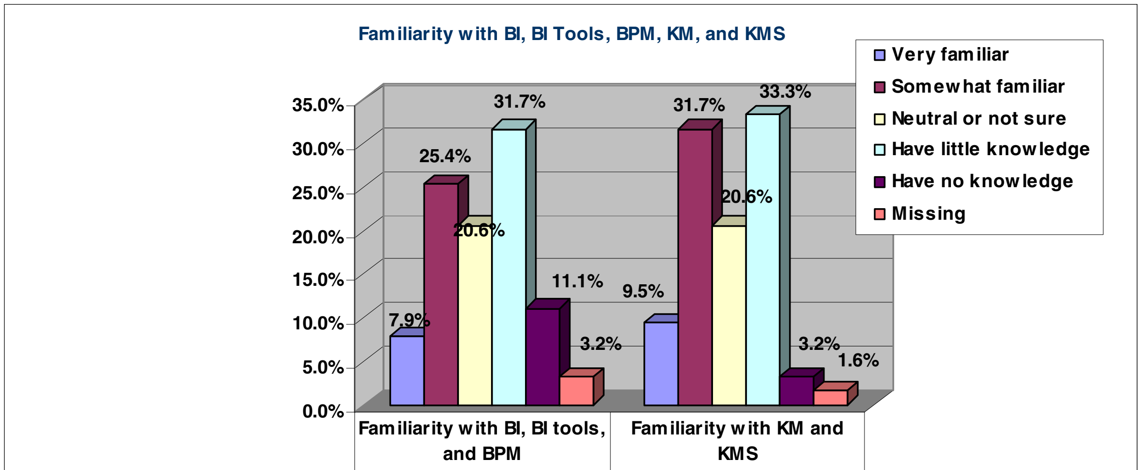
Figure 9. BI and BI tools in building KC.

The Rotated Component Matrix shows the second factor, Organization Intelligence, to have eight correlations values that are all positive. The corresponding variables with high correlations are the following:

1. Familiarity with KM and KMS (0.865)

2. Familiarity with BI, BI tools, and BPM (0.875)
3. Organization use of KM (0.678)
4. Organization use of BI and BI tools (0.662)
5. Organization use KMS to build KC (0.553)
6. Organization use KMS to share K (0.479)
7. Nature of BI tools to integrate with KMS (0.647)
8. Does IT and KM staff has knowledge and experience? (0.402)

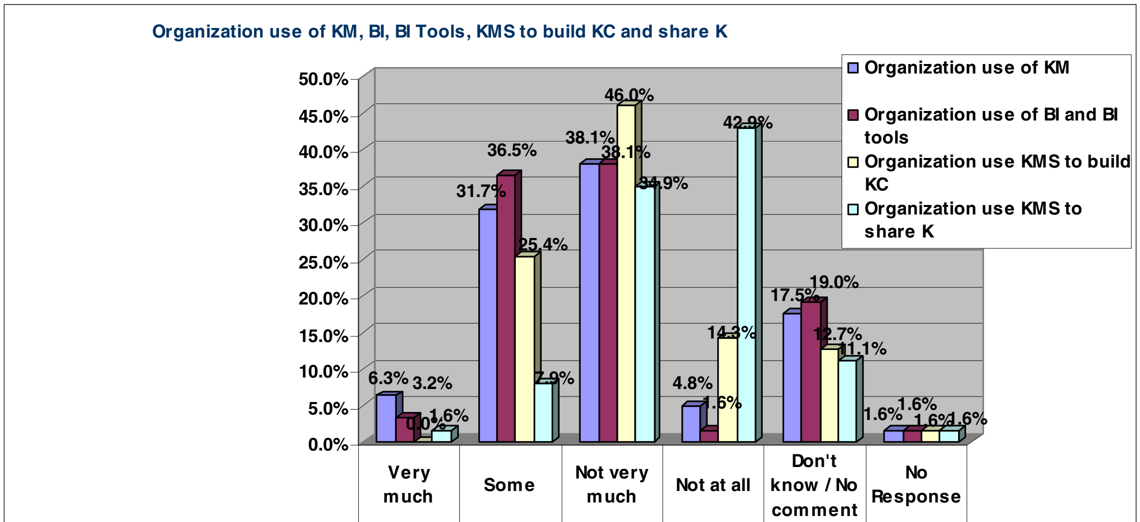
The eight high positive variables affected by the Organization Intelligence factor are supported by the findings of the Frequency analysis that show a correlation with the respondents' familiarity with BI, BI tools, BPM, KM, and KMS. According to this analysis, only 7.9% are very familiar with BI and BI tools, while the vast majority or 31.7% have little knowledge, 25.4% are somewhat familiar, 11.1% have no knowledge, 20.6% were not sure, and 3.2 did not respond to this question. Similarly, the familiarity with KM and KMS was slightly higher with 9.5% very familiar, 31.7% somewhat familiar, almost one-third or 33.3% have little knowledge, 3.2% have no knowledge, and 1.6% gave no answer. The result of this frequency analysis is depicted in Figure 10.



	Familiarity with BI, BI tools, and BPM	Familiarity with KM and KMS
Very familiar	7.9%	9.5%
Somewhat familiar	25.4%	31.7%
Neutral or not sure	20.6%	20.6%
Have little knowledge	31.7%	33.3%
Have no knowledge	11.1%	3.2%
Missing	3.2%	1.6%

Figure 10. Familiarity with BI, BI tools, BMP, KM, and KMS.

Correlation was also noted between the respondent's familiarity with BI, BI tools, KM, KMS, and BPM and the organization's use of KM, BI, BI tools, and KMS to build knowledge capital and share knowledge. The Frequency Analysis extraction showed the organizational use of the four variables is generally not very high – 38.1% of the participants said the organization uses KM, BI, and BI tools but not very much. However, on the organization's use of KM, only 6.3% said it was very much, 31% said it was some, 4.8% not at all, 17.5% did not know or had no comment, and only 1.6% gave no response. On the organization use's of BI and BI tools, only 3.2% said it was very much, 36.5% noted some, 1.6% not at all, a fairly large percent of respondents, 19%, did not know or chose not to comment on this question, and 1.6% skipped this question. On the organization's use of KMS to build KC, 25.4% said it was some, almost half of the respondents, 46.0%, noted not very much, 14.4% said not at all, 12.7% did not know or had no comment, and 1.6% did not answer. On the organization's use of KMS to share knowledge, a significant majority said not at all, 1.6% noted very much, 7.9% said it was some, 34.9% not very much, 11.1% did not know or would not comment, and 1.6% skipped this question. This data is represented below in Figure 11.



	Very much	Some	Not very much	Not at all	Don't know / No comment	No Response
Organization use of KM	6.3%	31.7%	38.1%	4.8%	17.5%	1.6%
Organization use of BI and BI tools	3.2%	36.5%	38.1%	1.6%	19.0%	1.6%
Organization use KMS to build KC	0.0%	25.4%	46.0%	14.3%	12.7%	1.6%
Organization use KMS to share K	1.6%	7.9%	34.9%	42.9%	11.1%	1.6%

Figure 11. Organization use of KM, BI, BI tools, and KMS to build KC and share knowledge.

The eight positive variables are associated with the factor Organization Intelligence because the variables pertaining to the organization's familiarity with KM, BI, and KMS and their current use of these concepts, BI tools, and knowledge management systems to build a knowledge capital, have a strong influence on the organization's level of intelligence. A graph was constructed to represent the correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the eight variables that are greater than or equal to the threshold of -0.400 and +0.400. All 28 of the PCA variables are also shown in Figure 12 (Organization Intelligence).

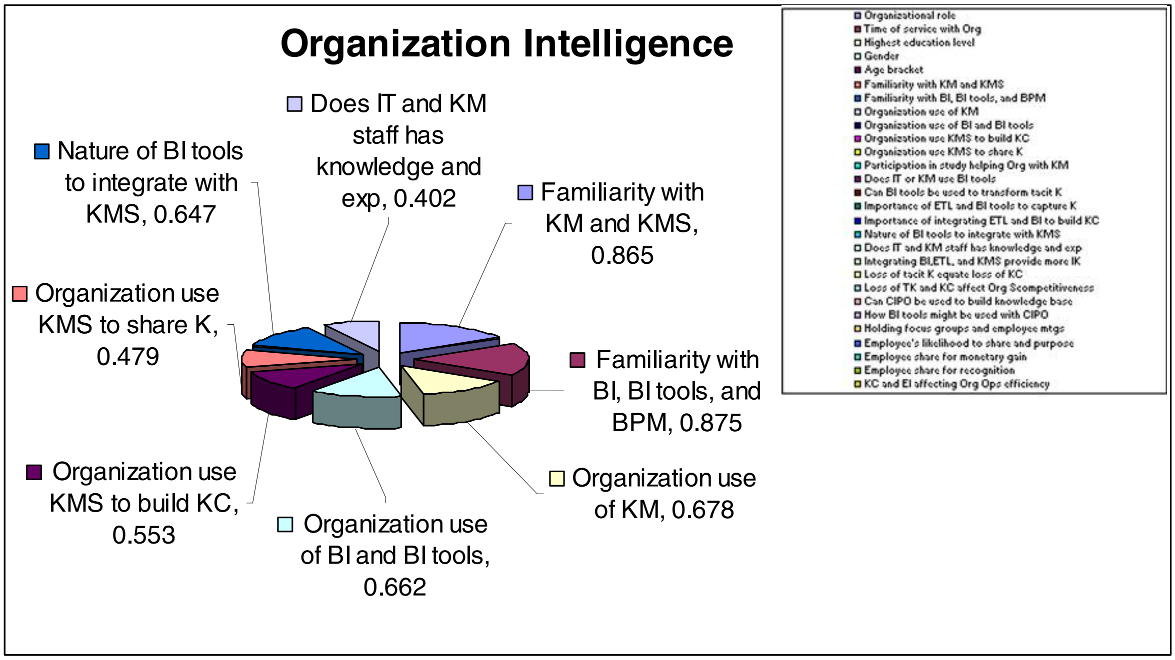


Figure 12. Organization Intelligence.

The third factor on the Rotated Component Matrix, Building KC, is shown to have one negative high correlation and four positive high correlation coefficients for a total of five variables. These variables are listed as follows:

1. Does IT or KM use BI tools? (-0.668)
2. Employee's likelihood to share and purpose (0.902)
3. Employee share for monetary gain (0.835)
4. Employee share for recognition (0.842)
5. KC and EI affecting Org Ops efficiency (0.934)

A graph was constructed to represent the five correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the five variables that are greater than or equal to the threshold of -0.400 and +0.400. All 28 of the PCA variables are also shown in (Figure 13. Building Knowledge Capital).

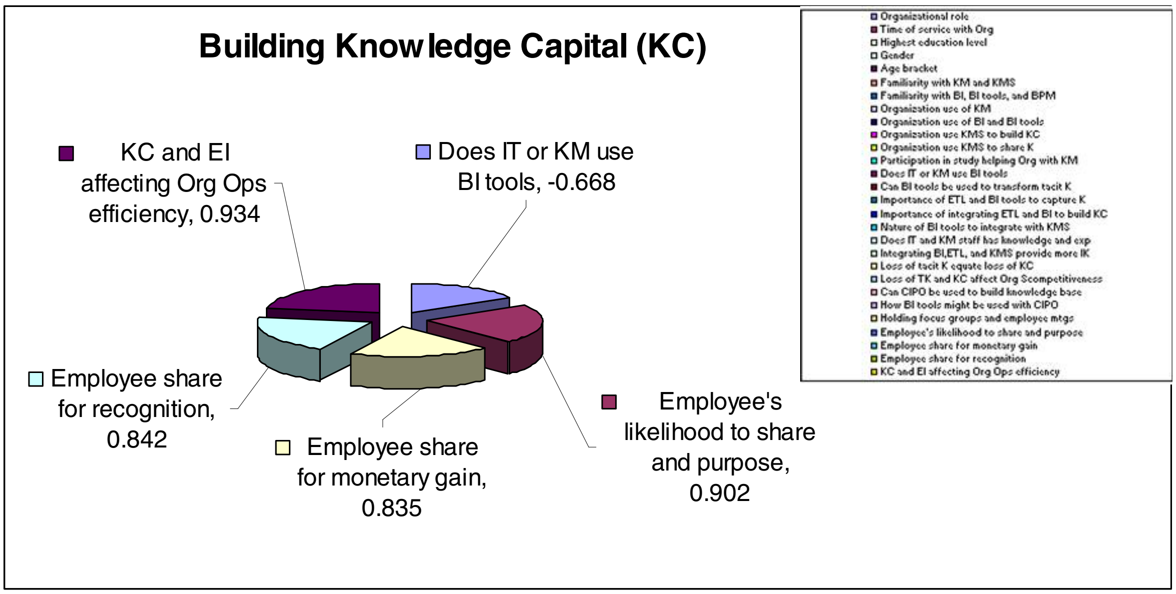


Figure 13. Building Knowledge Capital.

The Organization use of BI, KM, and KMS is factor four on the Rotated Component Matrix. According to this matrix, there are four positive high correlations and three variables with negative significant values exceeding the threshold of -0.400. The four positive variables are:

1. Organizational role (0.786)
2. Time of service with organization (0.854)
3. Highest education level (0.637)

4. Age bracket (0.783)

On the other hand, the three variables with negative correlation are:

1. Organization use of KM (-.0431)
2. Organization use of BI and BI tools (-0.488)
3. Organization use of KMS to share K (-0.537)

A graph was constructed to represent the seven correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the seven variables that are greater than or equal to the threshold of -0.400 and +0.400. All 28 of the PCA variables are also shown in (Figure 14. Organization Use of BI, KM, and KMS).

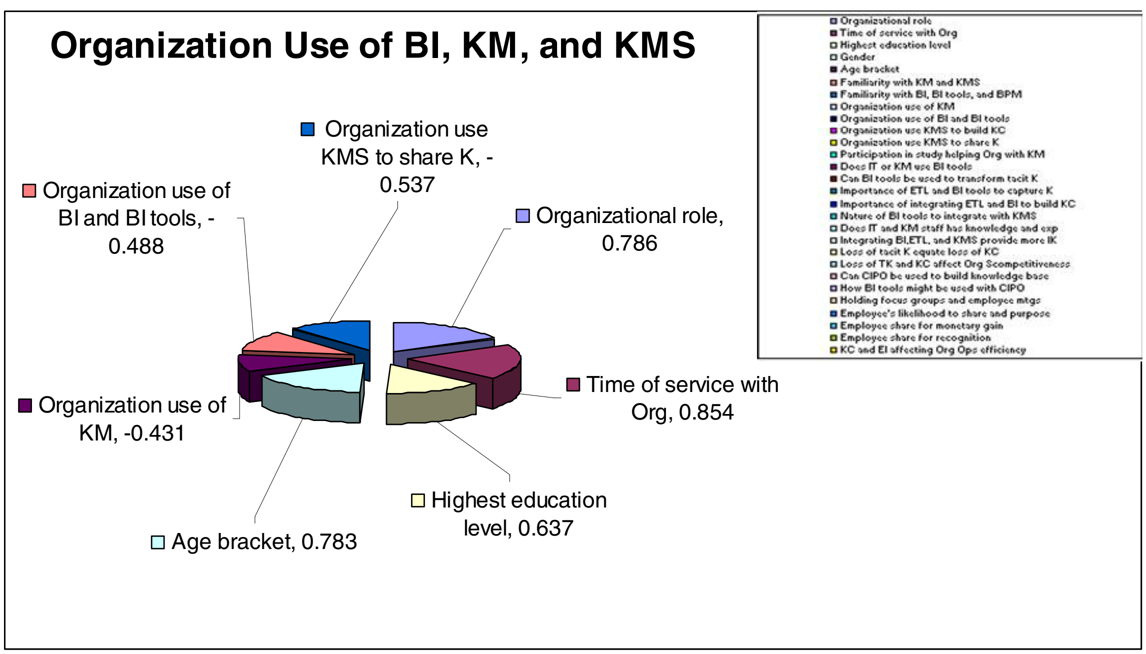


Figure 14. Organization use of BI, KM, and KMS.

As noted earlier in this research, the presence of three or more variables with negative correlation would indicate an adverse affect or relationship between the rotated component and the variables. In this case considering the negative correlation and based on the respondents data analysis from the onsite survey, the researcher concluded that the organization's current use of BI, BI tools, KM, and KMS to build knowledge capital is very low. Extraction from the Frequency analysis Table 10 showed a significant majority of respondents (90.5%), said “NO” when asked if the organization’s IT and KM department use BI tools to capture, transform, reuse, and record knowledge within the organization.

Table 10. Does IT or KM use BI tools?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	7.9	8.1	8.1
	No	57	90.5	91.9	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

From the Frequency analysis, it was also determined that the vast majority of the respondents (46%) noted that the organization’s use of KMS to build capital knowledge is not very much, 14.3% said not at all, 12.7% did not know or had no comment, 1.6% gave no response, and none of the participants said the organization uses KMS to build KC very much. On the other hand, the largest majority (42.9%) said the organization does not use KMS at all to share knowledge, while 34.9% noted the organization uses KMS to share K but not very much, 11.1% did not know or had no comment, 1.6% did not respond to this question, and only 1.6% said the organization uses KMS to share knowledge very much. This data analysis is found to support the negative affect of the selected component and is depicted in Figure 15.

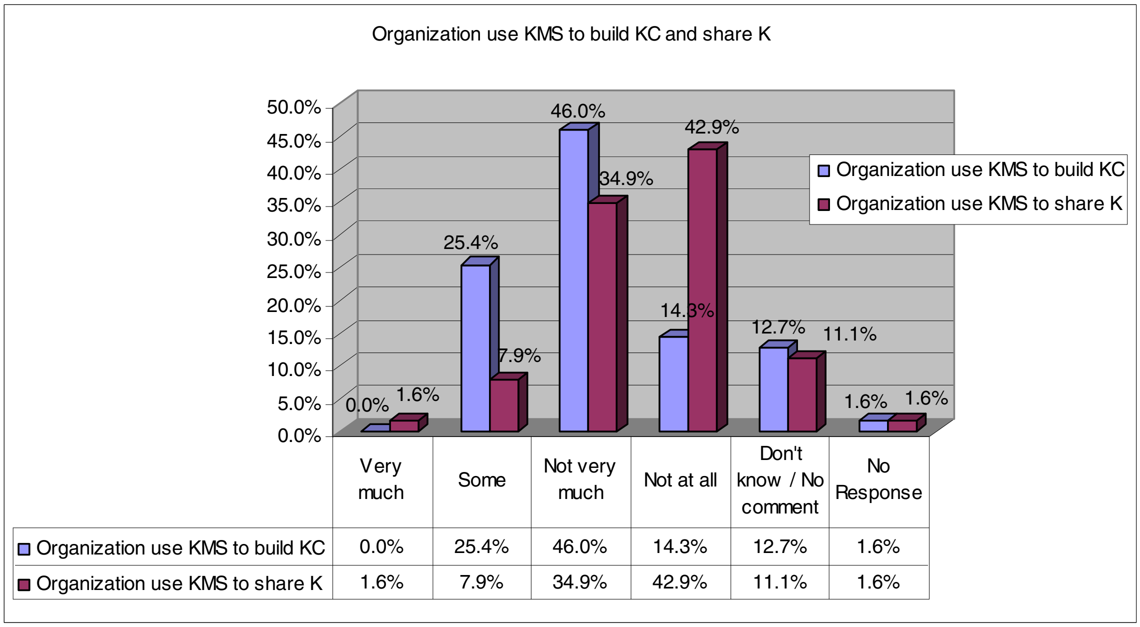


Figure 15. Organization use of KMS to build KC and share knowledge.

Integrating the CIPO model in KC is the fifth factor on the Rotated Component Analysis. This factor had three correlations and they are all highly positive. The variables corresponding to these high positive correlations are:

1. Loss of TK and KC affect organization's sustainable competitiveness (0.750)
2. Can CIPO be used to build knowledge base? (0.669)
3. Holding focus groups and employee meetings (0.913)

A graph was constructed to represent the seven correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the seven variables that are greater than or equal to the threshold of -0.400 and +0.400. All 28 of the PCA variables are also shown in (Figure 16. Integrating CIPO in KC).

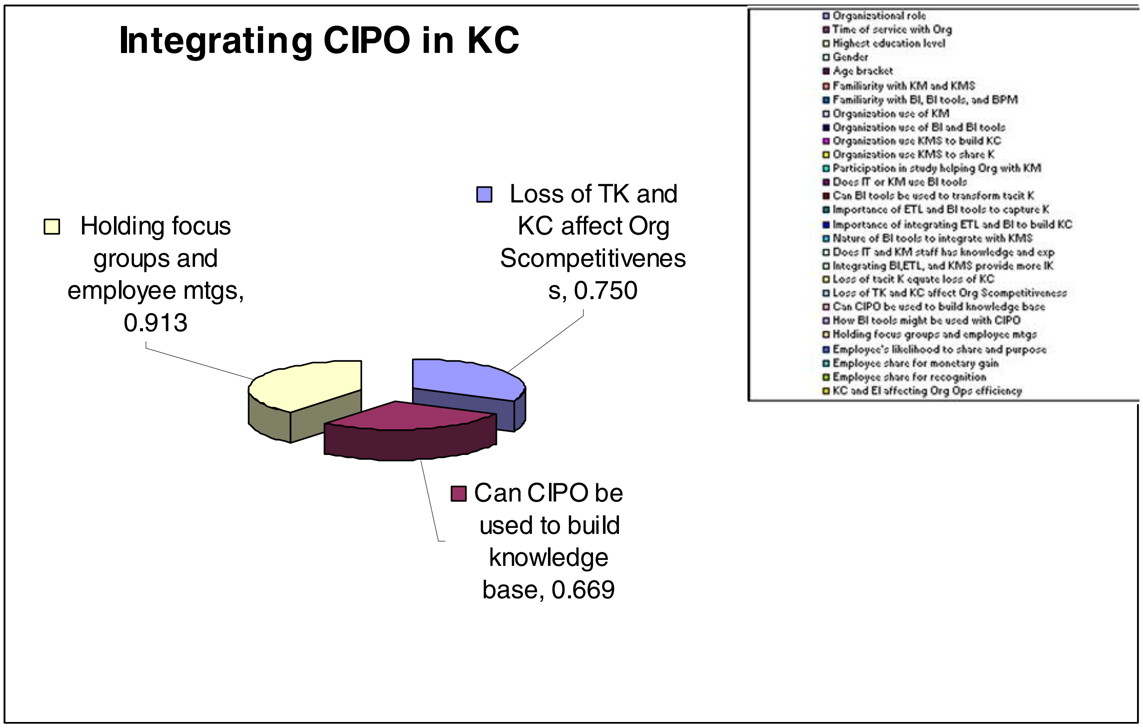


Figure 16. Integrating CIPO in KC.

Factor six, CIPO and BI Tools was associated with the following three high positive correlations:

1. Organization uses KMS to build KC (0.423)
2. Can BI tools be used to transform tacit K? (0.764)
3. How BI tools might be used with CIPO (0.434)

A graph was constructed to represent the three correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the three variables that are greater than or equal to the threshold of -0.400 and +0.400. All 28 of the PCA variables are also shown in (Figure 17. CIPO and BI Tools).

