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A BEHAVIOR SYSTEMS ANALYSIS APPROACH TO DESIGNING A HIGH-IMPACT KNOWLEDGE MANAGEMENT SYSTEM

by

Jacalyn S. Smeltzer

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
June 2003

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THE GRADUATE COLLEGE
WESTERN MICHIGAN UNIVERSITY
KALAMAZOO, MICHIGAN

Date April 21, 2003

WE HEREBY APPROVE THE DISSERTATION SUBMITTED BY

Jacalyn S. Smeltzer

ENTITLED A Behavior Systems Analysis Approach to Designing a High-Impact Knowledge Management System

AS PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF Doctor of Philosophy

Psychology
(Department)

Psychology
(Program)

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Date June 2003

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A BEHAVIOR SYSTEMS ANALYSIS APPROACH TO DESIGNING A HIGH-IMPACT KNOWLEDGE MANAGEMENT SYSTEM

Jacalyn S. Smeltzer, Ph.D.

Western Michigan University, 2003

Behavior systems analysis is an approach to designing and managing systems that incorporates the human-performance-technology model of systems analysis and considers the basic principles of behavior when analyzing causes of performance deficiencies and in selecting interventions to address those deficiencies. Behavior systems analysis focuses on three major conditions that influence behavior: (1) the motivation of the individual, (2) the immediate environmental cues, and (3) the consequences of behavior (Malott & Garcia, 1987; Suarez, 2001). The present study used behavior systems analysis to design a knowledge management system (independent variable) for a small business, a consulting firm in the employer-provided training industry. A six-phase process of analysis, goal specification, design and development, implementation, evaluation, and recycling was used to meet the system's objectives.

The objective of this study was to use the principles of behavior analysis and the behavior-systems-analysis method to design a knowledge management system that would support employees' performance on the job in a way that clearly linked to business results (high impact) and that was appropriate for a small business. The behavior systems analysis approach is described and a review of the traditional

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theoretical underpinnings of knowledge management is provided. In addition, many concepts in knowledge management are explained using a behavior-analytic interpretation.

The knowledge management system (KMS) was evaluated with subjective measures, process measures, and performance measures, which assessed employee satisfaction, productivity, and work performance (dependent variables). Subjective measures indicated a positive effect on employee satisfaction and productivity. Process measures indicated reasonable business outcomes would result. Performance measures were assessed with statistical tests, which indicated a significant increase in the frequency of performance (i.e., the frequency of creating a particular work product supported by a knowledge item in the KMS) after the KMS implementation for one of the two subject groups (chi-square for independence test); and a significant improvement in the consistency of performance (i.e., the similarity of a particular work product to expected attributes provided in the KMS) after the KMS implementation for both subject groups (t-tests for independent samples).

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ACKNOWLEDGEMENTS

I would like to begin by acknowledging my advisors: Dr. Malott, Dr. Brethower, Dr. Austin, and Dr. Apking. I am privileged to have such a distinguished committee supporting me in this endeavor. Dr. Austin has answered questions and freely given his advice, and I am grateful for his contribution. I have interacted with my other committee members over a longer time period and would like to say a few words about each of their contributions.

Dr. Malott spent many hours reviewing this paper and helped me with the behavior-analytic interpretation of the knowledge management concepts. Throughout my academic career, Dr. Malott has provided me with numerous opportunities to grow, develop, and learn. In his words, he gave me a sandbox to play in and the tools to play with. I am forever indebted to him for teaching me how to play and for letting me play in his sandbox.

One of my favorite courses was *Systems Analysis*, taught by Dr. Brethower. His systems-analysis expertise was of great value to me on this dissertation. He helped me with the application of his total-performance-system model and clarified many of the intricacies of the human-performance-technology method for performance improvement. Dr. Brethower has never ceased to encourage me or to believe in me. I am ever so grateful for the opportunities he has given me.

I would also like to thank Dr. Apking. Dr. Apking is president and CEO of

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Triad Performance Technologies, Inc. (Triad), a distinguished learning and performance-support consulting firm in Michigan. This study was conducted at Triad over a period of more than two years. He not only agreed to all of the improvements, and investments, he would be making in undertaking this project but he continued to support it and me even during the economic downturn. Dr. Apking generously gave me advice on how to handle many challenging issues I faced during this study and kept encouraging me to finish and not give up.