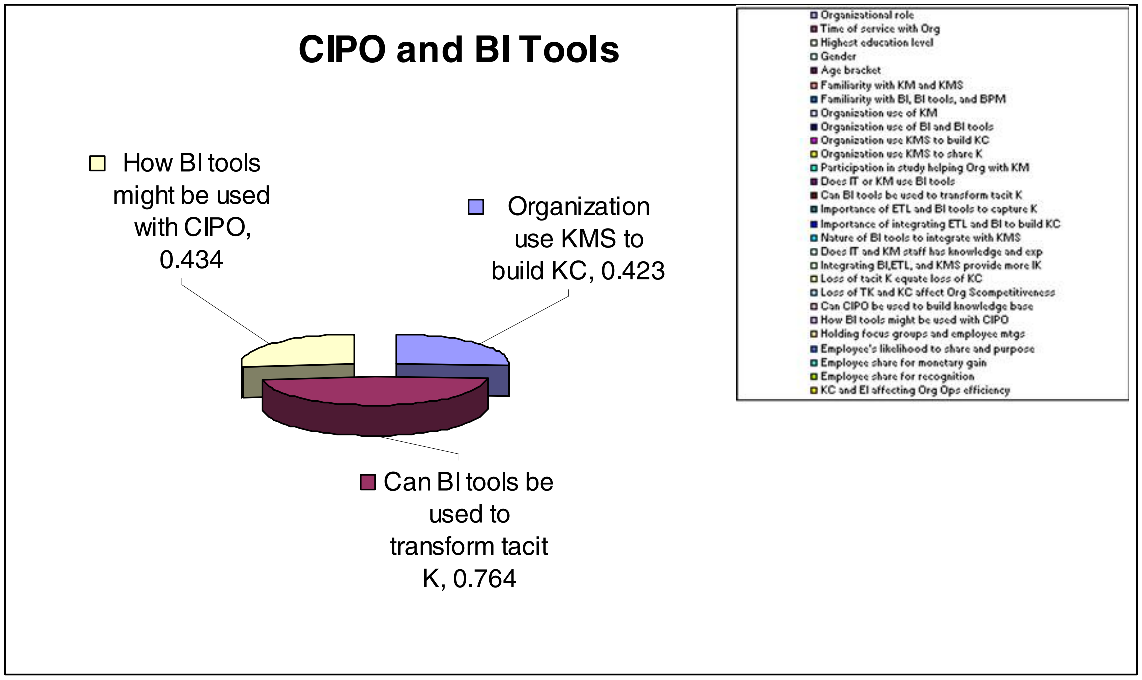
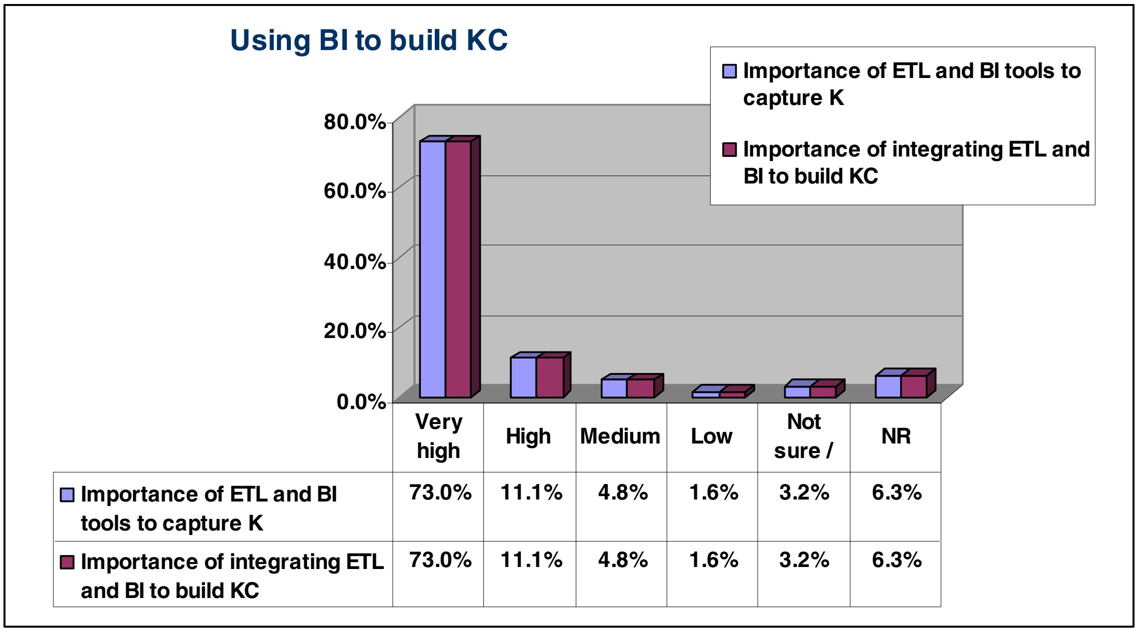


Figure 17. CIPO and BI tools.

From the descriptive statistics, a significant majority of the respondents (more than 79%) felt that BI tools can be used to transform tacit knowledge. All respondents were given a background and a full description of the CIPO model. When asked if they believed the described CIPO model could be used to capture and store tacit knowledge in a data repository, 85.7% said yes, only 4.8% said no, and 6 participants, or 9.5%, opted not to answer. Correlating with this finding, 96.5% of the participants believed the loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equated to loss of knowledge capital (Appendix C). The results found on the Frequency extraction also showed the vast majority of the participants, 73%, rated the importance of ETL and BI tools to capture knowledge and the integration of BI in building knowledge capital as very high (Figure 18).



	Very high	High	Medium	Low	Not sure /	NR
Importance of ETL and BI tools to capture K	73.0%	11.1%	4.8%	1.6%	3.2%	6.3%
Importance of integrating ETL and BI to build KC	73.0%	11.1%	4.8%	1.6%	3.2%	6.3%

Figure 18. Using BI to build KC.

The last factor on the Rotated Component Matrix, Employee Participation, had only two positive correlations associated with two variables, Gender (0.801) and Participation in study helping organization with KM (0.695). When asked about their participation in this study helping their organization with its initiative in knowledge management, the large majorities of the respondents (63.5%) selected “maybe” and were not sure if their participation would or wouldn’t help. On the other hand, 30.2% said “yes” and noted that they have seen improvement made already, while 4.8% said “no” and they have seen little if any improvements (Appendix C). A graph was constructed to represent the two correlated values and the relationship between the selected factor and the corresponding variables with their positive high degree of influence. However, the pie chart only shows the two variables that are greater or equal to the threshold of -0.400 and +0.400. All 28 of the PCA variables are also shown in (Figure 19.Employee’s Participation).

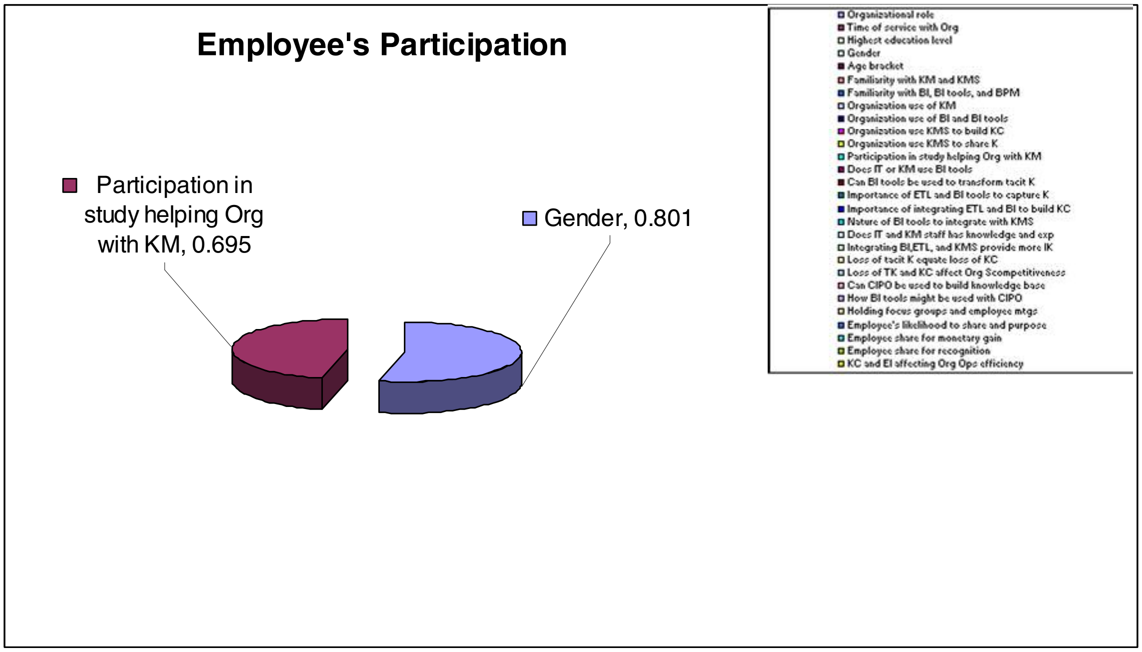


Figure 19. Employee’s participation.

Research Question Discussion

The main research question asks if Business Intelligence (BI) can be incorporated into building knowledge capital (KC) and what are some of the essentials requirements needed to use BI tools to create an intelligent KC that leads to a sustainable competitive advantage and transform a company into an intelligent organization?

From the in-depth interviews, the researcher was able to recognize an overall positive insight from the participants and their overall perception that BI could be incorporated with KM and would significantly contribute to the process of building KC and organizational intelligence. A 100% of the participants gave a positive response when asked if they believe their organization would view building intelligent knowledge capital through the integration of the CIPO model and BI leading to the transformation of their company into an intelligent organization. This fact is also supported by the survey's descriptive statistics (Figure 20), where 100% of the Executive Management and the Knowledge Management respondents rated the importance of integrating BI to build knowledge capital very high. From the Information Technology group, 74% rated the importance of Integrating BI to build knowledge capital very high, 14% rated this integration high, and 11.6% did not respond to this question. From the Management group, 42.9% rated the integration of BI into building knowledge capital very high while 14.3% said it was high, 14.3% selected medium, and 14.3% rated this integration very low.

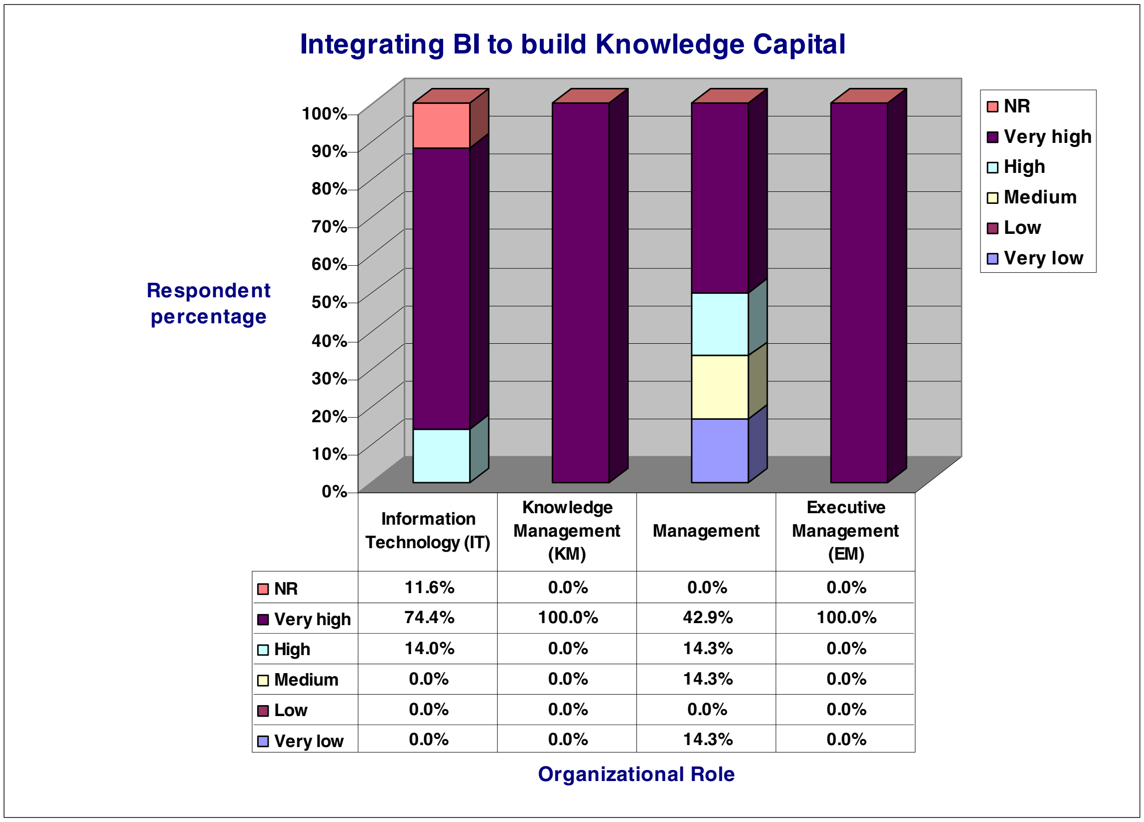


Figure 20. Integrating BI to build Knowledge Capital.

According to the descriptive statistics from Table 11 (KC and EI affecting Organization Operations Efficiency), the vast majority of respondents 76.2% believed that the degree of knowledge capital and enterprise intelligence affecting their organization's operational efficiency is very high. From the remaining participants, 11.1% believed the affect are high, while only 1.6% of the total respondents said it would be medium, 1.6% believe it is very low, and 9.5% elected not to respond to this question. A two tailed Pearson Correlation analysis (Appendix F), revealed that the respondents' perception of KC and EI affecting their organization's operations efficiency is highly correlated with their rating of the (Importance of ETL and BI tools to capture K) and the (Importance of integrating ETL and BI to build KC). The correlation between the respondents' rating of the importance of using ETL and BI tools to capture, transform, and reuse knowledge, is also very significant at .985 with the respondent's rating of the importance of using a knowledge management system that integrates with ETL and BI tools to build knowledge capital. The latter finding and the significant correlations depicted in Appendix F supports the highly positive variance between these factors as shown in (Appendix D), the positive perception concluded from the in-depth interview, and the research question that BI can be incorporated into building knowledge capital that leads to a sustainable competitive advantage and transform a company into an intelligent organization.

Table 11. KC and EI affecting Organization Operations Efficiency

KC and EI affecting Org Ops efficiency					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	1	1.6	1.8	1.8
	Medium	1	1.6	1.8	3.5
	High	7	11.1	12.3	15.8
	Very high	48	76.2	84.2	100
	Total	57	90.5	100	
Missing	NR	6	9.5		
Total		63	100		

Additionally, the factorial analysis revealed the relationships among the variables and the extracted factors were marked by significant positive correlation coefficients leading the researcher to conclude that there is also a high correlation between the factors delineated in the research question. The researcher interpreted the research themes and relationships across all the seven extracted factors depicted in Table 7 from the PCA matrix of Total Variance Explained. According to the latter variance analysis, factor one, Integrating BI and BI tools in building KC revealed a significant positive correlation between the variables 'Importance of ETL and BI tools to capture K,' 'Importance of integrating ETL and BI to build KC,' 'Does IT and KM staff has knowledge and exp,' 'Integrating BI, ETL, and KMS provide more IK,' 'Loss of tacit K equate loss of KC,' and 'Loss of tacit knowledge and KC affect Organization' s sustainable competitiveness.' Factor two, Organization Intelligence also revealed a significant positive correlation between the variables 'Familiarity with KM and KMS,' 'Familiarity with BI, BI tools, and BPM,' 'Organization use of KM,' 'Organization use of BI and BI tools,' 'Organization use KMS to build KC,' 'Organization use KMS to share K,' 'Nature of BI tools to integrate with KMS,' and 'Does IT and KM staff has knowledge and experience.'

Although Integrating BI and BI tools in KC was the holder of almost all components enclosed in the main research question, the PCA statistical method used in the data analysis of all responses did not yield a positive correlation throughout the entire factors. Nonetheless, a full analysis and interpretation of the remaining five factors separately, revealed that each extracted factor with highly positive variances is indeed in support of a positive answer to the research main question. The researcher also examined the highly negative correlations along with the highly positive correlations for all seven factors and concluded that taken as a whole, these correlations do concur with the discovered perceptions of the participants during the in-depth interviews and the main themes and concepts recognized from the constant comparison of the interviews notes and data. The overall significant positive correlations and contribution of the participant's perceptions of incorporating BI into building knowledge capital to create an intelligent

KC that leads to a sustainable competitive advantage and organizational intelligence, both helped explain the answer to the research main question being decidedly positive.

Hypotheses Discussion

Building on the PCA results from the Factor Analysis, the multiple regression analysis is was used to determine which independent variables contributed to the results and test the hypotheses and the whether the model is significantly better at predicting the outcomes, the researcher used the statistics from the analysis of variance (ANOVA) contained in the output of the multiple regression. According to Field (2000), ANOVA and regression are conceptually the same procedure. A summary of the multiple regression and the ANOVA analysis is extracted in (Table 12. Hypotheses Summary)

Table 12. Hypotheses Summary

Hypotheses	Hypotheses Description	Status
$H1_a$:	The loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equate to loss of KC.	Supported
$H1_0$:	The loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge does not equate to loss of KC.	Rejected
$H2_a$:	Loss of tacit knowledge and KC affect the organization’s sustainable competitive advantage.	Supported
$H2_0$:	Loss of tacit knowledge and KC does not affect the organization’s sustainable competitive advantage.	Rejected
$H3_a$:	BI and some BI tools might be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization’s KC.	Supported
$H3_0$:	BI and BI tools cannot be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization’s KC.	Rejected

$H4_a$:	There are specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.	Supported
$H4_0$:	There are no specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.	Rejected

Hypothesis 1 and 2

The first two hypotheses addressed the phenomenon of tacit knowledge in building knowledge capital and the affect on an organization's sustainable competitive advantage. First it was hypothesized that the loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equate to loss of KC. Secondly, it was hypothesized that the loss of tacit knowledge and KC affect the organization's sustainable competitive advantage. From the descriptive statistics shown in (Appendix G Multiple Regression H1-2), it was first noted that there are no predictors from the multicollinearity matrix correlating too highly with each others with a substantial correlation of $R>.9$ except for the perfect 1.00 correlation coefficients representing the correlation of each variable with itself. However, the Pearson correlation matrix showed some significant positive and negative correlation coefficients between some pairs of variables. For example, the loss of tacit knowledge equate loss of KC has a large negative correlation with KC and EI affecting organization's operations efficiency, $R= -.789$. This coefficient is also significant according to the one-tailed significances for each variable, $p < .001$ shown in Appendix G Multiple Regression H1-2.

The Regression model summary depicted in (Appendix G Multiple Regression H1-2), describes the overall model. The researcher selected a hierarchical method of two models to address the first two hypotheses. The first model included the variables used as predictors in terms of employee's willingness to participate in focus groups and employee meetings to share their tacit knowledge and the likelihood that most employees are more than happy to share their tacit knowledge in form of expertise and experience. The variables used also included the employee's reasons behind their willingness to share their tacit knowledge to contribute in building KC and organizational intelligence. The second model referred to the use of all predictors used in model one in addition to the use of the respondents' rating of KC and EI affecting the organization's operations efficiency and their view on the loss of tacit knowledge affecting the organization's sustainable advantage. The Regression model summary in Appendix G shows the dependent or outcome variable used and the independent variables or predictors used in each of the two models. According to the latter model summary, when only the employee's willingness to participate in focus groups and employee meetings and the likelihood that most employees are more than happy to share their tacit knowledge are used as predictors, the multiple correlation coefficient with the dependent variable loss of tacit knowledge correlation shows a significant R value, R = .692. The R Square value which measures how much the variability in the outcome (loss of tacit knowledge) is accounted for in model one shows .479. On this basis, the researcher concluded that for model one, employee's willingness to participate in focus groups and employee meetings and the likelihood that most employees are more than happy to share their tacit knowledge accounts for 47.9% of the variation in the loss of tacit knowledge equating loss of KC.

Furthermore, when the other independent variables or predictors are taken into account in model two, the R Square value increases significantly to .801 and would account for 80.1% of the variation in the loss of tacit knowledge and its affect on the organization. Consequently, the researcher concluded that employee's willingness to participate and share their tacit knowledge accounts for 47.9% while KC and EI and loss of tacit knowledge and KC affecting the organization's efficiency and competitiveness accounts for an additional 32.2%. Hence, the inclusion of the additional independent variables in model two helped explain a larger amount of the variance in the dependent variable or loss of tacit knowledge. The change in the calculated F-ratio from 11.471 to 79.441, which is also significant since p is less than .001, explains the change of the amount of variance introduced by adding the new predictors. The researcher also extracted the Durbin-Watson statistic as part of this Multiple Regression Analysis to confirm whether the assumption of independent errors is tenable. According to the model summary in Appendix G, the Durbin-Watson value is 1.182. With this value being greater than one and less than three, there are no alarms to be sounded and the assumption about the loss of tacit knowledge as a dependent variable is said to be positively met.

According to Field (2000), the analysis of variance (ANOVA) is a much better measure of predicting the outcome than using the mean as a 'best guess'. The researcher examined the ANOVA output in Appendix G to determine whether the F-ratio accurately corresponds to the ratio of the improvement in the predictions that resulted from fitting the two models used and to what degree this is a significant fit of the overall data. With the (a) predictors from the ANOVA table in (Appendix G), the F-ratio of the initial model shows a value of 11.471, which is very significant ($p < .001$) from the Sig column showing a .000 significance value. The (b) indicators in the second model show a higher F value (39.462), which is also highly significant with a Sig value of .000. The researcher interpreted these results as an improvement in the ability of predicting the outcome variable significantly increasing with the additional predictors in model two where the F value is even more significant. The Coefficients table in Appendix G revealed that most of the variables used have absolute high standardized coefficient Beta value. The three variables with the highest Beta values are: Employees share their tacit knowledge for monetary gain (absolute value = .841), Employees share their tacit knowledge for recognition (absolute value = .667), and KC and EI affecting organization operations efficiency (absolute value = .762). These higher standardized coefficient Beta values would also indicate that their corresponding variables are more important predictors.

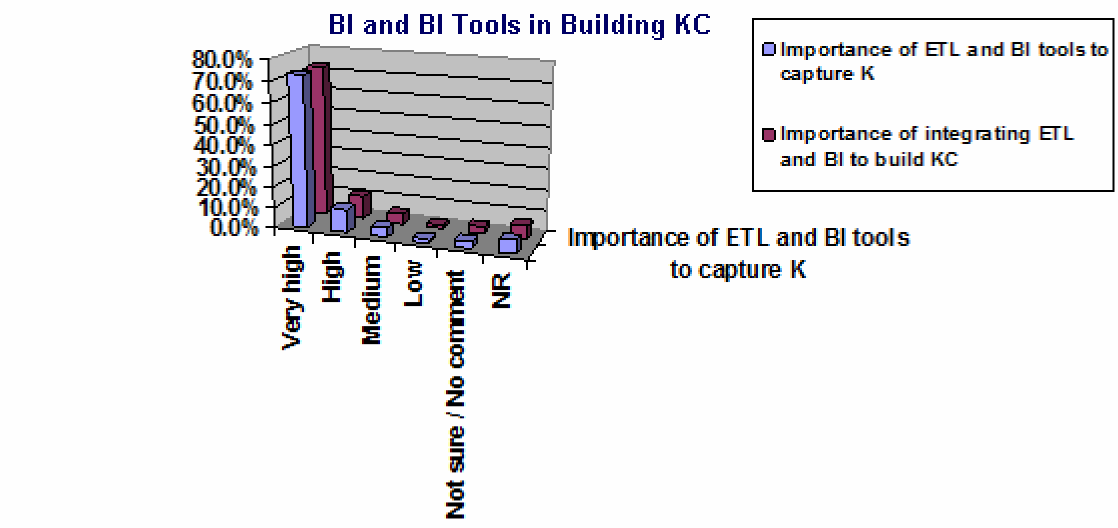
The question raised from the ANOVA results is whether the mean differences are statistically significant to accept or reject the first two hypotheses of this study in conjunction with the results of the PCA where it was concluded that Loss of tacit K equates loss of KC has a significant positive correlation value (0.824), and Loss of TK and KC affects organization's sustainable competitiveness (0.465). Taking into account the latter results and by examining the significant F values and the multivariate analysis test for homogeneity of dispersion matrices used to evaluate whether the variances and covariance among the dependent variables are the same for all levels, the researcher concluded that both hypothesis $H1_a$ and $H2_a$ are supported, therefore accepted while $H1_0$ and $H2_0$ should be rejected.