I have such gratitude for knowing and working with Lisa Toenniges. She is an amazing woman, friend, business leader, and an overall down-to-her-toes good soul. I have learned so much from her. She is my mentor—a role model of the businessperson I aspire to become. In addition, she played a large part in all of the interventions that contributed to my dissertation and became the executive sponsor of the KM strategic initiative, the highlight of my dissertation. She kept me on-track and helped me to focus when I tended to over-analyze and over-engineer. I genuinely admire and respect her and am deeply indebted to her.

I would like to thank Dave Bonello who spent many hours reading my ramblings, brainstorming with me, and helping me sort through, and make sense of, the real concepts I was struggling with.

I would like to thank Karyn Patterson and Kari McNamara who generously reviewed work plans and evaluated disconnects in order for me to offer reliability measures for some of my data analyses, my cousin Roger Korenstra who helped me

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calculate the return on investment, and June Cline who helped me with the statistics tests.

I am grateful to many other people who contributed greatly to the work described in this dissertation, without whom this dissertation would have been of less quality: Jeannine Rice, Karolyn Smalley, Karen Milner, Sue Fisher, Matt Kurtin, Tom Petro, and Ray Yu.

To my mom, dad, and aunt and uncle Korenstra, I am grateful for their love and for all they have done for me over the last 33 years—I love you dearly. To my cousins Roger and Marcia Korenstra, thank you so much for your love and support, and for letting me stay at the cottage while writing this dissertation, which was key to me being able to finish. Finally, yet ever so importantly, thanks to my close friends—who, when I felt like quitting, inspired me to continue— Marc and Beth Suarez, and Jeff and Cari Porter.

Jacalyn S. Smeltzer

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TABLE OF CONTENTS

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Table of Contents—continued

CHAPTER

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Table of Contents—continued

CHAPTER

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Table of Contents—continued

CHAPTER

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Table of Contents—continued

CHAPTER

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Table of Contents—continued

CHAPTER

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Table of Contents—continued

CHAPTER

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CHAPTER

APPENDICES

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LIST OF TABLES

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LIST OF FIGURES

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WRITING CONVENTIONS

I tried to use terms consistently throughout this study. For example, the terms *employees* and *users* are synonymous in certain contexts and are not synonymous in other contexts. There are places in this study where one term was more appropriate to the context and made for easier reading. However, I tried to use the same term within a given section to minimize confusion.

When discussing human behavior and knowledge in a general sense, it seemed more appropriate to use the term *people,* even when talking about people in an organization. For the most part, people who use any computer application, such as a KM computer application, are referred to as *users*. However, without a KM application, it is more appropriate to call them *employees*. In addition, a particular kind of employee, those whose work primarily involves exchanging information and knowledge (such as software programmers, engineers, scientists, inventors, and consultants) are often referred to as *knowledge workers,* whether or not there is a KMS in place (Drucker, 1994; Loughridge, 1999; Marks, 2001). Therefore, these terms are used to mean slightly different groups of people throughout this study, but the reader is encouraged not to spend too much time trying to understand subtle differences as they are all somewhat synonymous.

In addition, I provided examples to clarify various points. It would have been awkward to use the gender-neutral, plural pronoun "they"—awkward to write and to

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read. Therefore, I used gender-specific pronouns and varied which gender I used from example to example.

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CHAPTER I

INTRODUCTION

Over the last decade, companies have been increasingly concerned with capturing the collective knowledge of their workers in order to re-use that knowledge in new situations. While this trend is known by various terms, it is known in the business world as knowledge management (KM). The management of corporate knowledge or business intelligence refers to the act of managing the intellectual assets of the organization (such as copyrighted materials) and the knowledge from individual workers (such as knowing how to fix a particular problem). Managing this "knowledge" encompasses such things as ensuring that the right kind of corporate information is acquired, organized, stored, maintained, distributed, and reused in appropriate, new situations. Appendix A is a glossary of terms used in this study, which may help readers understand the relation among various terms[1].

The Knowledge Era

Just as the 1950s are characterized as the manufacturing era, we now live in the knowledge era (Bender & Fish, 2000; Drucker, 1993). The United States (U.S.) economy is moving away from manufacturing tangible products, such as steel and

[1] Because this study relies on disciplines other than behavior analysis, terms that may be foreign to the behavior analytic research base are also defined in the glossary (Appendix A).

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cars, toward providing services such as computerizing manual processes. It has been estimated that as much as 70% of a company's value is in intangible assets (Newcombe, 1999), such as knowledge and various intellectual property (for example, copyrights and trademarks). In addition, with the advent of computers and the World Wide Web, we are now inundated more than ever with information. The rapid convergence of information technologies characterizes this new era. This convergence of technologies includes innovations such as computers, ranging from mainframe servers to hand-held palm pilots, software for every conceivable purpose, satellites, fiber optics, the Internet, and Intranets (Malhotra, 1997a; Monthly Review, 2001).

In a recession, such as that which began in 2001 and has continued throughout 2002 (Bush, 2002), companies have had to operate more efficiently than before in order to survive. Managing cost effectively has become top priority. Executives are focused on two things: (1) increasing revenues, and (2) reducing costs. Only efforts that accomplish these ends will receive the attention, funding, and support of executives.

Professional service organizations, such as consulting firms, are differentiating themselves in the marketplace based on the value-adding potential of their corporate knowledge (Petty & Guthrie, 2000)—that is, the ability of an organization to create value for their customers due to assets and experiences they have captured—a "corporate memory" of sorts.

Surviving in this new era requires that corporate executives lead their

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organizations through a rapidly changing economic environment with rapidly changing business needs. The ability to quickly adapt to the changing environment and innovate is essential for survival and is dependent on effectively managing knowledge (Pendly, 2000). As evidence of that, many companies, such as The Dow Chemical Company, Hewlett Packard, FedEx, Johnson and Johnson, and RWD Technologies, and consulting firms, such as KPMG and Ernst and Young, have invested significant time and money into developing systems to manage their corporate knowledge (Liebowitz & Suen, 2000).

A Brief History

Knowledge Management (KM) is a new discipline (Beckman, 1999) that has garnered interest from both academicians and practitioners. The concept of KM is approximately 17 years old. Wiig (1997) coined the term at a 1986 conference sponsored by the International Labor Organization (Beckman). Sveiby is widely recognized as one of the first pioneers of KM. He introduced KM in Europe through his book, *The Know-How Company*, published in 1986 (Harrison & Sullivan, 2000). The concept of KM has since matured into a discipline complete with principles, models, concepts, a research base, and numerous theories (Birkinshaw, 2001). Paralleling the growth of the KM discipline is the growth of interest and need from the business community. The Dow Chemical Company was one of the first companies to implement a KM program (Harrison & Sullivan) in 1993. However, by 1999 a survey conducted by Management Review and American Management Association

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Research (American Management Association, 1999) concluded that more than one-third of major U.S. companies had formal KM programs in place, although nearly half of them were estimated to be in name only.

This increased interest in KM by business and industry stems from six major trends in the U.S. economy:

1. There has been a steep increase in selling the services of people rather than tangible products; these people are often called knowledge workers (Davenport, 1996; Davenport, Jarvenpaa & Beers, 1996; Santosus & Surmacz, 2001). Information and the ability to do the right things with that information is key to delivering better service to customers and achieving higher profitability.

2. Turnover rates are higher now than ten years ago (Nelson, 1998; Newcombe, 1999). People are retiring earlier (Mullett, 2000) and switching jobs more frequently. When a person leaves a company, their experience, techniques, customer relationships, and lessons they have learned go with them. The burden is on the company to capture all of that "knowledge" and secure it for the company before the person leaves.

3. There has been an increase in businesses using virtual or remote employees—that is, "when a worker performs some significant portion of the work at some location other than the employer's central office" (Austin & Garnier, 1998, p. 9). The operational efficiencies gained from using virtual employees is particularly enticing to executives who are looking for cost savings during a time when the need to operate more efficiently is essential in order to survive (Pendly, 2000). It is

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estimated that using remote employees can save 25% to 40% in office overhead and can result in a 15% to 20% increase in productivity (Austin & Garnier, 1998).