Hypothesis 3

The third hypothesis noted that BI and some BI tools might be used to transform, and convert tacit knowledge to articulated knowledge that can be assimilated into the organization's KC. From the descriptive statistics analysis, 79.4% (Table 13) of the total respondents believe that BI and BI tools can be used to transform tacit knowledge into articulated knowledge that can become a part of their organization's knowledge capital. On the other hand, only 12.7% did not believe so and 7.9% selected not to give a response. Correlating with this result, 73% of the participants rated the importance of using ETL and BI tools to capture, transform, and reuse knowledge as well as the importance of using KMS to integrate ETL and BI tools to build KC very high. From the remaining number of participants, 11.1% rated the latter importance high, 4.8% said it is medium, 1.6% said it is low, 3.2% were unsure or had no comments, and 6.3% gave no response. These results are depicted in Figure

Table 13. Can BI Tools be Used to Transform Tacit Knowledge?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	79.4	86.2	86.2
	No	8	12.7	13.8	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		



	Very high	High	Medium	Low	Not sure / No comment	NR
Importance of ETL and BI tools to capture K	73.0%	11.1%	4.8%	1.6%	3.2%	6.3%
Importance of integrating ETL and BI to build KC	73.0%	11.1%	4.8%	1.6%	3.2%	6.3%

Figure 21. BI and BI tools in building Knowledge Capital.

From the descriptive statistics shown in (Appendix H Multiple Regression H3), it was first noted that there is only one predictor from the multicollinearity matrix correlating too highly with another variable. The variable (Importance of ETL and BI tools to capture) has a substantial correlation of R = .992. The perfect 1.00 correlation coefficients represented the correlation of each variable with itself. However, the Pearson correlation matrix showed some other significant positive that are within a significant range but not with a substantial coefficient of R > .9. For example, the (Familiarity with BI, BI tools, and BPM) is highly correlated with the participant’s view on the (Organization use of BI and BI tools), R= .504. This coefficient is also significant according to the one-tailed significances for each variable, $p < .001$ shown in Appendix H Multiple Regression H3.

The Regression model summary depicted in (Appendix H Multiple Regression H3), describes the overall model used to examine the alternative hypothesis $H3_a$ and the null hypothesis $H3_0$. Once again the researcher selected a hierarchical method of two models to address these hypotheses. The dependent variable was set to (Can BI tools be used to transform tacit knowledge). The first model included the variables used as predictors included the participants' rating of the importance of using ETL and BI tools to capture knowledge and the importance of integrating ETL and BI to build KC. The second model referred to the participants' (Familiarity with BI, BI tools, and BPM), their view on the (Organization's use of BI and BI tools), and the (Nature of BI tools to integrate with KMS). The Regression model summary in Appendix H shows the dependent or outcome variable used and the independent variables or predictors used in each of the two models.

According to the model summary depicted in Appendix H, when considering the (a) predictors in the first model the multiple correlation coefficient with the dependent variable (Can BI tools be used to transform tacit knowledge) shows a significant R value, $R = .636$. The R Square value which measures how much the variability in the outcome is accounted shows .404. On this basis, the researcher concluded that for model one, the participants'' rating of the importance of using BI and BI tools to capture knowledge and the importance of integrating ETL and BI tools to build KC accounts for 40.4% of the variation in the respondents' perception of BI tools being used to transform tacit knowledge. However, when the other independent variables or predictors are taken into account in model two, the R Square value does not increase significantly, and only slightly edges to .431. Consequently, this would account for the total of 43.1% of the variation. Hence, the researcher concluded that while the importance of using BI and BI tools to capture knowledge and the importance of integrating ETL and BI tools to build KC accounts for 47.9%, the participants' familiarity with BI, BI tools, and BPM, their view on the organization's use of BI and BI tools, and on the nature of BI tools to integrate with KMS, only account for an additional 2.7%. The inclusion of the additional independent variables in model two did not help explain a much larger amount of the variance in the dependent variable. The F-ratio noted in the model summary in Appendix H, decreased from 18.000 to .782. With the first model the F-ration is also significant since p is less than .001, however, with the second model F-ration is not significant, F = .510. The researcher also extracted the Durbin-Watson statistic as part of this Multiple Regression Analysis to confirm whether the assumption of independent errors is tenable. According to the model summary in Appendix H, the Durbin-Watson value is 2.394. With this value being greater than one and less than three, there are no alarms to be sounded and the assumption about the dependent variable BI tools being used to transform tacit is met.

The researcher examined the ANOVA output in Appendix H to determine whether the F-ratio accurately corresponds to the ratio of the improvement in the predictions that resulted from fitting the two models used and to what degree this is a significant fit of the overall data. With the (a) predictors from the ANOVA table in (Appendix H), the F-ratio of the initial model shows a value of 18.000, which is very significant ($p < .001$) from the Sig column showing a .000 significance value. The (b) indicators in the second model shows a lower F value (7.580), which is also highly significant with a Sig value of .000. The Coefficients table in Appendix H revealed that only the variables used with the first model have an absolute high standardized coefficient Beta value. This finding supports the conclusion that the importance of using BI and BI tools to capture knowledge and the importance of integrating ETL and BI tools to build KC are more important predictors as independent variables with their higher standardized coefficient Beta values.

From the Principal Component Analysis, the researcher concluded that the first factor on the Rotated Component Matrix, BI and BI Tools in KC, indicated a significant positive affiliation with the Importance of ETL and BI tools to capture Knowledge (0.899), and the Importance of integrating ETL and BI to build KC (0.899). The question that is now raised from the ANOVA results is whether the mean differences are statistically significant to accept or reject $H3_a$ and $H3_0$ in conjunction with the results of the PCA. Taking into account the latter results and by examining the significant F values and the multivariate analysis test for homogeneity of dispersion matrices used to evaluate whether the variances and covariance among the dependent variables are the same for all levels, the researcher concluded that the alternative hypothesis $H3_a$ is supported therefore accepted whereas $H3_0$ should be rejected.

Hypothesis 4

Lastly it was hypothesized that there are specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge. From the frequency statistics shown in Table 14, the vast majority of the participants (85.7%) believed that the described CIPO model could be used to capture and store tacit knowledge in a data repository. Only 4.8% did not think the CIPO model can be used of this purpose, and 9.5% of the participants selected not respond to this question.

Table 14. Can CIPO be Used to Build Knowledge Base?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	54	85.7	94.7	94.7
	No	3	4.8	5.3	100.0
	Total	57	90.5	100.0	
Missing	NR	6	9.5		
Total		63	100.0		

Additionally, 92.5% of the participants who chose to describe how some BI tools might be used to transform, and convert tacit knowledge captured using the CIPO model, rated their selection very high based on their past experience. When asked to describe any specific data structures and system's requirement needed to extract, transform, and load tacit knowledge into data marts where BI tools can further be applied to extrapolate more intelligent knowledge, only twenty six out of the sixty three respondents elected to give answers. However, the 26 respondents that elected not to skip this question were all from the KM group and other IT employees with higher knowledge of Bi, KMS, and data structures. From the frequency statistics Table 15, 84.1% of the respondents indicated that the integration of BI and ETL tools with a KMS will provide much more knowledge and only 3.2% said it would be the same. On the other hand, only 4.8% were unsure of what to expect or what knowledge to gain and 7.9% gave no answer.

Table 15. Integrating BI, ETL, and KMS Provide More IK

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Much more knowledge	53	84.1	91.4	91.4
	About the same	2	3.2	3.4	94.8
	I am unsure what to expect or what knowledge	3	4.8	5.2	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		

From the descriptive statistics shown in (Appendix I Multiple Regression H4), it was first noted that there are no predictors from the multicollinearity matrix correlating too highly with each others with a substantial correlation of R>.9 except for the perfect 1.00 correlation coefficients representing the correlation of each variable with itself. However, the Pearson correlation matrix showed some significant positive and negative correlation coefficients between some pairs of variables. For example, the Organization use of KM has a large positive correlation with the Organization use of BI and BI tools, R= .864. This coefficient is also significant according to the one-tailed test between the two variables where the Sig (1-tailed) is less than .001 as shown in Appendix I Multiple Regression H4.

The model summary in (Appendix I Multiple Regression H4) depicts the first model with a set of independent variables or predictors, including the participants' perception of the organization’s use of KM, use of KMS to share knowledge, use of KMS to build KC, use of BI and BI tools to build KC, and the whether the CIPO model can be used to build a knowledge base. The second model referred to the use of all predictors used in model one in addition to the use of the respondents' rating of KC and EI affecting the efficiency of the organization's operations. The regression model summary in Appendix I shows the dependent or outcome variable used and the independent variables or predictors used in each of the two models. By examining the model summary (Appendix I), the researcher noted that the predictors used with the first model do not yield a significant multiple correlation coefficient, R = .380. The R Square value measuring how much the variability in how BI tools might be used to transform, and convert tacit knowledge captured using the CIPO model is .144. On this basis, the predictors used in model one are said to account for 14.4% of the variation in how BI tools might be used with the CIPO model. However, when the other independent variables or predictors are taken into account in model two, the R Square value increases significantly to .503 and would account for 50.3% of the variation. Accordingly, it is concluded that the organization’s use of KM, KMS, BI to build and share knowledge along with the participants’ perception of using the CIPO model to build knowledge, accounts for 14.4% while KC and EI and loss of tacit knowledge and KC affecting the organization's efficiency and competitiveness accounts for an additional 35.9%. To that extent, the inclusion of the additional independent variables in model two helped explain a larger amount of the variance in the dependent variable. The F Change increase from 1.115 to 23.081, which is also significant since p is less than .001, explains the change of the amount of variance introduced by adding the new predictor. The researcher also extracted the Durbin-Watson statistic as part of this Multiple Regression Analysis to confirm whether the assumption of independent errors is tenable. According to the model summary in Appendix I, the Durbin-Watson value is 2.101. With this value being greater than one and less than three, there are no concerns noted and the assumption about how Bi tools might be used with the CIPO model is positively met.

By examining the analysis of variance (ANOVA) output (Appendix I), the researcher was able to determine whether the F-ratio accurately corresponds to the ratio of the improvement in the predictions that resulted from fitting the two models used and to what degree this is a significant fit of the overall data. With the (a) predictors from the ANOVA table in (Appendix I), the F-ratio of the initial model shows a value of 1.115 that is not significant ($p > .001$). From the Sig column the first F-ratio shows a value of .372. The (b) indicators in the second model show a higher F value (5.397), which is highly significant with a Sig value of .001. The researcher interpreted these results as an improvement in the ability of predicting the outcome variable significantly increasing with the additional predictors in model two where the F value is even more significant. The Coefficients table in (Appendix I) revealed two variables with an absolute high standardized coefficient Beta value.

Recalling the results from the Principal Component Analysis, it was noted that several factors on the Rotated Component Matrix included some of the same variables used in the Multiple Regression conducted on the fourth hypothesis. These variables were associated with a insignificant high correlation in the PCA, including the Organization use of KM (0.678), Organization use of BI and BI tools (0.662), Organization use KMS to build KC (0.553), Organization use KMS to share K (0.479), Nature of BI tools to integrate with KMS (0.647), and Can CIPO be used to build knowledge base? (0.669). Again the question raised from the ANOVA results is whether the mean differences are statistically significant to accept or reject $H4_a$ and $H4_0$ in conjunction with the results of the PCA. Taking into account the latter results and by examining the significant F values and the multivariate analysis test for homogeneity of dispersion matrices used to evaluate whether the variances and covariance among the dependent variables are the same for all levels, the researcher concluded that both hypothesis $H4_a$ is supported, therefore accepted while $H4_0$ should be rejected.

CHAPTER 5: RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Overview

In this section, results from the data captured and analyzed with both the qualitative and quantitative methods in chapter four will be discussed. The use of data analysis extractions and reports from SPSS, along with the further examination of the resulting tables and charts, will be the framework for examining the research questions and hypotheses raised in chapter three. Results from the in-depth interviews and the survey questions, in addition to the literature review within the described framework, will also be the guidelines and basis for the summary, conclusion, and recommendations of this study.

The literature review on knowledge management, knowledge capital, knowledge management systems, business intelligence, and BI tools covered in chapter two, coupled with the researcher's prior work experience with BI and background in knowledge management and the use of BI tools, led to the questions raised in this research:

1. Can Business Intelligence (BI) be incorporated into building knowledge capital (KC)?
2. What are some of the essentials requirements needed to use BI tools to create an intelligent KC that leads to a sustainable competitive advantage and transform a company into an intelligent organization?

Four hypotheses pertinent to the latter research questions were developed. The first examined whether the loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equates to loss of KC. The second hypothesis dealt with the loss of tacit knowledge and KC affecting the organization's sustainable competitive advantage. The third hypothesis asked if BI and some BI tools might be used to transform and convert tacit knowledge into articulated knowledge that can be assimilated into the organization's KC. The fourth hypothesis intended to identify any specific data structures and system's requirements needed to extract, transform, and load tacit knowledge from the CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge.

The four hypotheses were observed in the course of a survey questionnaire that resulted in a multivariate analysis of 28 different variables. The analyzed data was further reduced and loaded into a matrix depicting the correlation of coefficients among the useable variables. The Principal Component Analysis (PCA) applied to the collected data resulted in each loaded factor achieving a statistical significance level of <-0.400 or >0.0400 based on one in twenty-eight chances. This factorial analysis also yielded seven extracted factors from the total measures and the matrix of total explained variances.

With the discussion of the research questions and hypotheses results in terms of the research themes and the factorial analysis, this research closes with a proposed set of guidelines that could serve as a framework for future research studies in the area of applying BI and BI tools to building knowledge capital and enterprise intelligence.

Concluding Summary

The PCA factorial analysis resulted in seven factors that were displayed with significant positive correlation coefficient values corresponding to their correlations to each of the 28 variables used in the SPSS data analysis. The researcher interpreted the research themes and relationships across all the seven extracted factors (depicted in Table 7) from the PCA matrix of Total Variance Explained and noted a significant positive correlation. For example, factor one, Integrating BI and BI tools in building KC, revealed a significant positive correlation among the variables 'Importance of ETL and BI tools to capture K,' 'Importance of integrating ETL and BI to build KC,' 'Does IT and KM staff has knowledge and exp,' 'Integrating BI, ETL, and KMS provide more IK,' 'Loss of tacit K equate loss of KC,' and 'Loss of tacit knowledge and KC affect Organization' s sustainable competitiveness.'

The seven factors (consisting of BI and BI Tools in KC, Organization Intelligence, Building KC, Organization Use of BI, KM, and KMS, Integrating CIPO in KC, CIPO and BI Tools, and Employee Participation) are further supported by the results of the in-depth interviews and the Frequency Analysis. From all these different analyses, high correlations are noted in support of a positive response to the research questions that Business Intelligence (BI) can be incorporated into building knowledge capital (KC) and that there are some essentials requirements needed to use BI tools to create an intelligent KC that leads to a sustainable competitive advantage and to transform a company into an intelligent organization. The multivariate analysis test for homogeneity of dispersion matrices used to evaluate whether the variances and covariance among the dependent variables are the same for all levels resulted in significant F values. In concurrence with the results of the Factor and Frequency analysis, the Regression Analysis and the ANOVA results where the mean differences and the F values are statistically significant, the researcher concluded that all four hypotheses, $H1_a$, $H2_a$, $H3_a$, and $H4_a$, are supported

(Table 12 Hypotheses Summary). Hence, all four alternative hypotheses are accepted and all four null hypotheses are rejected.

One interesting aspect noted was an apparent relationship between the respondents' overall familiarity with BI, BI tools, KM, KMS, and BPM and the organization's use of KM, BI, BI tools, and KMS to build knowledge capital, share knowledge, and contribute to the organizational intelligence. Extraction from the Frequency analysis (Table 10) showed a significant majority of respondents (90.5%), said "NO" when asked if the organization's IT and KM department use BI tools to capture, transform, reuse, and record knowledge within the organization. By the same token, only 14% of the total respondents correctly identified Cognos as the organization's BI application currently being used.

The lack of awareness of the company's KM and BI initiative and the use of Cognos could be attributed to the need for additional training on Cognos, or the need for 'more Cognos tools,' and 'more intelligent queries and reports' expressed by several participants. Additionally, 30% of the participants who elected to elaborate on whether they are aware of or have any knowledge of any tools that can be deployed to improve their organization's ability to manage its knowledge and build a better knowledgebase, expressed their belief that Business Objects should have been the choice instead of Cognos. Other participants noted the need for management to understand the cost/benefit of implementing a KMS and for top management to realize there are problems that need to be solved and to embrace concepts that currently threaten their 'power.' One survey participant said, "This company could use a comprehensive ERP to go along with our data warehouse for Cognos. More training on Cognos." Another one suggested: "Create a less-complex analytical dashboard that all employees with access to Cognos can use." A third respondent asserted: "Need better use of enterprise performance management tools and using BI in all departments. So far it seems that not all departments has been using Cognos or have been trained in using it…Definitely [need] better reporting and analysis tools."

These findings also seem to correlate with the participants' responses about BI and BI tools being used to transform tacit knowledge into articulated knowledge that can become a part of their organization's knowledge capital and their rating and choice of what BI tools to use. According to the frequency analysis and the descriptive statistics from (Figure 22), 52.6% of the total respondents chose ETL and rated it 'very high', 18.4% selected Business Objects, 5.3% selected OLAP and OLTP, 18.4 chose others such as SOA, EII, CRM, ERP, QIQ, EPM, while only 2.6% selected Cognos and another 2.6% opted for SAS.

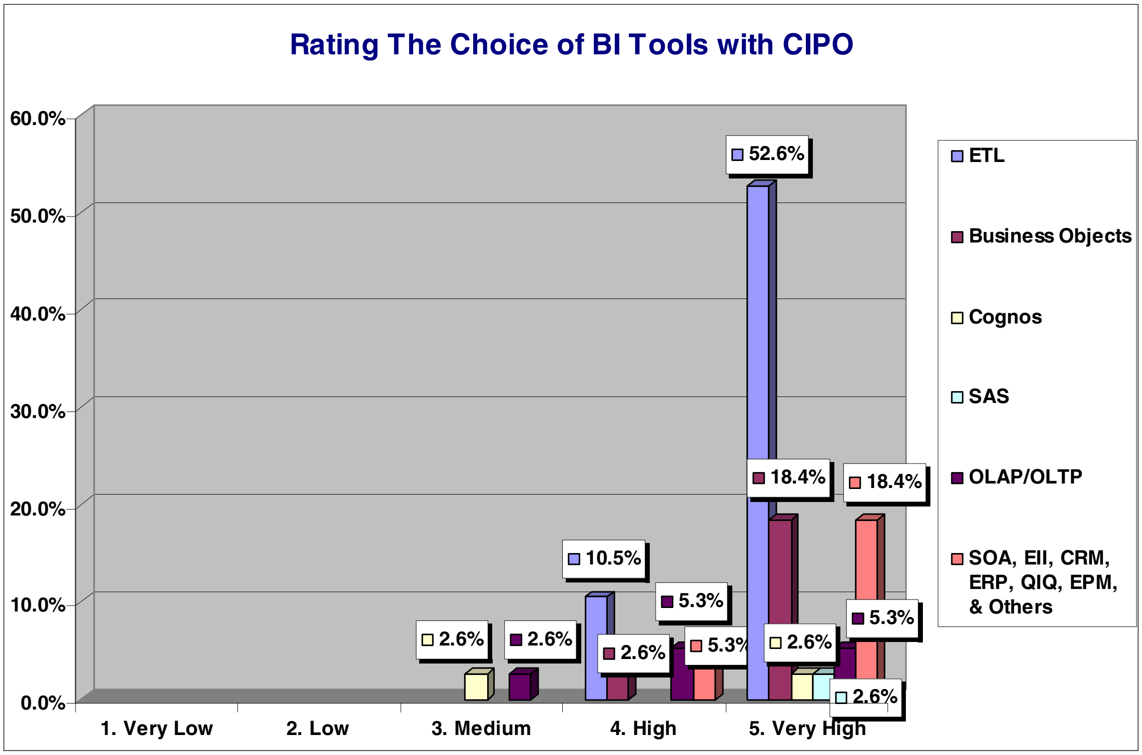


Figure 22. Rating the choice of BI Tools with CIPO.

Although the familiarity with and usage of KM, BI, and KMS are relatively low (38.1%), such as it is the case for Organization X, the overall perception of the importance of BI and its integration in building knowledge capital by all participants from the four different organizational roles is relatively very high. This perception is particularly very high with the Knowledge Management and the Executive Management group (100%), where both indicated based on their past experience that BI tools might be used to transform, and convert tacit knowledge captured using the CIPO model (Figure 20).

In complete support of the latter perception, the research revealed another significant finding pertaining to the organizational role in regard to the use of BI and ETL in KMS and the CIPO integration. Both the entire KM and the Executive group (100%) believed the described CIPO model could be used to capture and store tacit knowledge in a data repository. The entire KM and Executive group also believed the integration of BI and ETL tools with a KMS will provide more intelligent knowledge, in comparison, 86% of the IT group and 57% to 71% of the Management group held the same belief (Figure 23).

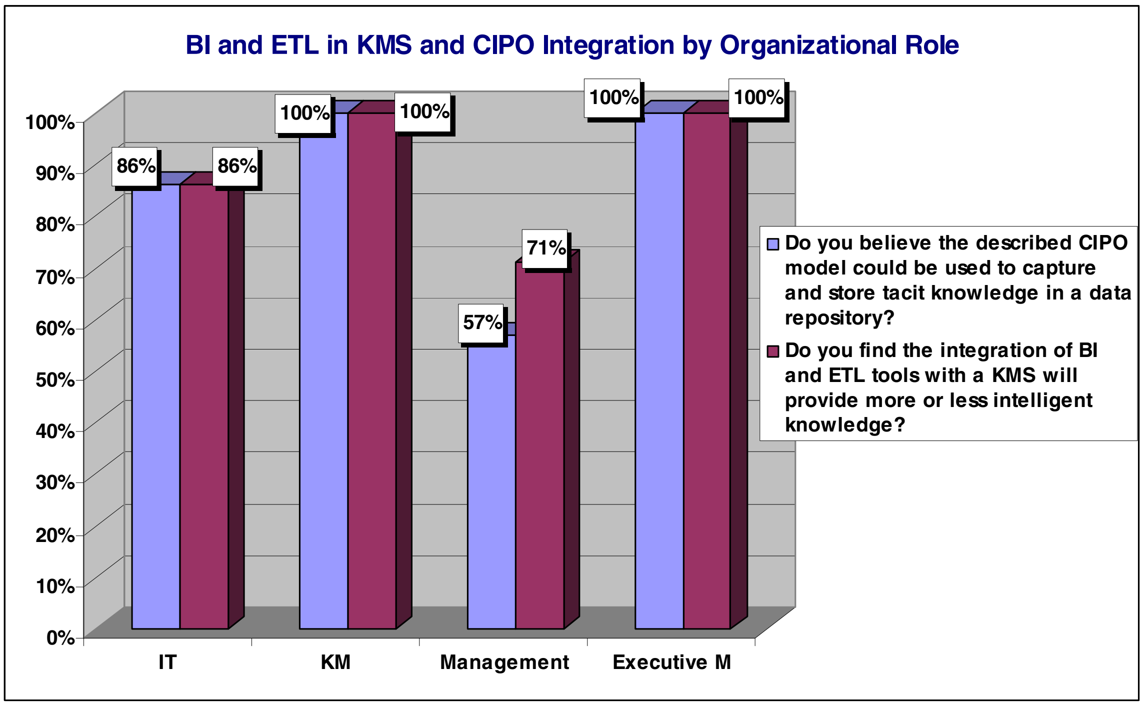
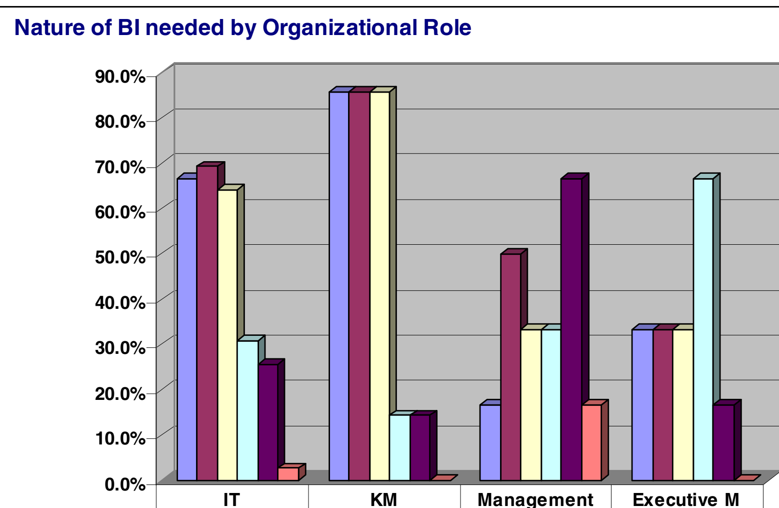


Figure 23. BI and ETL in KMS and CIPO integration by organizational role.

As previously demonstrated, the correlation between the respondents' rating of the importance of using ETL and BI tools to capture, transform, and reuse knowledge is also very significant (.985) with the respondent's rating of the importance of using a knowledge management system that integrates with ETL and BI tools to build knowledge capital. Furthermore, 91.4% of the total respondents indicated that the integration of BI with a KMS will provide much more intelligent knowledge and 92.1% expressed their opinion on the nature of BI tools needed to integrate with a KMS to build a knowledge base. Here again the organizational role played a significant role in the respondents' selection. The study revealed that differences of opinion on the nature of BI tools needed in the integration with a KMS showed the Need to Extract, Transform, and Load (ETL) and the creation of metadata of knowledge by department and by employee ranked highest among the IT and KM group (Figure 24). On the other hand, the need to clarify what BI tools to use and for some help researching KMS requirements ranked the highest with the Management and the Executive management groups (Figure 24).



	IT	KM	Management	Executive M
Need to Extract, Transform and Load data (ETL)	66.7%	85.7%	16.7%	33.3%
Create metadata of knowledge by department	69.2%	85.7%	50.0%	33.3%
Create metadata of knowledge by employee	64.1%	85.7%	33.3%	33.3%
Need clarification on what BI tools to use	30.8%	14.3%	33.3%	66.7%
Need some help researching KMS requirements	25.6%	14.3%	66.7%	16.7%
Other reason(s) not listed here	2.6%	0.0%	16.7%	0.0%

Figure 24 Nature of BI needed by organizational role.

Another interesting finding and conclusion of this study pertains to the phenomenon of tacit knowledge and employees' willingness to participate in building the organization's knowledge capital by sharing their expertise and experience. From the data analysis, the researcher concluded that employees' willingness to participate in focus groups and employee meetings and the likelihood that most employees are more than happy to share their tacit knowledge accounts for 80.1% of the variation in the loss of tacit knowledge equating to loss of KC and KC and EI and loss of tacit knowledge and KC affecting the organization's efficiency and overall competitiveness. Additionally, from an organizational behavior and culture perspective, it was noted that 98.2% of the total participants believed that holding groups and regular employee meetings to brainstorm and share ideas, including best practices, will be conducive to promoting knowledge sharing amongst colleagues and coworkers.

However, the perception of the likelihood that most employees would be more than happy to share their expertise and experience varies considerably by the participants' role in the organization. While half of the Executive Management group rated the employee sharing of tacit knowledge and experience as very high and 33.3% as high, the Management group rated this act 28.6% high and 57.1% medium. On the contrary, the vast majority (65.1%) of the Information Technology and (85.7%) of the Knowledge Management groups rated the employees' sharing of tacit knowledge and experience as medium (Figure 25).

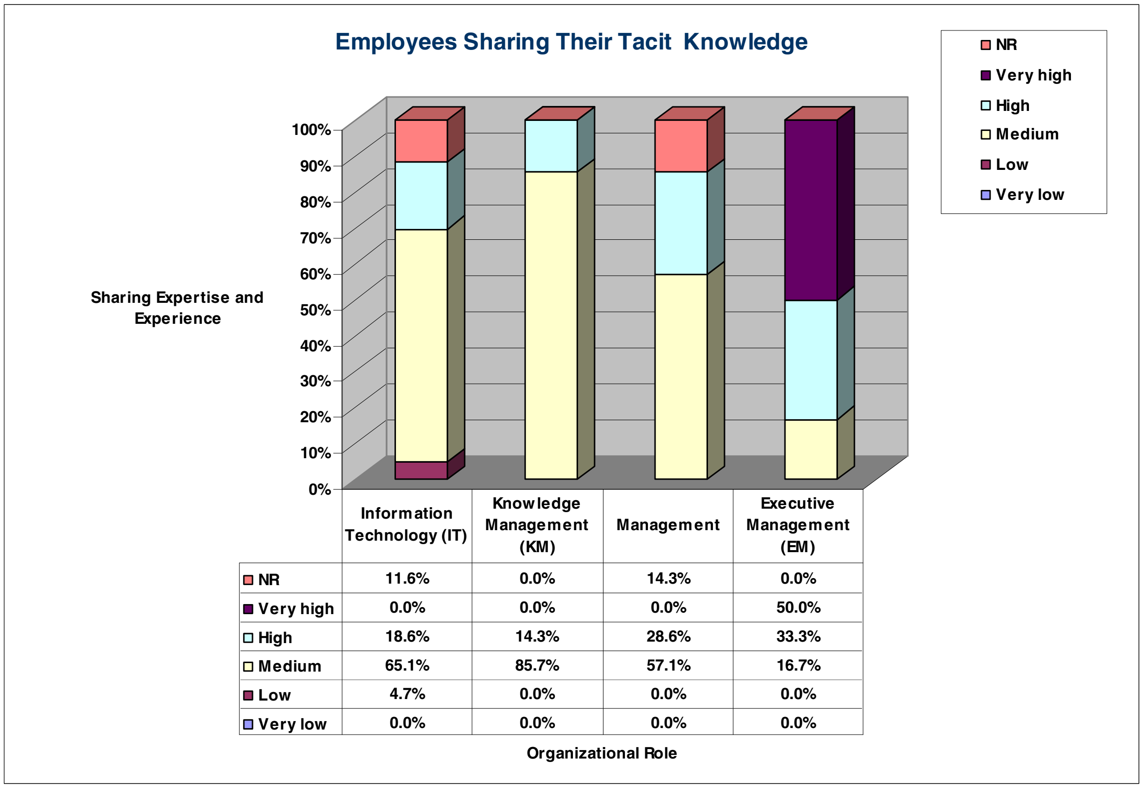
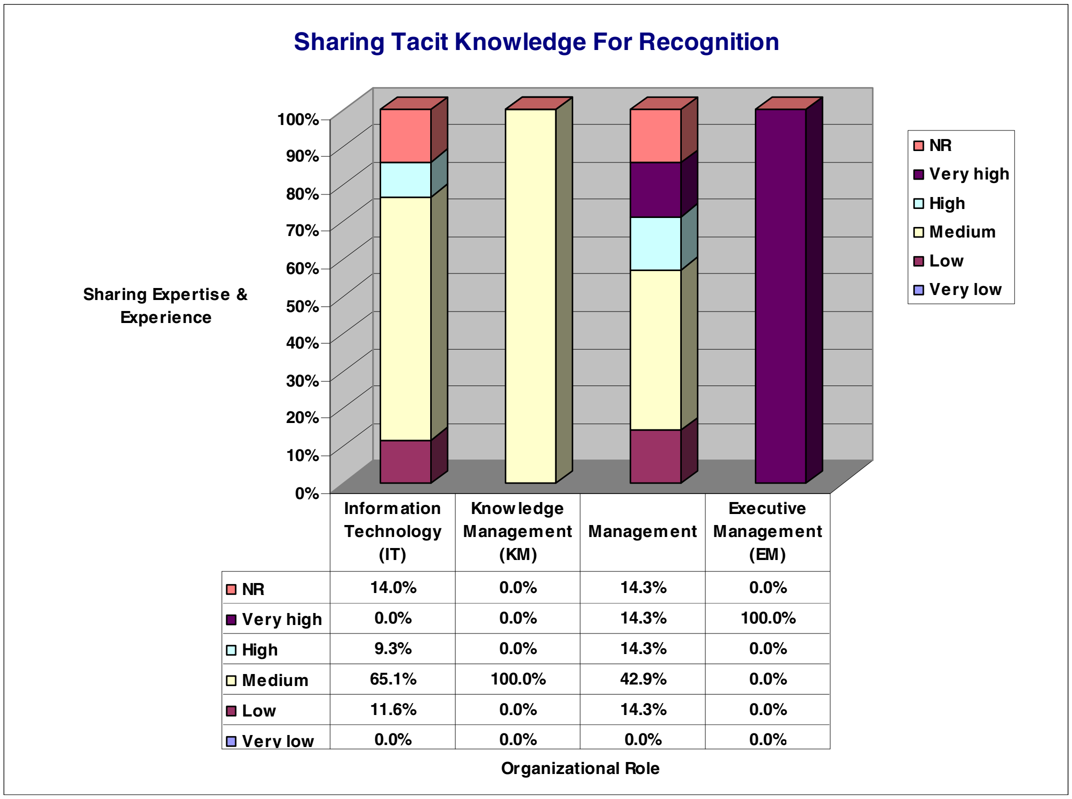


Figure 25. Employees sharing their tacit knowledge.

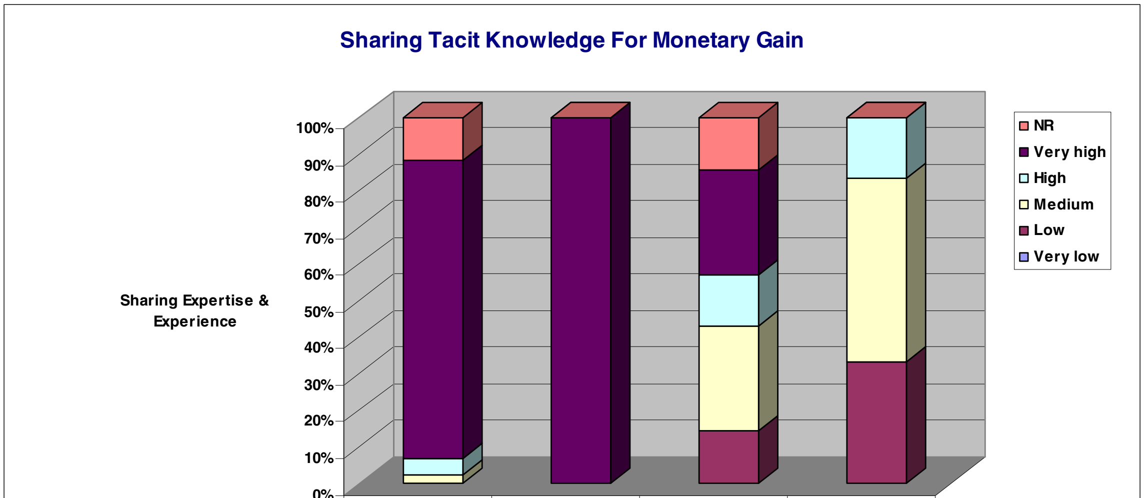
In concurrence with the latter conclusion, the motive behind the employees' sharing of their tacit knowledge as expertise and experience has an inverse relationship or negative correlation between the Executive Management on one side and the IT and KM group on the other side. Whereas a 100% of the Executive group perceived the employees' likelihood to share their tacit knowledge to gain recognition, gratitude, and self-fulfillment as very high, the IT and KM group utterly disagreed with that (Figure 26).



	Information Technology (IT)	Knowledge Management (KM)	Management	Executive Management (EM)
NR	14.0%	0.0%	14.3%	0.0%
Very high	0.0%	0.0%	14.3%	100.0%
High	9.3%	0.0%	14.3%	0.0%
Medium	65.1%	100.0%	42.9%	0.0%
Low	11.6%	0.0%	14.3%	0.0%
Very low	0.0%	0.0%	0.0%	0.0%

Figure 26. Sharing tacit knowledge for recognition.

The vast majority of the IT and KM, 81.4% and 100% respectively, felt the employees would share their tacit knowledge not for recognition, but rather to gain monetary compensation or/and career advancement (Figure 27). Also directly converse to the latter finding, the Executives' perception of the likelihood that employees share their tacit knowledge for monetary gain is not at all significant, 50% medium and 33.3% low. Taking into account this study's support for the hypothesis that loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equates to loss of KC, and loss of tacit knowledge and KC affect the organization's sustainable competitive advantage, the inverse relationship between the Executive group and other participants concerning the reasons behind sharing tacit knowledge becomes an area of concern and a critical factor that merits further research and study.

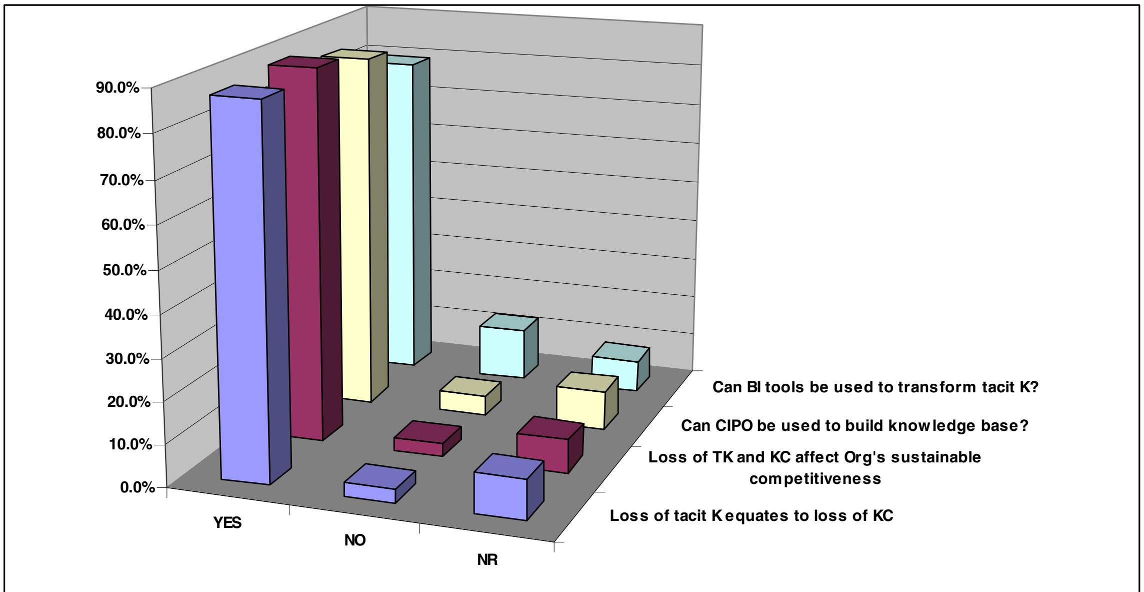


	Information Technology (IT)	Knowledge Management (KM)	Management	Executive Management (EM)
NR	11.6%	0.0%	14.3%	0.0%
Very high	81.4%	100.0%	28.6%	0.0%
High	4.7%	0.0%	14.3%	16.7%
Medium	2.3%	0.0%	28.6%	50.0%
Low	0.0%	0.0%	14.3%	33.3%
Very low	0.0%	0.0%	0.0%	0.0%

Organizational Role

Figure 27. Sharing tacit knowledge for monetary gain.

In concurrence with the positive association of factors and the significant correlations from the multivariate analysis on the loss of tacit knowledge equating loss of capital and the loss of tacit knowledge affecting the organizational sustainable competitive advantage in support of $H1_a$ and $H2_a$, this research revealed a significant positive response to integrating BI and BI tools with the CIPO model to build KC (Figure 28).



	YES	NO	NR
Loss of tacit K equates to loss of KC	87.3%	3.2%	9.5%
Loss of TK and KC affect Org's sustainable competitiveness	88.9%	3.2%	7.9%
Can CIPO be used to build knowledge base?	85.7%	4.8%	9.5%
Can BI tools be used to transform tacit K?	79.4%	12.7%	7.9%

Figure 28. Loss of tacit knowledge and use of CIPO.

Additionally, it was hypothesized that specific data structures and system requirements are needed to extract, transform, and load tacit knowledge from a CIPO repository into data marts and a DW where BI tools can further be applied to extrapolate more intelligent knowledge. As previously noted in the descriptive statistics, 100% of the participants gave a positive response when asked if they believe their organization would view building intelligent knowledge capital through the integration of the CIPO model and BI leading to the transformation of their company into an intelligent organization. Furthermore, 92.5% of the participants who chose to describe how some BI tools might be used to transform, and convert tacit knowledge captured using the CIPO model, rated their selection very high based on their past experience. However, when asked to describe any specific data structures and system requirements needed to extract, transform, and load tacit knowledge into data marts where BI tools can further be applied to extrapolate more intelligent knowledge, only 41% of all respondents were interested or able to answer this query. While this also correlates to a previous conclusion that the organization's overall familiarity and usage of BI, BI tools, KM, and KMS is low, it is also an indication of the rigorousness and complexity of this act. A closer look at the results and what was suggested as requirements, along with the distribution of the participants and their organizational role, also helped explain the answer to why only 41% opted to answer this query. To that extent, the largest contribution came from the KM and IT participants; however, within the group's distribution, KM has the largest total number of respondents (86%), IT the second largest (40%), followed by Management (29%). The Executive Management group has the lowest number of respondents (17%). These results are represented in (Figure 29).

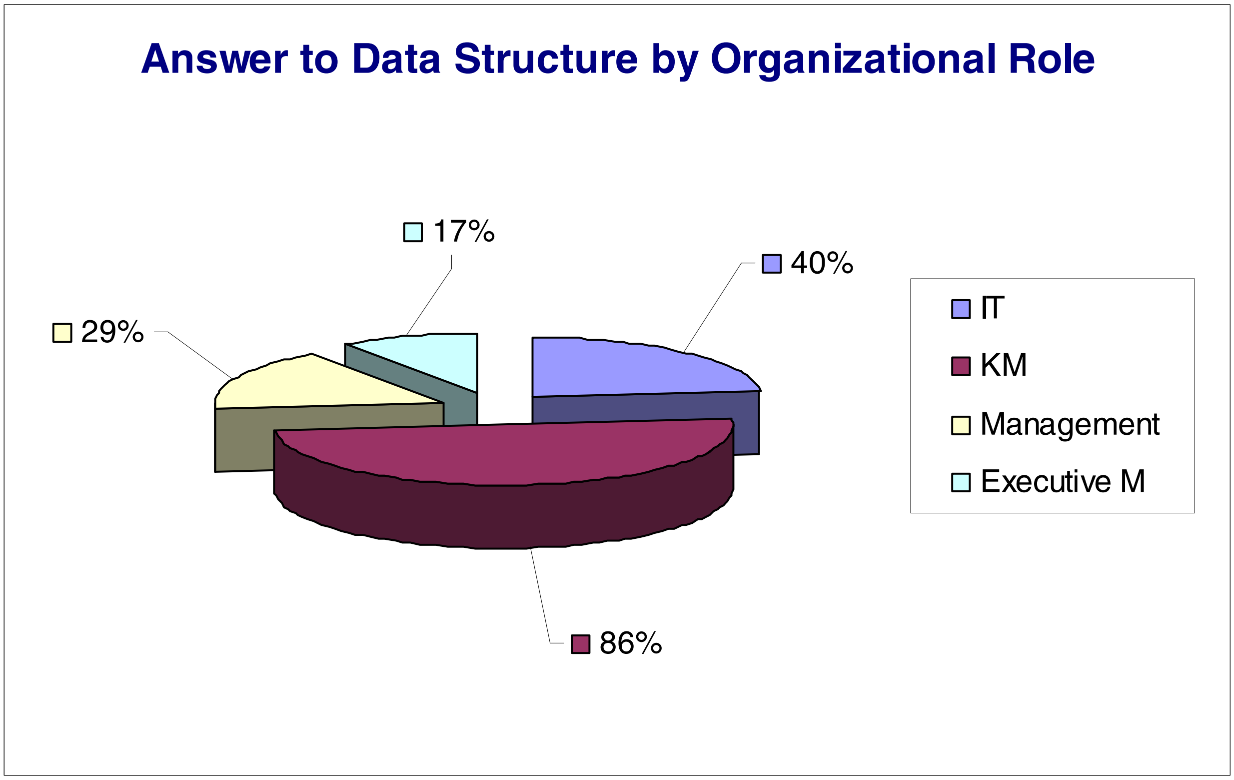


Figure 29. Answer to data structure by organizational role.

In the words of one of the respondents, the answer to the data structure requirements question was: "Tough task but any data structure for this purpose should be a reflection of the organization DNA just about." The concept of considering the type of data and designing a data structure that reflects the metadata from the start was prevalent in the respondents' opinion. For many participants, the data structure should be based on organized data elements in smaller chunks. Data grouping should be by department and function with a relational data field and a unique identifier to relate all data tables and data elements fit for a structure of a relational database management system (RDBMS). To that end, one of the respondents clearly noted: "Build relational database with a structure that lends itself to easy creation of useful data cubes from the metadata."

Another general consensus on the nature of the data structure requirements to integrate BI into KMS is the need to have a clearly defined and manageable Data Dictionary, and the need to make sure the metadata reflects all the business rules for the company. Once both needs are met, an ETL engine should be used to load all the source data to all RDBMS.

The full analysis and interpretation of the seven factors separately, together, and in association with the multivariate analysis revealed a positive association with the conclusions derived from this research. These results are also tied into supporting the research question and at the same time the hypotheses $H1_a$, $H2_a$, $H3_a$, and $H4_a$. In conclusion, the research finds of particular importance the association with the factor Organizational Intelligence and the Integration of CIPO into a KMS because the variables pertaining to the organization's familiarity with KM, BI, and KMS and their current use of these concepts, BI tools, and knowledge management systems to build KC have a strong influence on the organization's level of intelligence. This finding is also significant in terms of the overall contribution to the Organizational Intelligence and the company's ability to build an intelligent KC that would ensure its sustainable competitive advantage.

Research Implications

The concluding summary of this research supports the claim that Business Intelligence can be incorporated into building knowledge capital and, given the right requirements, BI tools can be integrated with the CIPO model to capture and transform tacit knowledge that ultimately helps create an intelligent KC that leads to organizational intelligence. However, the road to building knowledge capital that incorporates the organization's tacit knowledge and integrating this KC with BI and deploying BI tools to farther transform KC into organizational intelligence, is not an easy one and success depends on several factors.