4. Businesses are increasingly operating on a global level (Business Process Resource Centre, 2000). Large businesses with a global presence have offices, employees, or both all over the world. Technology alone does not forge the connections necessary between people that result in efficiency gains (Friedman, 2002a). There is a need for a KM business process that manages these connections so employees can access information, knowledge, and expertise globally to solve customer problems locally (Friedman).

5. The wave of downsizing that occurred in the 1980s (Al-Athari & Zairi, 2001) resulted in many companies losing employee-held information that was not adequately captured by the organizations. In many cases, this loss was not anticipated. In turn, this steep and sudden loss of employee knowledge brought attention to the problem of how companies were managing their knowledge.

6. Advancements in technology and innovations in the ability to automate (i.e., "computerize") many types of work processes is a contributor to the increased interest in KM (Civi, 2000). However, while companies have been investing heavily in new technologies that promise to streamline their businesses, there has been less investment in the people receiving that technology. Strassmann, an information-technology (IT) economist, estimated that U.S. businesses have invested as much as $1 trillion in technology improvements over the last two decades; yet this investment has had little effect on the efficiency and effectiveness of knowledge workers

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(Malhotra, 2000). These large investments in technology often yield marginal results on the bottom-line results for many companies (Malhotra, 1998c; 2000). Treating people as passive recipients of technology has not benefited companies the way they might have anticipated (Malhotra, 1998b; Newcombe, 1999). Instead, executives are realizing they need to pay more attention to how people use that technology so that they use more of it when they should and use it correctly when they do use it.

Therefore, it is necessary to use more than a computer application (for example, adding work processes and incentives) to effectively manage knowledge. As discussed earlier, KM is broader than the technology behind it and draws on several disciplines (Malhotra, 1997c). Although, there are many advanced computer applications with various KM components that can help businesses with their KM needs.

The recent increase in KM interest and demand has resulted in many concepts and models in the field that reflect the disagreement among practitioners about the concept of KM (Malhotra, 1999b). Furthermore, the diversity of ideas about KM make it difficult for the layperson to understand just what is meant by KM. Further, because KM is such a relatively new topic in business and industry, much of the literature is conceptual and theoretical (Davenport, 1999). Many ideas have yet to be tested, used, and reported (Zack, 1999)—especially for small businesses.

For the purposes of this study, KM refers to the guidelines, policies, and practices that an organization uses to create and transfer the right information (such as tangible deliverables, papers, and copyrights, and intangible processes, models and

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methods that their people use to get work done) in order to support the performance of the people in the organization. A KMS is the organized structure, or system, an organization uses to accomplish KM.

Purpose of the Present Study

The purpose of this study is to document a small business's approach to designing a KMS (independent variable) using behavior systems analysis, and to measure the impact of the KMS on employee satisfaction, employee performance, and business outcomes inferred from business process measures (dependent variables).

In the business community, companies are generally regarded as small, middle-market, or large businesses. There are various definitions for the terms *small business*, *middle-market business*, and *large business* based on either market value, number of employees, or annual revenues. In this study, a small-business is defined as a company that employs 500 or fewer people or earns less than $150 million in annual revenues; a middle-market business employs between 100-999 people or earns annual revenues between $150 million and $1 billion; and a large business employs more than 1000 people or earns over $1 billion in annual revenues (Calvey, 2002; Cunniff, 1998; Smith, 2002; Thornton, 2002).

Triad Performance Technologies, Inc. (hereafter referred to as Triad), the company in which the KMS in this study was implemented, had identified three organizational improvements in its Year-2000 Business Plan: (1) business-process standardization, (2) business-process automation, and (3) knowledge management

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system. Based on its organizational analysis, Triad decided that it should define and standardize its key business processes first, and then automate (i.e., "computerize") those processes before attempting to design and implement a KMS. Therefore, the business-process standardization and business-process automation interventions were considered prerequisites to the knowledge-management-system intervention. However, the first two interventions were planned to occur whether or not Triad implemented a KMS. Therefore, the business-process-standardization and business-process-automation interventions are described only briefly to show contributions to, and connections with, the KMS intervention, but they are not considered key elements in this study.