The processes and data analysis used during this research pointed out several factors that make the latter claim a complex undertaking. Among these factors are the impact of organizational behavior, the business environment and culture, and the differences of perceptions and opinions on this matter based on organizational role. Here organizational behavior is used in the context of how people work interdependently and together toward some purpose within their organization and how employee's behavior, attitude, and work ethics affect the organization's performance. The second main factor revealed by this research that pertains to integrating BI and BI tools into the process of building KC and organizational intelligence is that a successful integration hinges first and foremost on establishing some guiding rules to design the structure for building and controlling a metadata that reflects the organization's business rules and practices.

Nonetheless, the overall structure should be first based on data profiling that will allow us to discover and analyze any data discrepancies. Second, data quality and integrity should be based on an ongoing process of reconciling and correcting data and improving the processes used to create it. Here, the choice of the BI ETL tool would be critical. Third, the data structure must take into account data integration from all tables used by integrating and linking data across disparate sources from all databases. Lastly, this structure needs to allow for data augmentation and data monitoring that can enhance the information and knowledge by using both internal and external data sources as well as checking and controlling the data integrity over time.

The further implication of this research is to offer some guidelines to lessen the business risk of undertaking the process of incorporating tacit knowledge into building knowledge capital and deploying a knowledge management system that integrates the proposed CIPO model with BI and BI tools to further transform KC into intelligent knowledge. The proposed guidelines will only focus on the factors pertaining to describing any specific data structures and system requirements needed to extract, transform, and load tacit knowledge into data marts where BI tools can further be applied to extrapolate more intelligent knowledge.

These guidelines are:

1. Develop a KMS steering committee that includes participation from all functions but equally represented by IT, KM, MIS, and business analysts and BI specialists. They should all be on the same page.
2. Start the design of the data structure with a comprehensive data profiling.
3. Base the data structure on the six sigma quality system and use the DMAIC phases. The data structure should reflect the fundamental control and business processes of this company for this to be of any value.
4. Design the data structure for an open system and based on open-system protocols such as Simple Access Object Protocol or SOAP.
5. Make sure the data structure is designed in a way that all data would match the corresponding metadata. Design the structure so that all data adhere to the specified and required key relationships across all columns and data tables.

6. The Metadata structure should also be designed to describe all the data elements. The data structure could be based on Pattern Matching to validate all data elements and make sure they are consistent across the data source and verify if the information is consistent with the database developers' expectations.
7. Ensure good knowledge of all required database tables and fields by using Logical Databases (LDB). The database structure should be designed to support Queries that use ALV and Ad-Hoc Query tools from the get-go.
8. Develop a good data management system (DMS) to track and manage all data definitions in all metadata and make sue all the data definitions are reliable, flexible and always up-to-date.
9. Provide full support for documentation. The data tables should be created on the basis of: (1) transparent data tables, (2) pool tables, and (3) cluster tables. Make sure all data tables are clearly defined in the Data Dictionary.
10. Interface all RDBMS to create standard data cubes for the DW. Have all data tables integrated through a centralized RDBMS.
11. Develop training and orientation programs that will address the tasks, functions, and responsibilities according to the participants' organizational role and responsibilities within the organization.
12. Overall, the company should consider a complete EII-based architecture knowledge management system instead of bits and pieces here and there. BI tools from a stable, scalable, reliable, and reputable BI provider should also be

implemented in all departments based on organizational functions and job tasks.

All Guidelines with details are described in Appendix K.

Research Limitations

Because the focus of this research was on integrating BI and BI tools to capture and transform tacit knowledge to build knowledge capital that leads to organizational intelligence based on one business organization and its KM and BI initiatives, the results are limited to this organization's population of respondents from the IT, KM, Management, and Executive Management and may not be easily applied beyond this example.

The research design and framework was mostly designed around few factors with direct impact on the scope of this study and the research question. However, there are several other factors as revealed by this research that were not fully included in the design and framework of this research, yet could have played a significant role in the outcomes. These factors include the impact of organizational behavior, the business environment and culture, the overall organizational familiarity and usage of KMS, BI, and BI tools, and the differences of perceptions and opinions on the matter of integrating the proposed CIPO model with BI to build intelligent knowledge capital. Additionally, the proposed research guidelines are not completely based on organizational role and have not been fully designed into a framework of a system that can be developed, applied, and tested, then evaluated with a statistical analysis and results given a set of hypotheses.

The aspect of familiarity with and usage of KM, BI, and KMS noted from the analysis of the results about Organization X, would also be considered a research limitation in this study. The strong correlation between the respondents' overall familiarity with BI, BI tools, KM, KMS, and BPM and the organization's use of KM, BI, BI tools, and KMS to build knowledge capital, share knowledge, and contribute to the organizational intelligence may or may not be limited to this organization.

Although for this particular organization, this could be attributed to the low level of awareness, acceptance, and training noted about the company's KM and BI initiative, this limitation still begs the question of to what extent does the lack of familiarity and usage affect the overall high positive perception of the importance of BI and its integration in building KC by all participants. Hence, this weakens the conclusion that the BI tools can be integrated and at the same time would point out the need to consider and evaluate multiple organizations instead of one in order to conduct a comparative analysis in respect to their BI and KM initiatives, familiarity, and practices relative to the extent of successful integration of BI tools in building KC.

Future Research Recommendations

This research offered one approach to integrating BI and BI tools with KMS by applying the CIPO approach in capturing and transforming the organization's tacit knowledge that resides in the expertise and experiences of its participants. The proposed integration could make a huge difference in developing and maintaining RDBMS for the sake of creating intelligent knowledge capital and transforming organizational intelligence. However, this integration can only be successful and especially useful if all the business rules of the organization are combined in the data extraction and transformation process and the integrated knowledge management system is utterly designed to reflect the organization's DNA and its true essence of mission, including business goals and objectives in the context of organizational role. The human factor in both the organization's DNA and building its knowledge capital is an area of grave importance and one that merits further research and studies.

The Guidelines proposed in this research included some technical requirements as well as system requirements and suggestions for designing, developing, and maintaining the data structure for logical databases and RDBMS that could be used in the integration of BI and BI tools and the CIPO model within a knowledge management system aimed at building intelligent knowledge capital. Several systems' entities and domains were included in the guidelines, including data management system (DMS), metadata structure, logical databases (LDB), data dictionary (DD), data profiling (DP), and functional and technical training and support based on organizational role. To address the latter from a holistic approach, additional research and studies are needed. This type of research could be considered as a move toward providing a complete Enterprise Integrated Intelligence EII-based architecture knowledge management system that would lead to building intelligent knowledge within the overall context of Enterprise Intelligence (EI).

With almost infinite bits of data and gigantic amounts of information continuing to fuel business decision-making, intelligent business resolutions and strategies that drive Enterprise Intelligence and sustainable competitiveness are becoming an ever-growing challenge and equally important in strategic alignment to ensure business success.

According to Harbour (1997), organizations should come to terms with the need to understand that simple business and information technology alignment is not enough, if the organization does not merge its strategic business and competitive intelligence and performance measures. From this idea comes another area of recommended research resulting from this study. This recommended future research deals with the integration of BI and BI tools and the CIPO model within a KMS leading to the evolution of organizational competitive intelligence that takes advantage of the organization's strategic alignment of its intelligent knowledge capital and its internal systems and operations aimed at gaining and sustaining a competitive advantage. Wu (2002) asserted that in today's business intelligence and information age, business organizations must tap the embassies of data to increase their competitive advantage by embracing new data distribution practices and moving away from old data management. An organization can achieve the latter by reinventing its competitive intelligence strategy to monitor itself and its environments. This future research would center on the organization's ability to evolve in its intelligent business decision-making by moving away from the old data, information, and knowledge management strategies and practices that no longer align with the overall strategy and no longer contribute to organization's sustainable advantage.

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APPENDIX A
Data Collection Instrument

Demographic Questions

1. Please indicate your role in the organization (Select the best fit).

- ☐ Information Technology (IT)
- ☐ Knowledge Management (KM)
- ☐ Management
- ☐ Executive Management

2. Please indicate your time of service with your organization (Select the best fit).

- ☐ Less than 6 months
- ☐ More than 6 months but less than a year
- ☐ More than 2 years but less than 5 years
- ☐ More than 5 years but less than 10 years
- ☐ More than 10 years

3. Please indicate your highest level of education?

- ☐ No post secondary school
- ☐ Some college courses but no degree achieved
- ☐ Technical degree
- ☐ Associate College Degree
- ☐ Bachelor Degree
- ☐ Masters Degree
- ☐ Doctoral Degree
- ☐ None of the above

4. Please indicate your gender.

- ☐ Male
- ☐ Female

5. Please indicate what age bracket best describes you.

- ☐ 18 - 25

- 26 - 35
- 36 - 50
- 50 and above

Overall Questions

6. How would rate your familiarity with the concepts of Knowledge Management (KM) and Knowledge Management Systems (KMS)?

- Very familiar
- Somewhat familiar
- Neutral or not sure
- Have little knowledge
- Have no knowledge

7. How would rate your familiarity with the concepts of Business Intelligence (BI), BI Tools, and Business Process Management (BPM)?

- Very familiar
- Somewhat familiar
- Neutral or not sure
- Have little knowledge
- Have no knowledge

8. Would you say your organization uses Knowledge Management (KM)?

- Very much
- Some
- Not very much
- Not at all
- Don't know / No comment

9. Would you say your organization uses Business Intelligence (BI) and BI Tools?

- Very much
- Some
- Not very much
- Not at all

- [ ] Don't know / No comment

10. Would you say your organization uses its Knowledge Management System (KMS) to collect the correct knowledge to build its Knowledge Capital (KC)?

- [ ] Very much
- [ ] Some
- [ ] Not very much
- [ ] Not at all
- [ ] Don't know / No comment

11. Would you say your organization uses its Knowledge Management System (KMS) to share knowledge with the entire organization?

- [ ] Very much
- [ ] Some
- [ ] Not very much
- [ ] Not at all
- [ ] Don't know / No comment

12. Do you feel that participating in this survey could lead to improvements in the quality of service provided by the IT or the KM department to help your organization with its Knowledge Management (KM) initiatives?

- [ ] Yes, I have seen improvements made already and believe this survey contributes to that process
- [ ] Yes, but the service is already great and there isn't much to improve
- [ ] Maybe, I am not really sure if it will or won't
- [ ] Actually, I like things the way they are, and I am a little worried it might contribute to making things worse
- [ ] No, I have seen little if any improvements made and doubt this survey will do much if anything to change that
- [ ] No, but I appreciate the chance to express my feelings anyway

13. If none of the options above express your true feelings, please describe them here:

Use of BI in Knowledge Management

14. Does your IT or KM department use any BI tools to capture, transform, reuse, and record knowledge within your organization? If Yes, please list them below; else go to question # 16.

- Yes
- No

15. From your past experience do you believe Business Intelligence and BI tools can be used to transform tacit knowledge into articulated knowledge that can become a part of your organization's knowledge capital? If Yes please identify some of the BI tools that could be used and briefly describe your organization's use of BI for knowledge building here below.

- Yes
- No

16. How would you rate the importance of using ETL and BI tools to capture, transform, and reuse knowledge within your organization?

- Very high
- High
- Medium
- Low
- Very Low
- Not sure / No comment

17. How would you rate the importance of using a knowledge management system that integrates with ETL and BI tools to build Knowledge Capital (KC)?

- Very high
- High
- Medium
- Low
- Very Low

- [ ] Not sure / No comment

Nature of BI and KMS needed

18. What is the nature of BI tools needed to integrate with a KMS to build a knowledgebase?

- [ ] Need to Extract, Transform and Load data (ETL)
- [ ] Create metadata of knowledge by department
- [ ] Create metadata of knowledge by employee
- [ ] Need clarification on what BI tools to use
- [ ] Need some help researching KMS requirements
- [ ] Other reason(s) not listed here

If needed, please further describe the nature in your own words

19. Do you feel your IT or KM staff has the knowledge and expertise to use BI tools to build a knowledgebase?

- [ ] Yes, we have very knowledgeable experts
- [ ] Yes, perhaps not in every respect, but for the most part, very good
- [ ] Yes, but just barely good enough
- [ ] Yes and no - not at first, but they are able to get the knowledge they need
- [ ] Yes and no - in some ways they are knowledgeable but in other ways they are not
- [ ] Yes and no - some involved are knowledgeable but others involved are not
- [ ] No, they do not have sufficient knowledge or expertise

20. I have other feelings not listed here (please describe):

21. Do you find the integration of BI and ETL tools with a KMS will provide more or less intelligent knowledge?

- Much More knowledge
- About the same
- Much less knowledge
- More knowledge about some things but less about others
- I am unsure what to expect, or what knowledge

22. Do you believe the loss of tacit knowledge or the inability to capture, convert, and articulate tacit into codified knowledge equate to loss of knowledge capital?

- Yes
- No

23. Do you feel the loss of tacit knowledge and KC would affect your organization's sustainable competitive advantage?

- Yes
- No

If so, are you aware of or do you have any knowledge; information or any tools that can be deployed to improve your organization's ability to manage its knowledge and build a better knowledgebase?

CIPO Model and KC Integration

24. Do you believe the described CIPO model could be used to capture and store tacit knowledge in a data repository?

- Yes
- No

25. Based on your past experience, please describe how some BI tools might be used to transform, and convert tacit knowledge captured using the CIPO model to articulated knowledge that can be assimilated into the organization's KC. Please rate the tools or systems on a 1-to-5 scale (lowest to highest).

26. Please describe any specific data structures and system's requirements needed to extract, transform, and load tacit knowledge into data marts where BI tools can further be applied to extrapolate more intelligent knowledge:

27. Do you believe holding focus groups and regular employee meeting to brain storm and share ideas including best practices will be conducive to promoting knowledge sharing amongst colleagues and coworkers?

- ☐ Yes
- ☐ No

28. If you answered "YES" to 27, please indicate on a scale of 1 to 5 (Lowest to highest) the likelihood that most employees are more than happy to share their expertise and experience.

- ☐ 5. Very high
- ☐ 4. High
- ☐ 3. Medium
- ☐ 2. Low
- ☐ 1. Very low

29. To what degree do Knowledge Capital and enterprise Intelligence affect your organization's operational efficiency?

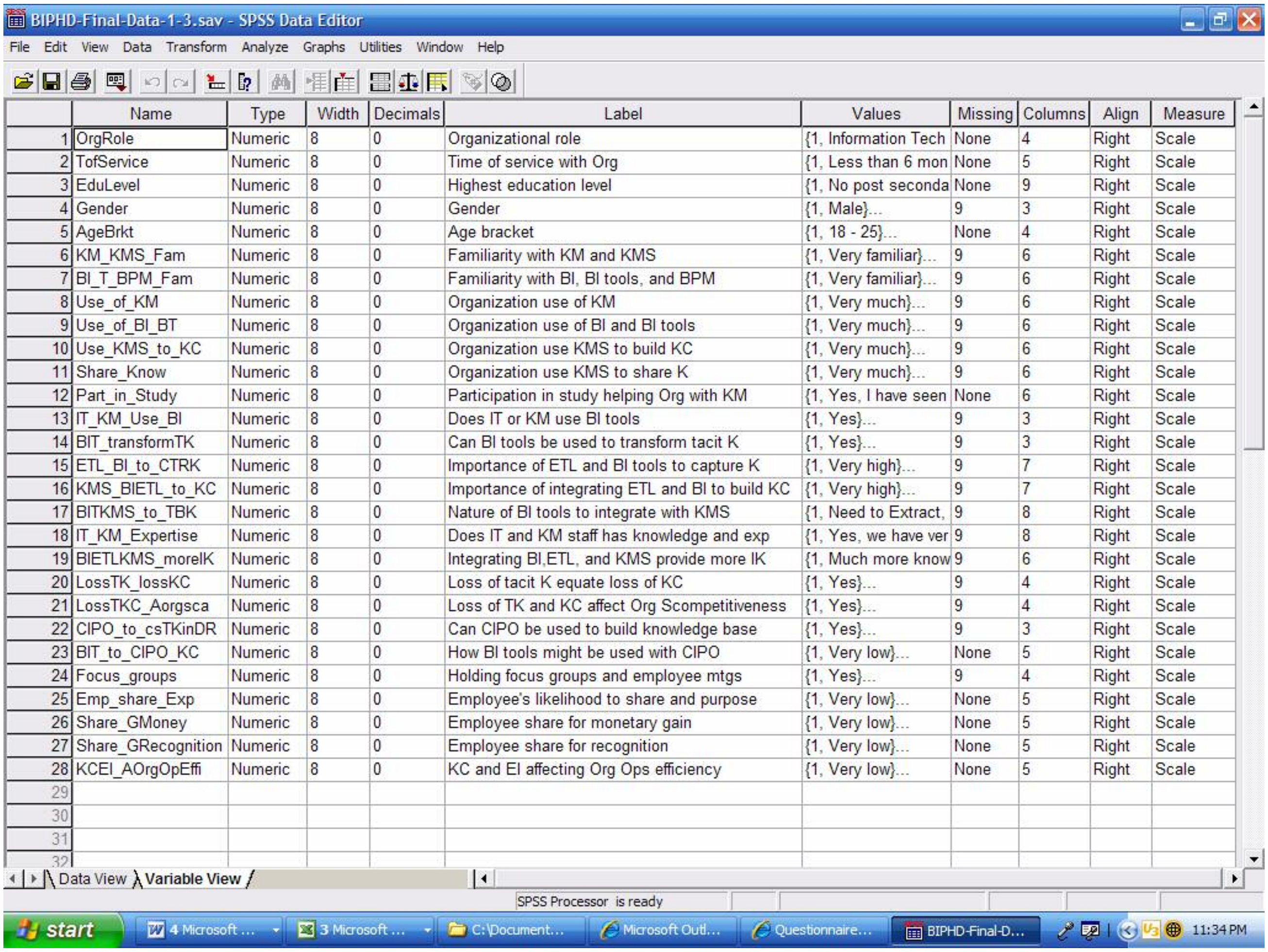
- ☐ 5. Very high

- 4. High
- 3. Medium
- 2. Low
- 1. Very low

30. What would help the most your IT or KM department implement a KMS to support your organization's knowledge management and efforts to build Knowledge Capital (KC) that could lead to Enterprise Intelligence (EI)?

http://www.surveymonkey.com/s.asp?u=36843221417

APPENDIX B
SPSS Data Structure



BIPHD-Final-Data-1-3.sav - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	OrgRole	Numeric	8	0	Organizational role	{1, Information Tech	None	4	Right	Scale
2	TofService	Numeric	8	0	Time of service with Org	{1, Less than 6 mon	None	5	Right	Scale
3	EduLevel	Numeric	8	0	Highest education level	{1, No post seconda	None	9	Right	Scale
4	Gender	Numeric	8	0	Gender	{1, Male}...	9	3	Right	Scale
5	AgeBrkt	Numeric	8	0	Age bracket	{1, 18 - 25}...	None	4	Right	Scale
6	KM_KMS_Fam	Numeric	8	0	Familiarity with KM and KMS	{1, Very familiar}...	9	6	Right	Scale
7	BI_T_BPM_Fam	Numeric	8	0	Familiarity with BI, BI tools, and BPM	{1, Very familiar}...	9	6	Right	Scale
8	Use_of_KM	Numeric	8	0	Organization use of KM	{1, Very much}...	9	6	Right	Scale
9	Use_of_BI_BT	Numeric	8	0	Organization use of BI and BI tools	{1, Very much}...	9	6	Right	Scale
10	Use_KMS_to_KC	Numeric	8	0	Organization use KMS to build KC	{1, Very much}...	9	6	Right	Scale
11	Share_Know	Numeric	8	0	Organization use KMS to share K	{1, Very much}...	9	6	Right	Scale
12	Part_in_Study	Numeric	8	0	Participation in study helping Org with KM	{1, Yes, I have seen	None	6	Right	Scale
13	IT_KM_Use_BI	Numeric	8	0	Does IT or KM use BI tools	{1, Yes}...	9	3	Right	Scale
14	BIT_transformTK	Numeric	8	0	Can BI tools be used to transform tacit K	{1, Yes}...	9	3	Right	Scale
15	ETL_BI_to_CTRK	Numeric	8	0	Importance of ETL and BI tools to capture K	{1, Very high}...	9	7	Right	Scale
16	KMS_BIETL_to_KC	Numeric	8	0	Importance of integrating ETL and BI to build KC	{1, Very high}...	9	7	Right	Scale
17	BITKMS_to_TBK	Numeric	8	0	Nature of BI tools to integrate with KMS	{1, Need to Extract,	9	8	Right	Scale
18	IT_KM_Expertise	Numeric	8	0	Does IT and KM staff has knowledge and exp	{1, Yes, we have ver	9	8	Right	Scale
19	BIETLKMS_moreIK	Numeric	8	0	Integrating BI,ETL, and KMS provide more IK	{1, Much more know	9	6	Right	Scale
20	LossTK_lossKC	Numeric	8	0	Loss of tacit K equate loss of KC	{1, Yes}...	9	4	Right	Scale
21	LossTKC_Aorgsca	Numeric	8	0	Loss of TK and KC affect Org Scompetitiveness	{1, Yes}...	9	4	Right	Scale
22	CIPO_to_csTKinDR	Numeric	8	0	Can CIPO be used to build knowledge base	{1, Yes}...	9	3	Right	Scale
23	BIT_to_CIPO_KC	Numeric	8	0	How BI tools might be used with CIPO	{1, Very low}...	None	5	Right	Scale
24	Focus_groups	Numeric	8	0	Holding focus groups and employee mtgs	{1, Yes}...	9	4	Right	Scale
25	Emp_share_Exp	Numeric	8	0	Employee's likelihood to share and purpose	{1, Very low}...	None	5	Right	Scale
26	Share_GMoney	Numeric	8	0	Employee share for monetary gain	{1, Very low}...	None	5	Right	Scale
27	Share_GRecognition	Numeric	8	0	Employee share for recognition	{1, Very low}...	None	5	Right	Scale
28	KCEI_AOrgOpEffi	Numeric	8	0	KC and EI affecting Org Ops efficiency	{1, Very low}...	None	5	Right	Scale
29										
30										
31										
32										

APPENDIX C
Frequencies Analysis

Notes

Descriptive Statistics

	N						Std. D	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Organizational role	63	3	1	4	1.62	0.129	1.023	1.046
Time of service with Org	63	4	1	5	3.06	0.166	1.318	1.738
Highest education level	63	4	3	7	5.03	0.134	1.062	1.128
Gender	62	1	1	2	1.18	0.049	0.385	0.148
Age bracket	63	3	1	4	2.63	0.116	0.921	0.848
Familiarity with KM and KMS	62	4	1	5	2.89	0.138	1.088	1.184
Familiarity with BI, BI tools, and BPM	61	4	1	5	3.13	0.151	1.176	1.383
Organization use of KM	62	4	1	5	2.95	0.148	1.165	1.358
Organization use of BI and BI tools	62	4	1	5	2.97	0.145	1.145	1.310
Organization use KMS to build KC	62	3	2	5	3.15	0.121	0.956	0.913
Organization use KMS to share K	62	4	1	5	3.55	0.110	0.862	0.744
Participation in study helping Org with KM	63	8	1	9	2.59	0.170	1.352	1.827
Does IT or KM use BI tools	62	1	1	2	1.92	0.035	0.275	0.075
Can BI tools be used to transform tacit K	58	1	1	2	1.14	0.046	0.348	0.121
Importance of ETL and BI tools to capture K	59	5	1	6	1.44	0.139	1.071	1.147
Importance of integrating ETL and BI to build KC	59	5	1	6	1.44	0.139	1.071	1.147
Nature of BI tools to integrate with KMS	58	5	1	6	2.14	0.199	1.515	2.296
Does IT and KM staff has knowledge and exp	58	5	2	7	3.72	0.187	1.424	2.028
Integrating BI,ETL, and KMS provide more IK	58	4	1	5	1.24	0.119	0.904	0.818
Loss of tacit K equate loss of KC	57	1	1	2	1.04	0.025	0.186	0.034
Loss of TK and KC affect Org Scompetitiveness	58	1	1	2	1.03	0.024	0.184	0.034
Can CIPO be used to build knowledge base	57	1	1	2	1.05	0.030	0.225	0.051
How BI tools might be used with CIPO	63	6	3	9	6.46	0.257	2.039	4.156
Holding focus groups and employee mtgs	57	1	1	2	1.02	0.018	0.132	0.018
Employee's likelihood to share and purpose	63	7	2	9	3.84	0.225	1.789	3.200
Employee share for monetary gain	63	7	2	9	4.98	0.197	1.561	2.435
Employee share for recognition	63	7	2	9	3.87	0.249	1.980	3.919
KC and EI affecting Org Ops efficiency	63	8	1	9	5.17	0.176	1.397	1.953
Valid N (listwise)	53							

Organizational role

Statistics

Organizational role

N	Valid	63
	Missing	0
Mean		1.62
Std. Error of Mean		.129
Median		1.00
Mode		1
Std. Deviation		1.023
Variance		1.046
Skewness		1.395
Std. Error of Skewness		.302
Kurtosis		.498
Std. Error of Kurtosis		.595
Range		3
Minimum		1
Maximum		4
Percentiles	25	1.00
	50	1.00
	75	2.00

Organizational role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Information Technology (IT)	43	68.3	68.3	68.3
	Knowledge Management (KM)	7	11.1	11.1	79.4
	Management	7	11.1	11.1	90.5
	Executive Management (EM)	6	9.5	9.5	100.0
	Total	63	100.0	100.0	

Time of service with Org

Statistics

Time of service with Org

N	Valid	63
	Missing	0
Mean		3.06
Std. Error of Mean		.166
Median		3.00
Mode		2
Std. Deviation		1.318
Variance		1.738

Skewness		.142
Std. Error of Skewness		.302
Kurtosis		-1.148
Std. Error of Kurtosis		.595
Range		4
Minimum		1
Maximum		5
Percentiles	25	2.00
	50	3.00
	75	4.00

Time of service with Org

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 6 months	7	11.1	11.1	11.1
	More than 6 months but less than a year	18	28.6	28.6	39.7
	More than 2 years but less than 5 years	15	23.8	23.8	63.5
	More than 5 years but less than 10 years	10	15.9	15.9	79.4
	More than 10 years	13	20.6	20.6	100.0
	Total	63	100.0	100.0	

Highest education level

Statistics

Highest education level

N	Valid	63
	Missing	0
Mean		5.03
Std. Error of Mean		.134
Median		5.00
Mode		5
Std. Deviation		1.062
Variance		1.128
Skewness		-.649
Std. Error of Skewness		.302
Kurtosis		-.253
Std. Error of Kurtosis		.595
Range		4
Minimum		3
Maximum		7

Percentiles	25	5.00
	50	5.00
	75	6.00

Highest education level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Technical Degree	9	14.3	14.3	14.3
	Associate College Degree	5	7.9	7.9	22.2
	Bachelor Degree	26	41.3	41.3	63.5
	masters Degree	21	33.3	33.3	96.8
	Doctoral Degree	2	3.2	3.2	100.0
	Total	63	100.0	100.0	

Gender

Statistics

Gender

N	Valid	62
	Missing	1
Mean		1.18
Std. Error of Mean		.049
Median		1.00
Mode		1
Std. Deviation		.385
Variance		.148
Skewness		1.731
Std. Error of Skewness		.304
Kurtosis		1.028
Std. Error of Kurtosis		.599
Range		1
Minimum		1
Maximum		2
Percentiles	25	1.00
	50	1.00
	75	1.00

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	51	81.0	82.3	82.3

		Frequency	Percent	Valid Percent	Cumulative Percent
	Female	11	17.5	17.7	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Age bracket

Statistics

Age bracket

N	Valid	63
	Missing	0
Mean		2.63
Std. Error of Mean		.116
Median		3.00
Mode		2
Std. Deviation		.921
Variance		.848
Skewness		.036
Std. Error of Skewness		.302
Kurtosis		-.873
Std. Error of Kurtosis		.595
Range		3
Minimum		1
Maximum		4
Percentiles	25	2.00
	50	3.00
	75	3.00

Age bracket

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 25	6	9.5	9.5	9.5
	26 - 35	24	38.1	38.1	47.6
	36 - 50	20	31.7	31.7	79.4
	36 - 50	13	20.6	20.6	100.0
	Total	63	100.0	100.0	

Familiarity with KM and KMS

Statistics

Familiarity with KM and KMS

N	Valid	62
	Missing	1
Mean		2.89
Std. Error of Mean		.138
Median		3.00
Mode		4
Std. Deviation		1.088
Variance		1.184
Skewness		-.085
Std. Error of Skewness		.304
Kurtosis		-1.081
Std. Error of Kurtosis		.599
Range		4
Minimum		1
Maximum		5
Percentiles	25	2.00
	50	3.00
	75	4.00

Familiarity with KM and KMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very familiar	6	9.5	9.7	9.7
	Somewhat familiar	20	31.7	32.3	41.9
	Neutral or not sure	13	20.6	21.0	62.9
	Have little knowledge	21	33.3	33.9	96.8
	Have no knowledge	2	3.2	3.2	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Familiarity with BI, BI tools, and BPM

Statistics

Familiarity with BI, BI tools, and BPM

N	Valid	61
	Missing	2
Mean		3.13
Std. Error of Mean		.151
Median		3.00
Mode		4
Std. Deviation		1.176
Variance		1.383

Skewness		-.135
Std. Error of Skewness		.306
Kurtosis		-.977
Std. Error of Kurtosis		.604
Range		4
Minimum		1
Maximum		5
Percentiles	25	2.00
	50	3.00
	75	4.00

Familiarity with BI, BI tools, and BPM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very familiar	5	7.9	8.2	8.2
	Somewhat familiar	16	25.4	26.2	34.4
	Neutral or not sure	13	20.6	21.3	55.7
	Have little knowledge	20	31.7	32.8	88.5
	Have no knowledge	7	11.1	11.5	100.0
	Total	61	96.8	100.0	
Missing	NR	2	3.2		
Total		63	100.0		

Organization use of KM

Statistics

Organization use of KM

N	Valid	62
	Missing	1
Mean		2.95
Std. Error of Mean		.148
Median		3.00
Mode		3
Std. Deviation		1.165
Variance		1.358
Skewness		.546
Std. Error of Skewness		.304
Kurtosis		-.489
Std. Error of Kurtosis		.599
Range		4
Minimum		1
Maximum		5
Percentiles	25	2.00

	50	3.00
	75	3.00

Organization use of KM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very much	4	6.3	6.5	6.5
	Some	20	31.7	32.3	38.7
	Not very much	24	38.1	38.7	77.4
	Not at all	3	4.8	4.8	82.3
	Don't know / No comment	11	17.5	17.7	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Organization use of BI and BI tools

Statistics

Organization use of BI and BI tools

N	Valid	62
	Missing	1
Mean		2.97
Std. Error of Mean		.145
Median		3.00
Mode		3
Std. Deviation		1.145
Variance		1.310
Skewness		.742
Std. Error of Skewness		.304
Kurtosis		-.457
Std. Error of Kurtosis		.599
Range		4
Minimum		1
Maximum		5
Percentiles	25	2.00
	50	3.00
	75	3.00

Organization use of BI and BI tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very much	2	3.2	3.2	3.2

	Some	23	36.5	37.1	40.3
	Not very much	24	38.1	38.7	79.0
	Not at all	1	1.6	1.6	80.6
	Don't know / No comment	12	19.0	19.4	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Organization use KMS to build KC

Statistics

Organization use KMS to build KC

N	Valid	62
	Missing	1
Mean		3.15
Std. Error of Mean		.121
Median		3.00
Mode		3
Std. Deviation		.956
Variance		.913
Skewness		.632
Std. Error of Skewness		.304
Kurtosis		-.397
Std. Error of Kurtosis		.599
Range		3
Minimum		2
Maximum		5
Percentiles	25	2.00
	50	3.00
	75	4.00

Organization use KMS to build KC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Some	16	25.4	25.8	25.8
	Not very much	29	46.0	46.8	72.6
	Not at all	9	14.3	14.5	87.1
	Don't know / No comment	8	12.7	12.9	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Organization use KMS to share K

Statistics

Organization use KMS to share K

N	Valid	62
	Missing	1
Mean		3.55
Std. Error of Mean		.110
Median		4.00
Mode		4
Std. Deviation		.862
Variance		.744
Skewness		-.392
Std. Error of Skewness		.304
Kurtosis		.286
Std. Error of Kurtosis		.599
Range		4
Minimum		1
Maximum		5
Percentiles	25	3.00
	50	4.00
	75	4.00

Organization use KMS to share K

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very much	1	1.6	1.6	1.6
	Some	5	7.9	8.1	9.7
	Not very much	22	34.9	35.5	45.2
	Not at all	27	42.9	43.5	88.7
	Don't know / No comment	7	11.1	11.3	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Participation in study helping Org with KM

Statistics

Participation in study helping Org with KM

N	Valid	63
	Missing	0
Mean		2.59

Std. Error of Mean		.170
Median		3.00
Mode		3
Std. Deviation		1.352
Variance		1.827
Skewness		1.570
Std. Error of Skewness		.302
Kurtosis		7.041
Std. Error of Kurtosis		.595
Range		8
Minimum		1
Maximum		9
Percentiles	25	1.00
	50	3.00
	75	3.00

Participation in study helping Org with KM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, I have seen improvement made already	19	30.2	30.2	30.2
	Maybe, I am not really sure if it will or won't	40	63.5	63.5	93.7
	No, I have seen little if any improvements made	3	4.8	4.8	98.4
	NR	1	1.6	1.6	100.0
	Total	63	100.0	100.0	

Does IT or KM use BI tools

Statistics

Does IT or KM use BI tools

N	Valid	62
	Missing	1
Mean		1.92
Std. Error of Mean		.035
Median		2.00
Mode		2
Std. Deviation		.275
Variance		.075
Skewness		-3.157
Std. Error of Skewness		.304

Kurtosis		8.232
Std. Error of Kurtosis		.599
Range		1
Minimum		1
Maximum		2
Percentiles	25	2.00
	50	2.00
	75	2.00

Does IT or KM use BI tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	7.9	8.1	8.1
	No	57	90.5	91.9	100.0
	Total	62	98.4	100.0	
Missing	NR	1	1.6		
Total		63	100.0		

Can BI tools be used to transform tacit K

Statistics

Can BI tools be used to transform tacit K

N	Valid	58
	Missing	5
Mean		1.14
Std. Error of Mean		.046
Median		1.00
Mode		1
Std. Deviation		.348
Variance		.121
Skewness		2.156
Std. Error of Skewness		.314
Kurtosis		2.742
Std. Error of Kurtosis		.618
Range		1
Minimum		1
Maximum		2
Percentiles	25	1.00
	50	1.00
	75	1.00

Can BI tools be used to transform tacit K

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	79.4	86.2	86.2
	No	8	12.7	13.8	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		

Importance of ETL and BI tools to capture K

Statistics

Importance of ETL and BI tools to capture K

N	Valid	59
	Missing	4
Mean		1.44
Std. Error of Mean		.139
Median		1.00
Mode		1
Std. Deviation		1.071
Variance		1.147
Skewness		3.122
Std. Error of Skewness		.311
Kurtosis		10.309
Std. Error of Kurtosis		.613
Range		5
Minimum		1
Maximum		6
Percentiles	25	1.00
	50	1.00
	75	1.00

Importance of ETL and BI tools to capture K

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very high	46	73.0	78.0	78.0
	High	7	11.1	11.9	89.8
	Medium	3	4.8	5.1	94.9
	Low	1	1.6	1.7	96.6
	Not sure / No comment	2	3.2	3.4	100.0
	Total	59	93.7	100.0	
Missing	NR	4	6.3		
Total		63	100.0		

Importance of integrating ETL and BI to build KC

Statistics

Importance of integrating ETL and BI to build KC

N	Valid	59
	Missing	4
Mean		1.44
Std. Error of Mean		.139
Median		1.00
Mode		1
Std. Deviation		1.071
Variance		1.147
Skewness		3.122
Std. Error of Skewness		.311
Kurtosis		10.309
Std. Error of Kurtosis		.613
Range		5
Minimum		1
Maximum		6
Percentiles	25	1.00
	50	1.00
	75	1.00

Importance of integrating ETL and BI to build KC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very high	46	73.0	78.0	78.0
	High	7	11.1	11.9	89.8
	Medium	3	4.8	5.1	94.9
	Low	1	1.6	1.7	96.6
	Not sure / No comment	2	3.2	3.4	100.0
	Total	59	93.7	100.0	
Missing	NR	4	6.3		
Total		63	100.0		

Nature of BI tools to integrate with KMS

Statistics

Nature of BI tools to integrate with KMS

N	Valid	58
	Missing	5

Mean		2.14
Std. Error of Mean		.199
Median		1.00
Mode		1
Std. Deviation		1.515
Variance		2.296
Skewness		.761
Std. Error of Skewness		.314
Kurtosis		-1.078
Std. Error of Kurtosis		.618
Range		5
Minimum		1
Maximum		6
Percentiles	25	1.00
	50	1.00
	75	4.00

Nature of BI tools to integrate with KMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Need to Extract, Transform, and Load (ETL)	35	55.6	60.3	60.3
	Create metadata of knowledge by department	3	4.8	5.2	65.5
	Need clarification on what BI tools to use	18	28.6	31.0	96.6
	Need some help researching KMS requirements	1	1.6	1.7	98.3
	Other reason(s) not listed here	1	1.6	1.7	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		

Does IT and KM staff has knowledge and exp

Statistics

Does IT and KM staff has knowledge and exp

N	Valid	58
	Missing	5
Mean		3.72
Std. Error of Mean		.187

Median		4.00
Mode		4
Std. Deviation		1.424
Variance		2.028
Skewness		.660
Std. Error of Skewness		.314
Kurtosis		-.137
Std. Error of Kurtosis		.618
Range		5
Minimum		2
Maximum		7
Percentiles	25	2.75
	50	4.00
	75	4.00

Does IT and KM staff has knowledge and exp

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, perhaps not in evey respect, but for the most part	14	22.2	24.1	24.1
	Yes, but just barely good enough	11	17.5	19.0	43.1
	Yes and no, not at first, but they are able to get knowledge	22	34.9	37.9	81.0
	Yes and no, in some ways they are knowledgable	2	3.2	3.4	84.5
	Yes and no, some involved are knowledgable but others not	6	9.5	10.3	94.8
	No, they do not have sufficient knowledge or expertise	3	4.8	5.2	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		

Integrating BI,ETL, and KMS provide more IK

Statistics

Integrating BI,ETL, and KMS provide more IK

N	Valid	58

	Missing	5
Mean		1.24
Std. Error of Mean		.119
Median		1.00
Mode		1
Std. Deviation		.904
Variance		.818
Skewness		3.916
Std. Error of Skewness		.314
Kurtosis		14.305
Std. Error of Kurtosis		.618
Range		4
Minimum		1
Maximum		5
Percentiles	25	1.00
	50	1.00
	75	1.00

Integrating BI,ETL, and KMS provide more IK

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Much more knowledge	53	84.1	91.4	91.4
	About the same	2	3.2	3.4	94.8
	I am unsure what to expect or what knowledge	3	4.8	5.2	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		

Loss of tacit K equate loss of KC

Statistics

Loss of tacit K equate loss of KC

N	Valid	57
	Missing	6
Mean		1.04
Std. Error of Mean		.025
Median		1.00
Mode		1
Std. Deviation		.186
Variance		.034
Skewness		5.191
Std. Error of Skewness		.316

Kurtosis		25.853
Std. Error of Kurtosis		.623
Range		1
Minimum		1
Maximum		2
Percentiles	25	1.00
	50	1.00
	75	1.00

Loss of tacit K equate loss of KC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	55	87.3	96.5	96.5
	No	2	3.2	3.5	100.0
	Total	57	90.5	100.0	
Missing	NR	6	9.5		
Total		63	100.0		

Loss of TK and KC affect Org Scompetitiveness

Statistics

Loss of TK and KC affect Org Scompetitiveness

N	Valid	58
	Missing	5
Mean		1.03
Std. Error of Mean		.024
Median		1.00
Mode		1
Std. Deviation		.184
Variance		.034
Skewness		5.239
Std. Error of Skewness		.314
Kurtosis		26.355
Std. Error of Kurtosis		.618
Range		1
Minimum		1
Maximum		2
Percentiles	25	1.00
	50	1.00
	75	1.00

Loss of TK and KC affect Org Scompetitiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	56	88.9	96.6	96.6
	No	2	3.2	3.4	100.0
	Total	58	92.1	100.0	
Missing	NR	5	7.9		
Total		63	100.0		

Can CIPO be used to build knowledge base

Statistics

Can CIPO be used to build knowledge base

N	Valid	57
	Missing	6
Mean		1.05
Std. Error of Mean		.030
Median		1.00
Mode		1
Std. Deviation		.225
Variance		.051
Skewness		4.116
Std. Error of Skewness		.316
Kurtosis		15.484
Std. Error of Kurtosis		.623
Range		1
Minimum		1
Maximum		2
Percentiles	25	1.00
	50	1.00
	75	1.00

Can CIPO be used to build knowledge base

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	54	85.7	94.7	94.7
	No	3	4.8	5.3	100.0
	Total	57	90.5	100.0	
Missing	NR	6	9.5		
Total		63	100.0		

How BI tools might be used with CIPO

Statistics

How BI tools might be used with CIPO

N	Valid	63
	Missing	0
Mean		6.46
Std. Error of Mean		.257
Median		5.00
Mode		5
Std. Deviation		2.039
Variance		4.156
Skewness		.384
Std. Error of Skewness		.302
Kurtosis		-1.655
Std. Error of Kurtosis		.595
Range		6
Minimum		3
Maximum		9
Percentiles	25	5.00
	50	5.00
	75	9.00

How BI tools might be used with CIPO

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medium	2	3.2	3.2	3.2
	Very high	37	58.7	58.7	61.9
	9	24	38.1	38.1	100.0
	Total	63	100.0	100.0	

Holding focus groups and employee mtgs

Statistics

Holding focus groups and employee mtgs

N	Valid	57
	Missing	6
Mean		1.02
Std. Error of Mean		.018
Median		1.00
Mode		1
Std. Deviation		.132
Variance		.018

Skewness		7.550
Std. Error of Skewness		.316
Kurtosis		57.000
Std. Error of Kurtosis		.623
Range		1
Minimum		1
Maximum		2
Percentiles	25	1.00
	50	1.00
	75	1.00

Holding focus groups and employee mtgs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	56	88.9	98.2	98.2
	No	1	1.6	1.8	100.0
	Total	57	90.5	100.0	
Missing	NR	6	9.5		
Total		63	100.0		

Employee's likelihood to share and purpose

Statistics

Employee's likelihood to share and purpose

N	Valid	63
	Missing	0
Mean		3.84
Std. Error of Mean		.225
Median		3.00
Mode		3
Std. Deviation		1.789
Variance		3.200
Skewness		2.307
Std. Error of Skewness		.302
Kurtosis		4.305
Std. Error of Kurtosis		.595
Range		7
Minimum		2
Maximum		9
Percentiles	25	3.00
	50	3.00
	75	4.00

Employee's likelihood to share and purpose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	2	3.2	3.2	3.2
	Medium	39	61.9	61.9	65.1
	High	13	20.6	20.6	85.7
	Very high	3	4.8	4.8	90.5
	9	6	9.5	9.5	100.0
	Total	63	100.0	100.0	

Employee share for monetary gain

Statistics

Employee share for monetary gain

N	Valid	63
	Missing	0
Mean		4.98
Std. Error of Mean		.197
Median		5.00
Mode		5
Std. Deviation		1.561
Variance		2.435
Skewness		1.132
Std. Error of Skewness		.302
Kurtosis		2.527
Std. Error of Kurtosis		.595
Range		7
Minimum		2
Maximum		9
Percentiles	25	5.00
	50	5.00
	75	5.00

Employee share for monetary gain

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	3	4.8	4.8	4.8
	Medium	6	9.5	9.5	14.3
	High	4	6.3	6.3	20.6
	Very high	44	69.8	69.8	90.5
	9	6	9.5	9.5	100.0

	Total	63	100.0	100.0	

Employee share for recognition

Statistics

Employee share for recognition

N	Valid	63
	Missing	0
Mean		3.87
Std. Error of Mean		.249
Median		3.00
Mode		3
Std. Deviation		1.980
Variance		3.919
Skewness		1.908
Std. Error of Skewness		.302
Kurtosis		2.568
Std. Error of Kurtosis		.595
Range		7
Minimum		2
Maximum		9
Percentiles	25	3.00
	50	3.00
	75	4.00

Employee share for recognition

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	6	9.5	9.5	9.5
	Medium	38	60.3	60.3	69.8
	High	5	7.9	7.9	77.8
	Very high	7	11.1	11.1	88.9
	9	7	11.1	11.1	100.0
	Total	63	100.0	100.0	

KC and EI affecting Org Ops efficiency

Statistics

KC and EI affecting Org Ops efficiency

N	Valid	63
	Missing	0

Mean		5.17
Std. Error of Mean		.176
Median		5.00
Mode		5
Std. Deviation		1.397
Variance		1.953
Skewness		1.472
Std. Error of Skewness		.302
Kurtosis		4.417
Std. Error of Kurtosis		.595
Range		8
Minimum		1
Maximum		9
Percentiles	25	5.00
	50	5.00
	75	5.00

KC and EI affecting Org Ops efficiency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	1	1.6	1.6	1.6
	Medium	1	1.6	1.6	3.2
	High	7	11.1	11.1	14.3
	Very high	48	76.2	76.2	90.5
	9	6	9.5	9.5	100.0
	Total	63	100.0	100.0	