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CHAPTER II

THEORETICAL UNDERPINNINGS

To date, two schools of thought have had the largest impact on KM literature: (1) the school that relies on Michael Polanyi's epistemology of personal knowledge, referred to as Polanyists (Godbout, 1996); and (2) the school that has grown out of information systems theory (Godbout). Thomas Davenport, a leader in the area of KM, bases much of his writings on the latter school of thought. Godbout refers to those from this school as Davenportists; I will simply refer to this school as the information systems macro model. In this study, I introduce a new, and yet old, perspective on knowledge—that is, a behavior-analytic perspective. It is new in the sense that, thus far, literature on KM has not advocated a behavioral perspective. It is old in the sense that behavior analysis as a science can be traced back to the early 1930s.

Contributing Schools of Thought

Polanyi's Epistemology of Personal Knowledge

Michael Polanyi (1891-1976) was a Hungarian scientist who initially did research in the area of physical chemistry before turning to philosophy later in life. Polanyi regarded the process of knowing as a sensory-motor function (Sveiby,

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1997b). He maintained that we interpret what is going on around us by categorizing it. These categories can be theories, methods, feelings, values, and skills. We integrate various pieces of knowledge from these categories in processing new knowledge. He believed that this act of integration is a mental activity.

In his earlier works, Polanyi frequently used the verb "knowing" and the noun "knowledge" interchangeably. Polanyi thus regarded knowledge as both static "knowledge" and dynamic "knowing". The dynamic properties describe how human beings acquire new knowledge. He emphasized this dynamic view of knowing more in his later works (Sveiby, 1997b). Polanyi emphasized that human beings are in the act of knowing all the time—switching between tacit and focal (explicit) knowing every second of their lives.

Tacit Knowledge

Polanyi (1966) defined tacit knowledge as intangible, difficult to transfer, and impossible to completely codify. He maintained that it is embodied within the minds of people and gained by experience. People transfer tacit knowledge by sharing common experiences. Tacit knowledge is rooted in action and tied to a particular context. Fromm-Lewis (2000) defined tacit knowledge as a combination of experience, hunches, intuition, emotions, and beliefs. While Mårtensson (2000) claimed that tacit knowledge "resides in people's minds" (p. 209), she also described it as requiring skill and practice. An example of tacit knowledge, according to Polanyi, is recognizing a person by looking at his or her face, yet not being able to

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explain why you recognize that person's face. Polanyi also described it as intuitive insight. Tacit knowledge, by definition, is much more elusive, not as easily segmented, and more difficult to describe than is explicit knowledge. Other examples of tacit knowledge include the knowledge and skills a salesperson uses to close a sale or the knowledge and skills a consultant uses to guide a client through a strategic planning session. These examples are molar because it is hard to identify the smaller, molecular segments of knowledge that result in these accomplishments. In fact, it may be that instances of tacit knowledge are best referred to with accomplishments rather than trying to identify contributing segments of knowledge.

Acquiring tacit knowledge in a KMS is the least understood aspect of KM (Zack, 1999). The challenge is not just how to acquire tacit knowledge so that it can be effectively shared and reused by others, but also identifying what kind of tacit knowledge should be acquired and what kind is not worth acquiring. The lack of progress the KM field has made in acquiring tacit knowledge is also due to other challenges unique to tacit knowledge. For example, it may be better to leave certain types of tacit knowledge tacit instead of trying to codify it because it might be too uncertain, too contextually specific, too difficult to explain, too changeable, or too politically sensitive (Swan, Newell, Scarbrough, & Hislop, 1999). For example, March (1997) argues:

> It is one thing, for example, to make available to consultants the best current thinking on reorganizing a client's purchasing process...It is another thing entirely to describe clearly when and how to bring up hard issues with managers, when to push to close a sale, and which benefits or arguments are likely to be most persuasive at a particular moment. (p. 2)

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Moreover, sharing tacit knowledge in certain organizational cultures may result in power redistributions among employees that cause those employees to "hoard" knowledge (Marks, 2001).

Explicit Knowledge

Focal knowledge (Polanyi, 1966), or explicit knowledge as it is more often called (Nonaka & Takeuchi, 1995; Zack, 1999), is codifiable and easily transferred. In fact, a general rule is that if knowledge has the potential to be easily documented, archived and codified, it is explicit knowledge, regardless of whether or not it has been (Santosus & Surmacz, 2001). The recipient of explicit knowledge has the potential to become just as knowledgeable about a topic as the person who transferred it. Examples of explicit knowledge include: copyrights, technical drawings, concept graphics, patents, trademarks, customer lists, research findings, procedures, information readily obtained through lectures, books, and other written materials (Civi, 2000; Santosus & Surmacz).