APPENDIX D
Factor Analysis

Table 6 Reproduced Correlations

		Organizational role	Time of service with Org	Highest education level	Gender	Age bracket	Familiarity with KM and KMS	Familiarity with BI, BI tools, and BPM	Org us
Reproduced Correlation	Organizational role	0.727	0.604	0.462	-0.165	0.583	0.000	0.010	
	Time of service with Org	0.604	0.793	0.547	0.043	0.687	0.097	0.078	
	Highest education level	0.462	0.547	0.719	0.032	0.635	-0.402	-0.448	
	Gender	-0.165	0.043	0.032	0.710	0.076	-0.171	-0.116	
	Age bracket	0.583	0.687	0.635	0.076	0.735	-0.167	-0.186	
	Familiarity with KM and KMS	0.000	0.097	-0.402	-0.171	-0.167	0.811	0.758	
	Familiarity with BI, BI tools, and BPM	0.010	0.078	-0.448	-0.116	-0.186	0.758	0.809	
	Organization use of KM	-0.437	-0.217	-0.505	-0.116	-0.380	0.571	0.539	
	Organization use of BI and BI tools	-0.467	-0.283	-0.559	-0.086	-0.413	0.519	0.528	
	Organization use KMS to build KC	-0.415	-0.150	-0.383	-0.086	-0.296	0.441	0.429	
	Organization use KMS to share K	-0.488	-0.373	-0.562	-0.027	-0.492	0.387	0.396	
	Participation in study helping Org with KM	-0.288	0.112	-0.067	0.447	0.009	0.214	0.239	
	Does IT or KM use BI tools	0.085	0.060	-0.065	0.092	0.143	-0.032	0.103	
	Can BI tools be used to transform	0.054	0.250	0.362	-0.265	0.299	-0.076	-0.118	

	tacit K							
	Importance of ETL and BI tools to capture K	-0.006	0.160	0.233	-0.110	0.293	0.068	-0.124
	Importance of integrating ETL and BI to build KC	-0.013	0.166	0.230	-0.104	0.288	0.089	-0.111
	Nature of BI tools to integrate with KMS	0.115	0.169	-0.186	-0.092	0.083	0.583	0.517
	Does IT and KM staff has knowledge and exp	-0.260	0.046	-0.141	0.131	0.031	0.293	0.223
	Integrating BI,ETL, and KMS provide more IK	0.047	0.142	0.216	-0.099	0.306	0.046	-0.152
	Loss of tacit K equate loss of KC	0.043	0.068	0.152	0.034	0.244	0.002	-0.174
	Loss of TK and KC affect Org Scompetitiveness	0.135	0.026	0.132	-0.007	0.183	0.027	-0.054
	Can CIPO be used to build knowledge base	0.093	0.028	0.085	-0.065	0.170	-0.025	0.023
	How BI tools might be used with CIPO	0.062	0.291	0.175	0.005	0.189	0.219	0.185
	Holding focus groups and employee mtgs	0.188	0.051	0.165	-0.075	0.168	-0.098	-0.007
	Employee's likelihood to share and purpose	0.031	0.256	0.175	0.082	0.109	0.307	0.084
	Employee share for monetary gain	-0.414	-0.221	-0.151	0.225	-0.310	0.176	-0.012
	Employee share for recognition	0.092	0.338	0.255	-0.017	0.197	0.303	0.061
	KC and EI affecting Org Ops efficiency	-0.142	-0.005	-0.071	0.169	-0.177	0.305	0.113

Table 7 Residual(a)

Residual(a)	Organizational role		-0.107	0.010	0.059	-0.151	-0.097	-0.103
	Time of service with Org	-0.107		-0.076	0.004	0.049	0.022	0.034
	Highest education level	0.010	-0.076		0.001	-0.013	-0.003	0.027
	Gender	0.059	0.004	0.001		-0.110	0.013	0.024
	Age bracket	-0.151	0.049	-0.013	-0.110		0.011	0.007
	Familiarity with KM and KMS	-0.097	0.022	-0.003	0.013	0.011		0.054
	Familiarity with BI, BI tools, and BPM	-0.103	0.034	0.027	0.024	0.007	0.054	
	Organization use of KM	0.026	-0.003	-0.006	0.060	0.000	-0.046	-0.043
	Organization use of BI and BI tools	0.026	-0.039	0.039	0.024	0.016	-0.074	-0.049
	Organization use KMS to build KC	0.071	-0.012	0.106	-0.024	0.062	-0.063	-0.080
	Organization use KMS to share K	0.020	0.069	0.063	-0.002	0.054	0.047	0.018
	Participation in study helping Org with KM	0.033	-0.061	-0.014	-0.178	-0.003	0.033	-0.031
	Does IT or KM use BI tools	-0.018	-0.091	0.019	-0.120	-0.005	0.001	-0.018
	Can BI tools be used to transform tacit K	-0.012	0.028	-0.095	0.128	-0.057	0.036	0.035
	Importance of ETL and BI tools to capture K	-0.029	0.006	0.009	0.048	-0.026	0.032	0.031
	Importance of integrating ETL and BI to build KC	-0.022	-0.011	0.027	0.042	-0.021	0.026	0.031
	Nature of BI tools to integrate with KMS	0.090	-0.069	0.039	0.084	-0.062	-0.157	-0.129
	Does IT and KM staff has knowledge and exp	0.008	0.037	0.008	-0.067	-0.025	-0.039	0.006
	Integrating BI,ETL, and KMS provide more IK	0.009	0.010	-0.024	0.025	-0.027	0.030	0.050
	Loss of tacit K equate loss of KC	0.020	-0.001	-0.072	-0.069	0.024	0.027	-0.001
	Loss of TK and KC affect Org Scompetitiveness	-0.070	0.041	0.040	-0.069	0.084	0.002	-0.032
	Can CIPO be used to build knowledge base	0.058	0.026	-0.014	0.004	0.003	-0.004	0.027
	How BI tools might be used with CIPO	0.054	-0.098	-0.123	-0.038	-0.055	-0.029	-0.041
	Holding focus groups and employee mtgs	-0.019	0.044	0.077	0.021	0.022	0.002	0.007
	Employee's likelihood to share and purpose	0.041	-0.054	0.014	-0.020	-0.007	-0.021	-0.031

	Employee share for monetary gain	-0.055	0.072	0.005	-0.046	0.059	-0.018	0.042
	Employee share for recognition	0.051	-0.045	0.016	0.039	-0.063	-0.005	-0.014
	KC and EI affecting Org Ops efficiency	-0.003	-0.001	0.013	-0.038	0.039	-0.029	-0.015

Extraction Method: Principal Component Analysis.

a. Residuals are computed between observed and reproduced correlations. There are 99 (26.0%) nonredundant residuals wit

b. Reproduced communalities

Communalities

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.595
Bartlett's Test of Sphericity	Approx. Chi-Square	1550.955
	df	378
	Sig.	.000

a Measures of Sampling Adequacy(MSA)

Total Variance Explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.995	21.410	21.410	5.995	21.410	21.410	4.436
2	5.471	19.541	40.951	5.471	19.541	40.951	4.025
3	3.656	13.056	54.007	3.656	13.056	54.007	3.923
4	2.160	7.713	61.719	2.160	7.713	61.719	3.591
5	1.741	6.216	67.935	1.741	6.216	67.935	2.378
6	1.405	5.017	72.952	1.405	5.017	72.952	1.773
7	1.198	4.278	77.230	1.198	4.278	77.230	1.499
8	.941	3.361	80.591				
9	.887	3.169	83.760				
10	.813	2.904	86.663				
11	.671	2.395	89.058				
12	.521	1.860	90.918				
13	.500	1.787	92.705				
14	.397	1.417	94.122				
15	.343	1.224	95.346				
16	.296	1.056	96.402				
17	.214	.763	97.165				
18	.189	.674	97.839				
19	.139	.495	98.334				

20	.137	.488	98.822				
21	.093	.334	99.155				
22	.077	.275	99.430				
23	.055	.196	99.625				
24	.048	.170	99.795				
25	.026	.094	99.889				
26	.018	.063	99.952				
27	.009	.033	99.985				
28	.004	.015	100.000				

Extraction Method: Principal Component Analysis.

APPENDIX E

Research Introduction, Exemption and Acceptance Form

Consent Form

INFORMED CONSENT STATEMENT FORM

I certify that I have read the preceding for the research being conducted by Fawzi Ben Messaoud, a PhD learner with Capella University. Any questions I have or may have pertaining to this research will be addressed by Fawzi Ben Messaoud.

I hereby certify that I have freely agreed to participate in this research. A copy of this consent form will be given to me.

______________________________ ______________________________

Participant's Signature Date

______________________________ ______________________________

Witness's Signature Date

I certify that I have explained the above individuals the nature, purpose, potential benefits, and any possible risks that might be associated with participating in this research. I have, to the best of my knowledge, answered any questions that have been raised by the participant.

______________________________ ______________________________

Researcher's Signature Date

Preceding

Research Project Preceding

This research was designed to explore the phenomenon of tacit knowledge and the transformation of a traditional organization into an intelligent organization through the capture, conversion, and transformation of tacit knowledge and the use of Business Intelligence (BI) aimed at building intelligent Knowledge Capital (KC) through the integration of BI tools including an interface with Extract Transform and Load (ETL) tools.

This research proposes the integration of Concern, Issue, Problem, and Opportunity (CIPO) model with BI and outlines a knowledge management process designed for the capture of heuristics and expert knowledge that can be applied to optimize the factors of time and money. The latter concept depicts an intelligent organizational behavior that bears direct consequences on the organization's output. With the domains of KM and KC gaining tremendous interest from both practitioners and academics, the output of this research could also be used by both groups for further research on creating intelligent knowledge and the assimilation of both tacit and explicit knowledge toward building intelligent organizations.

Participants from various functions of your organization will be surveyed, including the IT and Knowledge Management departments, project leaders, managers, and executives. All participants will be asked to complete a brief questionnaire (30 questions) that could take approximately 30 to 60 minutes. The questionnaire will include some basic background questions about age, years of service, and education level in addition to your feelings and knowledge about Knowledge Management (KM), Business Intelligence (BI), **BI tools,** Knowledge Capital (KC), Knowledge Management Systems (KMS), and Business Process Management (BPM).

This questionnaire is conducted online and is entirely anonymous with every participant's responses not identifiable in any way since all you need to complete the survey is the given URL. As such there are no foreseeable risks that could result from your participation in this project, nor will there be any direct benefits. Please, bear in mind that all responses and the results will be kept strictly confidential and under lock and key. This research is being conducted by Fawzi Ben Messaoud, who can be e-mailed at **fawz.ben@gmail.com** or reached at 317-418-7924. Please feel free to call or e-mail should you have any questions.

APPENDIX F

Introduction Lettre for Questionnaire

Introduction to Survey

Your Assistance is Appreciated

In the beginning, data was scarce, information supreme, and knowledge divine. Then came the transformation ages, with rapid information technology (IT) innovations we hastily went from the electronics age to the information age to the digital age. By the time the cyber age dawned, data was in the air, and unbounded numbers of bits are in every breath we take. Information overloads all our senses and yet knowledge is scarce and intelligence supreme. Suddenly people and organizations alike find themselves drowning in stormy oceans of data, choking on infinite bytes of information.

Knowledge is power and Knowledge rules.

As an experienced professional you are or you have been at some point involved in the creation of your organization's knowledge capital through your participation and use of your enterprise strategic planning, business processes and performance tracking and evaluation. I am currently completing the research phase of my dissertation for a doctoral program in Information technology Management at Capella University. Given your knowledge and expertise, you have been selected to participate in a research project. The purpose if this research along with the definition and brief explanation of the terms and concepts used throughout this research have been summarized and provided in the following documents.

It is our hope that will take few minutes to complete an anonymous online survey questionnaire. This research was designed to explore the phenomenon of tacit knowledge and the transformation of a traditional organization into an intelligent organization through the capture, conversion, and transformation of tacit knowledge and the use of Business Intelligence (BI) aimed at building intelligent Knowledge Capital (KC) through the integration of BI tools including an interface with Extract Transform and Load (ETL) tools. This research also proposes the integration of CIPO model with BI and outlines a knowledge management process designed for the capture of heuristics and expert knowledge that can be applied to optimize the factors of time and money.

CIPO is short for concern, issue, problem, and opportunity depicted in (Figure 1). This model addresses the capture of both tacit and explicit knowledge from all participants through elicitations, analysis, and interpretation in relation to two driving factors: money and time. CIPO as a system is a technology solution with an output designed to create a living and dynamic process of know-how including the capture of heuristics and expert knowledge that can be applied to optimize the factors of time and money. The four variables of the CIPO are defined as the following:

- Concern: an issue in the making
- Issue: a concern that was not properly addressed

- Problem: an issue that was not properly resolved
- Opportunity: may be created by resolving any of the above factors or by avoiding their escalation. Opportunity may also be created by shared expertise and input from participants attempting to address or resolve the concerns, issues, or problems generated within the organization at various levels, ultimately leading to the creation of know-how or knowledge about the business operations, processes, and procedures.

The first three factors (concerns, issues, and problems) have an in-phase relationship with time and money as indicated in Figure 1, while the fourth factor, opportunity, has an inverse relationship (also illustrated in Figure 1). In this context, it takes an organization less time and less money to properly address a concern before it becomes an issue.

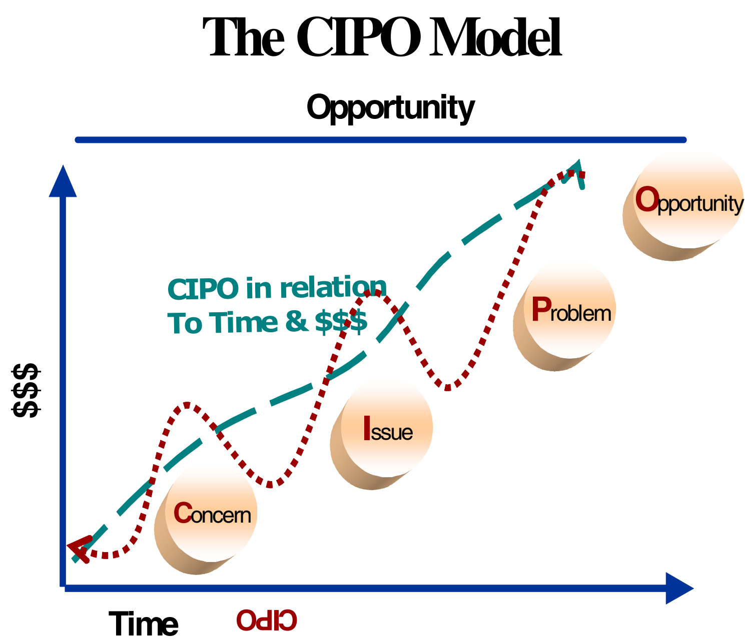


Figure-1

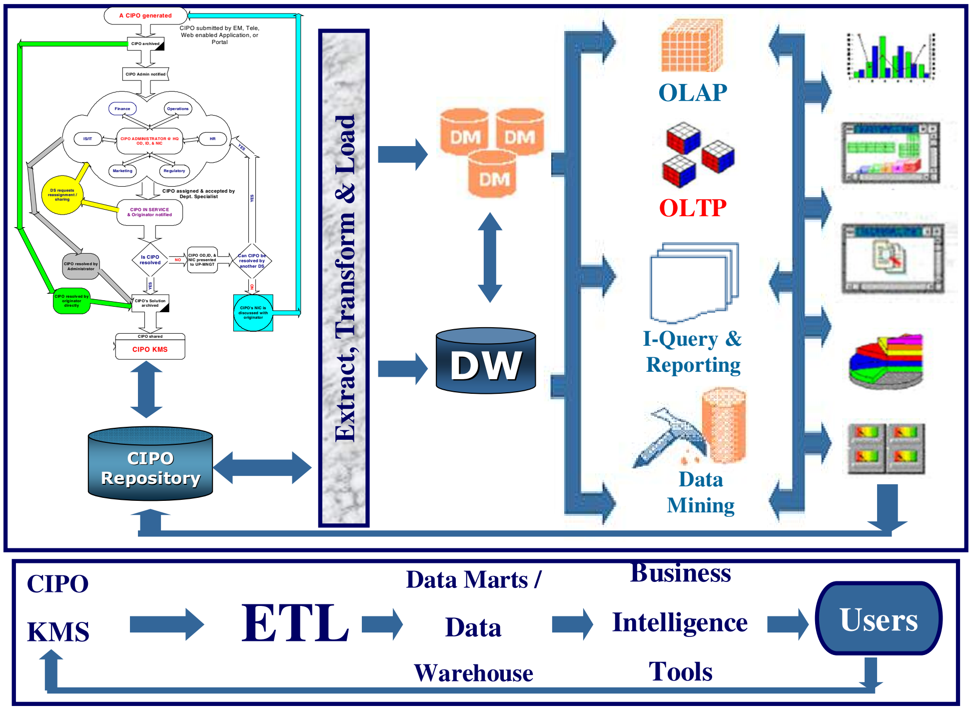


Figure 2

The latter concept depicts an intelligent organizational behavior that bears direct consequences on the organization's output. Your participation in this research would help identify some of the requirements needed to integrate BI with knowledge management to build intelligent knowledge capital that could lead to the transformation of a traditional organization into an intelligent organization.

Please use the following link or URL to gain access and complete this survey within 14 days. Should you have any questions, please e-mail or call me at 317-706-9353.

Survey URL: http://www.surveymonkey.com/s.asp?u=36843221417

My Sincere Thanks for your participation

Fawz

Fawzi Ben Messaoud
Telephone: 317-418-7924
E-mail: **fawz.ben@gmail.com**

APPENDIX G
Multiple Regression for Hypothesis 1-2

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
Loss of tacit K equate loss of KC	1.02	.135	55
Holding focus groups and employee mtgs	1.02	.135	55
Employee's likelihood to share and purpose	3.29	.629	55
Employee share for monetary gain	4.55	.899	55
Employee share for recognition	3.25	.799	55
KC and EI affecting Org Ops efficiency	4.78	.658	55
Loss of TK and KC affect Org Scompetitiveness	1.02	.135	55

Correlations

					Loss of tacit K equate loss of KC
Pearson Correlation	Loss of tacit K equate loss of KC	1.000	-.019	-.064	-.389
	Holding focus groups and employee mtgs	-.019	1.000	-.064	-.236
	Employee's likelihood to share and purpose	-.064	-.064	1.000	-.483
	Employee share for monetary gain	-.389	-.236	-.483	1.000
	Employee share for recognition	-.216	-.044	.661	-.558
	KC and EI affecting Org Ops efficiency	-.789	-.372	.022	.487
	Loss of TK and KC affect Org Scompetitiveness	-.019	1.000	-.064	-.236
Sig. (1-tailed)	Loss of tacit K equate loss of KC	.	.447	.322	.002
	Holding focus groups and employee mtgs	.447	.	.322	.041
	Employee's likelihood to share and purpose	.322	.322	.	.000

	Employee share for monetary gain	.002	.041	.000	.
	Employee share for recognition	.057	.375	.000	.000
	KC and EI affecting Org Ops efficiency	.000	.003	.437	.000
	Loss of TK and KC affect Org Scompetitiveness	.447	.000	.322	.041
N	Loss of tacit K equate loss of KC	55	55	55	55
	Holding focus groups and employee mtgs	55	55	55	55
	Employee's likelihood to share and purpose	55	55	55	55
	Employee share for monetary gain	55	55	55	55
	Employee share for recognition	55	55	55	55
	KC and EI affecting Org Ops efficiency	55	55	55	55
	Loss of TK and KC affect Org Scompetitiveness	55	55	55	55

Variables Entered/Removed(c)

Model	Variables Entered	Variables Removed	Method
1	Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose(a)	.	Enter
2	KC and EI affecting Org Ops efficiency(b)	.	Enter

a All requested variables entered.
b Tolerance = .000 limits reached.

c Dependent Variable: Loss of tacit K equate loss of KC

Model Summary(c)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig
1	.692(a)	.479	.437	.101	.479	11.471	4	50	
2	.895(b)	.801	.781	.063	.323	79.441	1	49	

a Predictors: (Constant), Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose
b Predictors: (Constant), Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose, KC and EI affecting Org Ops efficiency
c Dependent Variable: Loss of tacit K equate loss of KC

ANOVA(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.470	4	.117	11.471	.000(a)
	Residual	.512	50	.010		
	Total	.982	54			
2	Regression	.787	5	.157	39.462	.000(b)
	Residual	.195	49	.004		
	Total	.982	54			

a Predictors: (Constant), Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose
b Predictors: (Constant), Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose, KC and EI affecting Org Ops efficiency
c Dependent Variable: Loss of tacit K equate loss of KC

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	
				B	Std. Error	B
1	(Constant)	2.243	.221		10.131	.000
	Holding focus groups and employee mtgs	-.249	.108	-.249	-2.300	.026
	Employee's likelihood to share and purpose	-.010	.030	-.044	-.319	.751
	Employee share for monetary gain	-.126	.020	-.841	-6.349	.000
	Employee share for recognition	-.113	.025	-.667	-4.526	.000
2	(Constant)	2.545	.142		17.891	.000
	Holding focus groups and employee mtgs	-.387	.069	-.387	-5.580	.000

	Employee's likelihood to share and purpose	.005	.019	.021	.245	.807
	Employee share for monetary gain	-.045	.015	-.299	-2.915	.005
	Employee share for recognition	-.061	.017	-.359	-3.651	.001
	KC and EI affecting Org Ops efficiency	-.156	.018	-.762	-8.913	.000

a Dependent Variable: Loss of tacit K equate loss of KC

Excluded Variables(c)

Model		Beta In	t	Sig.	Partial Correlation	Colline	
1	KC and EI affecting Org Ops efficiency	-.762(a)	-8.913	.000	-.786	.555	1.8
	Loss of TK and KC affect Org Scompetitiveness	.(a)	.	.	.	.000	
2	Loss of TK and KC affect Org Scompetitiveness	.(b)	.	.	.	.000	

a Predictors in the Model: (Constant), Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose
b Predictors in the Model: (Constant), Employee share for recognition, Holding focus groups and employee mtgs, Employee share for monetary gain , Employee's likelihood to share and purpose, KC and EI affecting Org Ops efficiency
c Dependent Variable: Loss of tacit K equate loss of KC

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Propo		
					(Constant)	Holding focus gr and employee r
1	1	4.875	1.000	.00	.00	.00
	2	.084	7.628	.00	.00	.03
	3	.024	14.367	.00	.42	.03
	4	.014	18.495	.00	.01	.80
	5	.003	40.828	1.00	.57	.15
2	1	5.860	1.000	.00	.00	.00
	2	.088	8.181	.00	.00	.03
	3	.028	14.340	.00	.33	.00
	4	.014	20.104	.00	.02	.83
	5	.007	29.463	.00	.04	.01
	6	.003	45.350	1.00	.60	.13

a Dependent Variable: Loss of tacit K equate loss of KC

Casewise Diagnostics(a)

Case Number	Std. Residual	Loss of tacit K equate loss of KC	Predicted Value	Residual
8	-2.057	1	1.13	-.130
11	-3.655	1	1.23	-.231
12	-2.944	1	1.19	-.186
14	3.094	2	1.80	.195

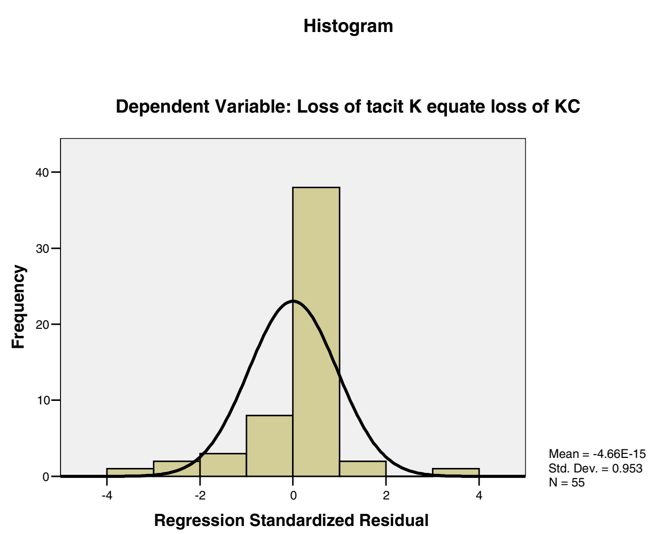
a Dependent Variable: Loss of tacit K equate loss of KC