Zack (1999) has argued that it is more important for an organization to acquire explicit knowledge than tacit knowledge because explicit knowledge is crucial to productivity. He challenges readers to imagine companies functioning effectively without procedures, policies, training manuals, and lists of information such as phone numbers, etc. It would be safe to say that all KM technologies have a method for acquiring explicit knowledge while the same cannot be said for tacit knowledge.

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Information-Systems Macro Model

What I refer to as the information-systems model is really a macro model—a composite of many theoretical models including: information-processing theory, Penrose's evolutionary theory of business and industry[2] (1959), numerous social theories such as social exchange theory[3] (Marks, 2001) and social construction theory[4] (Pendly, 2000), library science, and management information systems (Friedman, 2002a, 2002b; Gold, 2000; Malhotra, 1997c, 1998a, 2000; Marks, 2001). Several elements in the information-systems macro model are beyond the scope of this study. For example, one of these elements, *knowledge conversion*, is part of a knowledge creation model proposed by Nonaka and Takeuchi (1995).

The knowledge conversion element of this model proposes modes (Table 1) for converting tacit knowledge into explicit knowledge and vice versa through processes such as socialization, internalization, externalization and combination (Beckman, 1997; Malhotra, 1997a; Nonaka & Takeuchi, 1995).

However, the most consistently acknowledged element of the information-systems macro model is the *knowledge hierarchy*. According to this model, knowledge is defined in terms of its structure in a hierarchy (Alter, 1996; Beckman, 1997; Firestone, 1998; Tobin, 1996). At the foundation of this structure are data,

---

[2] Evolutionary theory of business and industry centers on how organizations grow (increase in size or improve quality) and proposes that organizational routines are created over time and direct the behavior of the people in the organization, and therefore directly affect knowledge creation (McFadyen, 2000).
[3] Social exchange theory holds that people's contributions to others are commensurate with the contributions that they perceive are being made to them (Gouldner, 1960).
[4] "Social construction theory holds that knowledge is contextual and constructed through human interaction using shared language" (Pendly, 2000, p. 3).

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Table 1

Knowledge Conversion Modes*

Conversion	Modes
Tacit knowledge to tacit knowledge	Socialization—the process of sharing experiences which create tacit knowledge
Tacit knowledge to explicit knowledge	Externalization—the process of translating tacit knowledge into explicit forms using such things as metaphors, analogies, concepts, and story-telling
Explicit knowledge to explicit knowledge	Combination—the process of combining different pieces of explicit knowledge
Explicit knowledge to tacit knowledge	Internalization—the process of embodying explicit knowledge into tacit knowledge by applying and using various pieces of explicit knowledge combined with coaching and mentoring

*Based on Nonaka and Takeuchi (1995) as cited in Civi, 2000, p. 167.

which are considered the basic building block of knowledge. These building blocks are viewed hierarchically as illustrated in Figure 1.

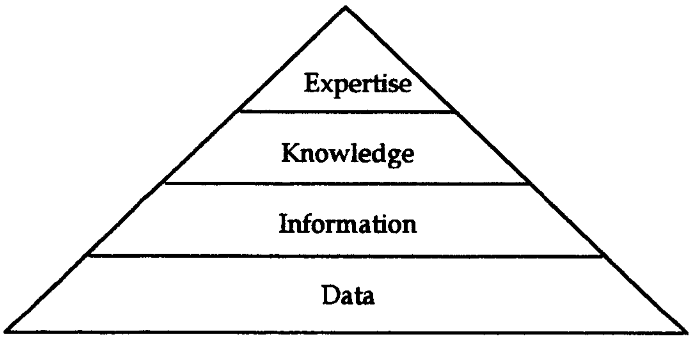

Figure 1. Knowledge Hierarchy (Based on Bender & Fish, 2000).