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.91	1.80	1.02	.121	55
Std. Predicted Value	-.908	6.517	.000	1.000	55
Standard Error of Predicted Value	.010	.063	.018	.011	55
Adjusted Predicted Value	.88	1.27	1.01	.063	54
Residual	-.231	.195	.000	.060	55
Std. Residual	-3.655	3.094	.000	.953	55
Stud. Residual	-3.959	7.000	.059	1.334	54
Deleted Residual	-.271	1.000	.013	.151	54
Stud. Deleted Residual	-4.751	1096835712.000	20311771.907	149260431.533	54
Mahal. Distance	.357	53.018	4.909	9.377	55
Cook's Distance	.000	33.646	.646	4.576	54
Centered Leverage Value	.007	.982	.091	.174	55

a Dependent Variable: Loss of tacit K equate loss of KC

Charts



APPENDIX H
Multiple Regression for Hypothesis 3

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
Can BI tools be used to transform tacit K	1.11	.312	56
Importance of ETL and BI tools to capture K	1.41	1.075	56
Importance of integrating ETL and BI to build KC	1.39	1.056	56
Organization use of BI and BI tools	3.04	1.111	56
Familiarity with BI, BI tools, and BPM	3.13	1.192	56
Nature of BI tools to integrate with KMS	2.13	1.514	56

Correlations

					Can BI tools be used to transform tacit K	I
Pearson Correlation	Can BI tools be used to transform tacit K	1.000	.571	.532	.094	
	Importance of ETL and BI tools to capture K	.571	1.000	.992	.155	
	Importance of integrating ETL and BI to build KC	.532	.992	1.000	.174	
	Organization use of BI and BI tools	.094	.155	.174	1.000	
	Familiarity with BI, BI tools, and BPM	-.134	-.112	-.112	.504	
	Nature of BI tools to integrate with KMS	.087	.381	.401	.516	
Sig. (1-tailed)	Can BI tools be used to transform tacit K	.	.000	.000	.246	
	Importance of ETL and BI tools to capture K	.000	.	.000	.127	
	Importance of integrating ETL and BI to build KC	.000	.000	.	.100	
	Organization use of BI and BI tools	.246	.127	.100	.	
	Familiarity with BI, BI tools, and BPM	.162	.206	.206	.000	

	Nature of BI tools to integrate with KMS	.263	.002	.001	.000
N	Can BI tools be used to transform tacit K	56	56	56	56
	Importance of ETL and BI tools to capture K	56	56	56	56
	Importance of integrating ETL and BI to build KC	56	56	56	56
	Organization use of BI and BI tools	56	56	56	56
	Familiarity with BI, BI tools, and BPM	56	56	56	56
	Nature of BI tools to integrate with KMS	56	56	56	56

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Importance of integrating ETL and BI to build KC, Importance of ETL and BI tools to capture K(a)	.	Enter
2	Familiarity with BI, BI tools, and BPM, Organizatio n use of BI and BI tools, Nature of BI tools to integrate with KMS(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Can BI tools be used to transform tacit K

Model Summary(c)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics

					R Square Change	F Change	df1	df2	Sig
1	.636(a)	.404	.382	.245	.404	18.000	2	53	
2	.657(b)	.431	.374	.247	.027	.782	3	50	

a Predictors: (Constant), Importance of integrating ETL and BI to build KC, Importance of ETL and BI tools to capture K
b Predictors: (Constant), Importance of integrating ETL and BI to build KC, Importance of ETL and BI tools to capture K, Familiarity with BI, BI tools, and BPM, Organization use of BI and BI tools, Nature of BI tools to integrate with KMS
c Dependent Variable: Can BI tools be used to transform tacit K

ANOVA(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.167	2	1.083	18.000	.000(a)
	Residual	3.190	53	.060		
	Total	5.357	55			
2	Regression	2.310	5	.462	7.580	.000(b)
	Residual	3.047	50	.061		
	Total	5.357	55			

a Predictors: (Constant), Importance of integrating ETL and BI to build KC, Importance of ETL and BI tools to capture K
b Predictors: (Constant), Importance of integrating ETL and BI to build KC, Importance of ETL and BI tools to capture K, Familiarity with BI, BI tools, and BPM, Organization use of BI and BI tools, Nature of BI tools to integrate with KMS
c Dependent Variable: Can BI tools be used to transform tacit K

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
					B	Std. Error
1	(Constant)	.885	.055		16.213	.000
	Importance of ETL and BI tools to capture K	.817	.248	2.814	3.290	.002
	Importance of integrating ETL and BI to build KC	-.668	.253	-2.260	-2.643	.011
2	(Constant)	.880	.119		7.373	.000
	Importance of ETL and BI tools to capture K	.831	.255	2.863	3.258	.002
	Importance of integrating ETL and BI to build KC	-.679	.264	-2.299	-2.578	.013
	Organization use of BI and BI tools	.048	.038	.170	1.245	.219
	Familiarity with BI, BI tools, and BPM	-.028	.035	-.106	-.795	.430
	Nature of BI tools to integrate with KMS	-.027	.029	-.129	-.915	.365

a Dependent Variable: Can BI tools be used to transform tacit K

Excluded Variables(b)

Model		Beta In	t	Sig.	Partial Correlation		
1	Organization use of BI and BI tools	.053(a)	.484	.631	.067	.950	1.053
	Familiarity with BI, BI tools, and BPM	-.074(a)	-.689	.494	-.095	.987	1.013
	Nature of BI tools to integrate with KMS	-.098(a)	-.833	.409	-.115	.822	1.217

a Predictors in the Model: (Constant), Importance of integrating ETL and BI to build KC, Importance of ETL and BI tools to capture K
b Dependent Variable: Can BI tools be used to transform tacit K

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportion		
					(Constant)	Importance of ET and BI tools to capture K
1	1	2.733	1.000	.04	.00	.00
	2	.264	3.218	.96	.00	.00
	3	.003	31.294	.00	1.00	1.00
2	1	5.179	1.000	.00	.00	.00
	2	.516	3.169	.01	.00	.00
	3	.199	5.096	.07	.00	.00
	4	.055	9.737	.00	.00	.00
	5	.048	10.373	.91	.00	.00
	6	.003	44.329	.00	.99	1.00

a Dependent Variable: Can BI tools be used to transform tacit K

Casewise Diagnostics(a)

Case Number	Std. Residual	Can BI tools be used to transform tacit K	Predicted Value	Residual
2	2.747	2	1.32	.678
5	-2.913	1	1.72	-.719
8	3.677	2	1.09	.908
11	3.112	2	1.23	.768

a Dependent Variable: Can BI tools be used to transform tacit K

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N

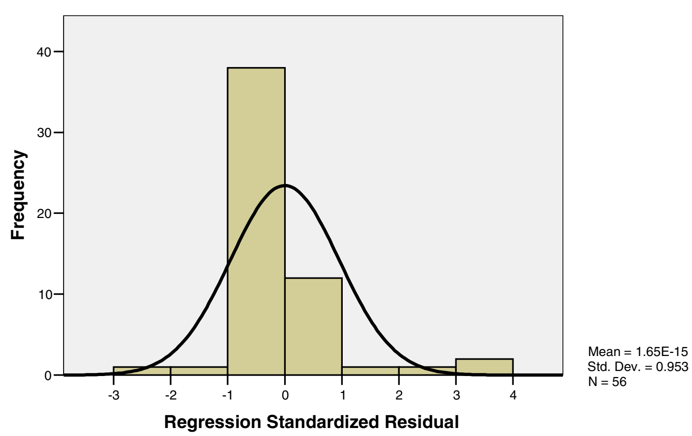
Predicted Value	.91	2.00	1.11	.205	56
Std. Predicted Value	-.967	4.357	.000	1.000	56
Standard Error of Predicted Value	.044	.247	.074	.033	56
Adjusted Predicted Value	.89	2.25	1.10	.201	55
Residual	-.719	.908	.000	.235	56
Std. Residual	-2.913	3.677	.000	.953	56
Stud. Residual	-3.833	3.772	-.008	1.060	55
Deleted Residual	-1.245	.955	-.005	.294	55
Stud. Deleted Residual	-4.516	4.415	.006	1.187	55
Mahal. Distance	.755	54.018	4.911	7.762	56
Cook's Distance	.000	1.793	.049	.244	55
Centered Leverage Value	.014	.982	.089	.141	56

a Dependent Variable: Can BI tools be used to transform tacit K

Charts

Histogram

Dependent Variable: Can BI tools be used to transform tacit K



APPENDIX I
Multiple Regression for Hypothesis 4

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
How BI tools might be used with CIPO	4.90	.447	39
Can CIPO be used to build knowledge base	1.03	.160	39
Organization use of KM	2.77	1.063	39
Organization use of BI and BI tools	2.87	1.056	39
Organization use KMS to build KC	3.05	.826	39
Organization use KMS to share K	3.64	.584	39
KC and EI affecting Org Ops efficiency	4.97	.160	39

Correlations

					How BI tools might be used with CIPO	Can C used kno b
Pearson Correlation	How BI tools might be used with CIPO	1.000	.038	-.273	-.252	
	Can CIPO be used to build knowledge base	.038	1.000	.345	.331	
	Organization use of KM	-.273	.345	1.000	.864	
	Organization use of BI and BI tools	-.252	.331	.864	1.000	
	Organization use KMS to build KC	-.271	.189	.644	.763	
	Organization use KMS to share K	-.346	.101	.583	.691	
	KC and EI affecting Org Ops efficiency	.698	.026	-.345	-.331	
Sig. (1-tailed)	How BI tools might be used with CIPO	.	.410	.046	.061	
	Can CIPO be used to build knowledge base	.410	.	.016	.020	
	Organization use of KM	.046	.016	.	.000	
	Organization use of BI and BI tools	.061	.020	.000	.	
	Organization use KMS to build KC	.048	.125	.000	.000	

	Organization use KMS to share K	.015	.270	.000	.000
	KC and EI affecting Org Ops efficiency	.000	.437	.016	.020
N	How BI tools might be used with CIPO	39	39	39	39
	Can CIPO be used to build knowledge base	39	39	39	39
	Organization use of KM	39	39	39	39
	Organization use of BI and BI tools	39	39	39	39
	Organization use KMS to build KC	39	39	39	39
	Organization use KMS to share K	39	39	39	39
	KC and EI affecting Org Ops efficiency	39	39	39	39

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Organization use KMS to share K, Can CIPO be used to build knowledge base, Organization use of KM, Organization use KMS to build KC, Organization use of BI and BI tools(a)	.	Enter
2	KC and EI affecting Org Ops efficiency(a)	.	Enter

a All requested variables entered.
b Dependent Variable: How BI tools might be used with CIPO

Model Summary(c)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig
1	.380(a)	.144	.015	.444	.144	1.115	5	33	
2	.709(b)	.503	.410	.343	.359	23.081	1	32	

a Predictors: (Constant), Organization use KMS to share K, Can CIPO be used to build knowledge base, Organization use of KM, Organization use KMS to build KC, Organization use of BI and BI tools
b Predictors: (Constant), Organization use KMS to share K, Can CIPO be used to build knowledge base, Organization use of KM, Organization use KMS to build KC, Organization use of BI and BI tools, KC and EI affecting Org Ops efficiency
c Dependent Variable: How BI tools might be used with CIPO

ANOVA(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.097	5	.219	1.115	.372(a)
	Residual	6.493	33	.197		
	Total	7.590	38			
2	Regression	3.817	6	.636	5.397	.001(b)
	Residual	3.772	32	.118		
	Total	7.590	38			

a Predictors: (Constant), Organization use KMS to share K, Can CIPO be used to build knowledge base, Organization use of KM, Organization use KMS to build KC, Organization use of BI and BI tools
b Predictors: (Constant), Organization use KMS to share K, Can CIPO be used to build knowledge base, Organization use of KM, Organization use KMS to build KC, Organization use of BI and BI tools, KC and EI affecting Org Ops efficiency
c Dependent Variable: How BI tools might be used with CIPO

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.568	.701		7.939	.000
	Can CIPO be used to build knowledge base	.302	.488	.108	.619	.540
	Organization use of KM	-.110	.136	-.261	-.809	.424
	Organization use of BI and BI tools	.069	.165	.163	.417	.680
	Organization use KMS to build KC	-.012	.153	-.022	-.078	.938
	Organization use KMS to share K	-.230	.196	-.301	-1.175	.249
2	(Constant)	-4.144	2.093		-1.980	.056
	Can CIPO be used to build knowledge base	.058	.381	.021	.153	.879
	Organization use of KM	-.030	.106	-.070	-.278	.783
	Organization use of BI and BI tools	.023	.128	.055	.180	.858

Organization use KMS to build KC	.068	.120	.126	.570	.572
Organization use KMS to share K	-.140	.153	-.183	-.918	.365
KC and EI affecting Org Ops efficiency	1.870	.389	.670	4.804	.000

a Dependent Variable: How BI tools might be used with CIPO

Excluded Variables(b)

Model		Beta In	t	Sig.	Partial Correlation		
1	KC and EI affecting Org Ops efficiency	.670(a)	4.804	.000	.647	.799	1.252

a Predictors in the Model: (Constant), Organization use KMS to share K, Can CIPO be used to build knowledge base, Organization use of KM, Organization use KMS to build KC, Organization use of BI and BI tools
b Dependent Variable: How BI tools might be used with CIPO

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Varia		
					(Constant)	Can CIPO be used build knowledge ba
1	1	5.825	1.000	.00	.00	.00
	2	.109	7.311	.02	.03	.08
	3	.034	13.038	.00	.13	.21
	4	.015	19.854	.06	.36	.49
	5	.012	22.176	.04	.13	.21
	6	.005	33.275	.88	.35	.00
2	1	6.793	1.000	.00	.00	.00
	2	.137	7.051	.00	.01	.07
	3	.035	14.007	.00	.09	.22
	4	.016	20.831	.00	.57	.35
	5	.012	23.508	.00	.10	.34
	6	.007	31.333	.01	.22	.00
	7	.000	134.220	.99	.00	.02

a Dependent Variable: How BI tools might be used with CIPO

Casewise Diagnostics(a)

Case Number	Std. Residual	How BI tools might be used with CIPO	Predicted Value	Residual
38	-5.493	3	4.89	-1.886

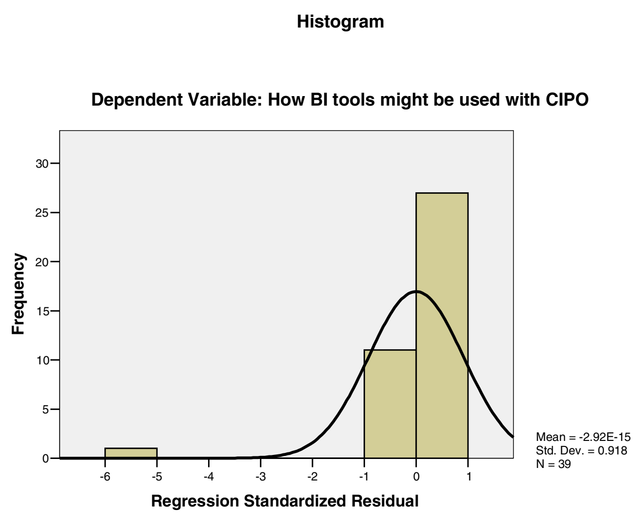
a Dependent Variable: How BI tools might be used with CIPO

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.00	5.03	4.90	.317	39
Std. Predicted Value	-5.986	.427	.000	1.000	39
Standard Error of Predicted Value	.082	.343	.130	.066	39
Adjusted Predicted Value	4.80	5.04	4.94	.068	37
Residual	-1.886	.137	.000	.315	39
Std. Residual	-5.493	.399	.000	.918	39
Stud. Residual	-5.657	.458	.006	.973	37
Deleted Residual	-2.000	.195	.004	.345	37
Stud. Deleted Residual	-.100	.452	.161	.178	36
Mahal. Distance	1.189	37.026	5.846	8.362	39
Cook's Distance	.000	.276	.009	.045	37
Centered Leverage Value	.031	.974	.154	.220	39

a Dependent Variable: How BI tools might be used with CIPO

Charts



APPENDIX J
In-depth interview questions

1) How do you and your organization define and use Knowledge Management and building Capital Knowledge?
2) How do you and your organization define tacit knowledge and what tools and systems are there currently used to capture and reuse this type of knowledge?
3) How does your organization define success with your current KM initiative in terms of building and sharing knowledge?
4) How do you and your organization define BI and the use of BI tools?
5) Please, describe the current use of BI within your organization and who are the main participants and their roles?
6) Based on your experience, what do you think is needed to integrate BI tools with building knowledge capital?
7) Given the CIPO model as a mean of gathering and storing tacit knowledge in a data repository, How do you and your organization would define the integration of this model into your Knowledge Management System?
8) How do you and your organization would see the use of BI and BI tools integrated with the CIPO model contributing to building intelligent knowledge and ultimately a sustainable completive advantage?
9) How do you and your organization define the transformation of tacit knowledge captured in the CIPO repository into data elements fit for a meta-data format?
10) Do you believe data structures and systems requirements could be identified to support the transformation, extract, and loading of tacit knowledge into meta data cubes and what would be the nature of the interface between the CIPO method of gathering tacit knowledge and the integration of BI?
11) How do you and your organization would go about to identify such requirements?
12) How do you and your organization view building intelligent knowledge capital through this integration of the CIPO model and BI leading to the transformation of your company into an intelligent organization?

APPENDIX K
Guidelines

1. Develop a KMS steering committee that includes participation from all functions but equally represented by IT, KM, MIS, and business analysts and BI specialists. They should all be on the same page.

2. Start the design of the data structure with a comprehensive Data Profiling that will:

- Ensure initial profiling and complete data assessment to identify all data elements and relationships.
- Integrate the Data Profiling into an automated process that will lead to cross-field verification, duplicate identification, and address format verification within all data tables.
- Identify all the data rules and including frequencies, ranges, and outliers.
- Ensure the Data Profiling results are used as the basis in all data quality and data integration processes.

3. Base the data structure on the six sigma quality system and use the DMAIC phases. The data structure should reflect the fundamental control and business processes of this company for this to be of any value.

4. Design the data structure for an open system and based on open-system protocols such as Simple Access Object Protocol or SOAP.

5. Make sure the data structure is designed in a way that all data would match the corresponding metadata. Design the structure so that all data adhere to the specified and required key relationships across all columns and data tables.

6. The Metadata structure should also be designed to describe all the data elements. The data structure could be based on Pattern Matching to validate all data elements and make sure they are consistent across the data source and verify if the information is consistent with the database developers' expectations.

7. Ensure good knowledge of all required database tables and fields by using Logical Databases (LDB). The database structure should be designed to support Queries that use ALV and Ad-Hoc Query tools from the get-go.

8. Develop a good data management system (DMS) to track and manage all data definitions in all metadata and make sue all the data definitions are reliable, flexible and always up-to-date.

9. Provide full support for documentation. The data tables should be created on the basis of: (1) transparent data tables, (2) pool tables, and (3) cluster tables. Make sure all data tables are clearly defined in the Data Dictionary.

10. Interface all RDBMS to create standard data cubes for the DW. Have all data tables integrated through a centralized RDBMS.

11. Develop training and orientation programs that will address the tasks, functions, and responsibilities according to the participants' organizational role and responsibilities within the organization.

12. Overall, the company should consider a complete EII-based architecture knowledge management system instead of bits and pieces here and there. BI tools from a stable, scalable, reliable, and reputable BI provider should also be implemented in all departments based on organizational functions and job tasks.

APPENDIX L

Survey Questionnaire

Instructions:

To gain access to the survey online uses the following link:

Survey URL: http://www.surveymonkey.com/s.asp?u=36843221417

Please answer each question by marking the box of your selection except the questions that require some text entry. For this type of questions, please type your answer in the given box which if needed will expand as you type.

Survey Questions Definitions (Definitions are taken or extrapolated from the SearchSQLserver and Whatis websites):

Knowledge Management (KM) -

Knowledge management is the name of a concept in which an enterprise consciously and comprehensively gathers, organizes, shares, and analyzes its knowledge in terms of resources, documents, and people skills. In early 1998, it was believed that few enterprises actually had a comprehensive knowledge management practice (by any name) in operation. Advances in technology and the way we access and share information have changed that; many enterprises now have some kind of knowledge management framework in place.

Knowledge Management System (KMS)

KMS is any distributed hypermedia system used for managing knowledge in organizations by gathering, organizing, analyzing, and converting data and information into knowledge and making it available for sharing and distribution.

Knowledge Capital (KC)

KM is the organization's collection of tacit, explicit, and heuristic knowledge, including intellectual capital, expertise, and the brain-power that can be exploited for business operations and building competitiveness.

Knowledge

Knowledge is, to an enterprise or an individual, the possession of information or the ability to quickly locate it. This is essentially what Samuel Johnson, compiler of the first comprehensive English dictionary, said when he wrote that:

> "Knowledge is of two kinds: we know a subject ourselves, or we know where we can find information upon it."

Information

Information is stimuli that have meaning in some context for its receiver. When information is entered into and stored in a computer, it is generally referred to as data. After processing (such as formatting and printing), output data can again be perceived as information. When information is packaged or used for understanding or doing something, it is known as knowledge.

Business Intelligence (BI)

BI is a business management term which refers to applications and technologies which are used to gather, provide access to, and analyze data and information about their company operations. Business intelligence systems can help companies have a more comprehensive knowledge of the factors affecting their business, such as metrics on sales, production, internal operations, and they can help companies to make better business decisions. Business Intelligence should not be confused with *competitive intelligence*, which is a separate management concept.

Extract Transform Load (ETL)

ETL refers to three separate functions extract, transform, and load combined into a single programming tool. First, the extract function reads data from a specified source database and extracts a desired subset of data. Next, the transform function works with the acquired data - using rules or lookup tables, or creating combinations with other data - to convert it to the desired state. Finally, the load function is used to write the resulting data (either all of the subset or just the changes) to a target database, which may or may not previously exist.

Business Process Management (BPM)

BPM is a systematic approach to improving an organization's business processes. BPM activities seek to make business processes more effective, more efficient, and more capable of adapting to an ever-changing environment. BPM is a subset of infrastructure management, the administrative area of concern dealing with maintenance and optimization of an organization's equipment and core operations.

Enterprise Intelligence (EI)

EI is the culmination of using BI, BPM, KMS, and other business processes and practices that offer both the functionality and essential modularity necessary to provide a quality range of sustainable competitiveness.

Information Systems (IS)

IS is the collection of technical and human resources that provide the storage, computing, distribution, and communication for the information required by all or some part of an enterprise. A special form of IS is a management information system (MIS), which provides information for managing an enterprise.

Information Technology (IT)

IT is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms, including those not yet conceived). It's a convenient term for including both telephony and computer technology in the same word. It is the technology that is driving what has often been called "the information revolution."

Concern, Issue, Problem, and Opportunity (CIPO)

Metadata

Metadata is data about data also used to describe how and when and by whom a particular set of data was collected, and how the data is formatted. Metadata is essential for understanding information stored in data warehouses.

Data Warehouse (DW)

A data warehouse is a central repository for all or significant parts of the data that an enterprise's various business systems collect. The term DW was coined by W. H. Inmon.

Online Analytical Processing (OLAP)

OLAP is computer processing that enables a user to easily and selectively extract and view data from different points-of-view. OLAP software can locate the intersection of dimensions and display them.

Online Transaction Processing (OLTP)

OLTP is a class of program that facilitates and manages transaction-oriented applications, typically for data entry and retrieval transactions in a number of industries, including banking, airlines, mail-order, supermarkets, and manufacturers. Probably the most widely installed OLTP product is IBM's CICS (Customer Information Control System).

Data Mining (DM)

DM refers to the practice of sorting through data to identify patterns and establish relationships.