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Data are values of observable, measurable, or calculable attributes (Firestone, 1998). Data, in the purest sense, do not have any context and have no meaning (Mullins, 2002; Zack, 1999). Mullins uses the following illustration:

> Examples of data include “27”, “010110”, and “Jan”. Without additional details, we know nothing about any of these three pieces of data. Consider:
> 1. Is 27 a number in base ten, or is it in octal (which would translate to 23 in base ten)?
> 2. If '27' is a number in base ten, what does it represent? Is it an age, a dollar amount, an IQ, a shoe size, or something else entirely?
> 3. What about 010110? Is it a binary number or is it a representation of a date, perhaps January 1, 1910? January 1, 2010? Or something else entirely?
> 4. Finally, what does JAN represent? Is it a woman’s name or does it represent January, the first month of the year? (2002, on-line)

Information is defined as data with context, which gives the data meaning to an individual. While “27”, “010110”, and “Jan” are examples of data, the previous numbered points give various examples of data with context. Data are considered information once the data have meaning to an individual (Zack, 1999). While this distinction between data and information is what many practitioners would offer, in reality many discriminate information from data intuitively and describe information as processed data (Firestone, 1998; Huang, Lee, & Wang, 1999).

Knowledge, the next level of progression, is considered a product of information. Once multiple pieces of information have been synthesized, retained, and applied, it is considered knowledge. Knowledge requires that an individual has information and that he or she forms patterns between pieces of data and information, and that the individual understands those patterns and is aware of when those patterns change. However, most traditional KM literature refers to knowledge as residing in

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people's minds (Bock, 2001). Said another way, "knowledge is created by humans when they interact with information" (Malhotra, 1997b, p. 2).

Expertise is the fourth distinction and it has been defined as the ability to train and teach others the subject on which one has expertise (Bender & Fish, 2000); for example, the ability to coach an Olympic gymnast or train someone to speak a foreign language. According to this model, both knowledge and expertise are built within the individual over a long period, and neither tacit knowledge nor expertise can be easily transferred (Sveiby, 1997b) from person to person without shared experiences.

Defining Knowledge

The views of Polanyi and the information-systems model have converged into a paradigm, pervasive in current KM-related literature, which has formed, what I will refer to as, the traditional paradigm of KM (Figure 2).

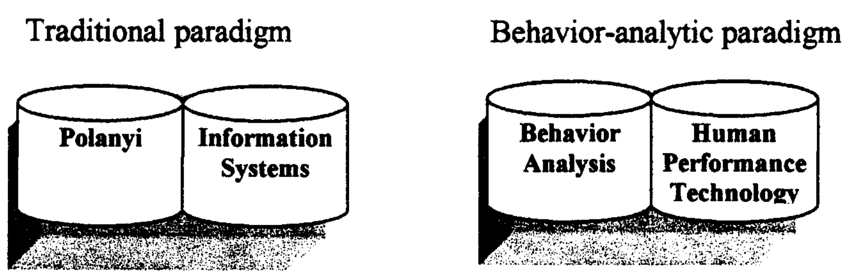

Figure 2. Contributing Schools of Thought.

Traditional Paradigm

To review, due to the information systems influence, many theorists and

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practitioners in the field of KM differentiate between data, information, and knowledge (Court, 1997; Davenport & Prusak, 1998; Garigue, 1998; Husemann & Goodman, 1999; Roehl, 1997; Sveiby, 1997a; Wiig, 1993; Zack, 1999). In practice, the *expertise* level is briefly dealt with in KMSs and inconsistently mentioned in literature. In addition, many practitioners use the terms *data*, *information,* and *knowledge* interchangeably, and those who do distinguish between these terms do so intuitively and imprecisely so that the distinctions are not always clear (Bender & Fish, 2000). Furthermore, *data*, *information,* and *knowledge* are thought of as similar concepts in a hierarchy and each concept evolves or progresses into the next (Bollinger & Smith, 2001; Cowley-Durst, 1999; Pascarella, 1997). Garigue (1998) explains it most succinctly, in that "data [are] transformed into information, and information into knowledge" (p. 8).

According to the information-systems model, data are discrete and objective values (for example, John Doe is told that Suds' soap manufacturing process is operating at 2.4 sigma quality level). Data have no inherent meaning, judgment, or relevance. Data become information once context, relevance, and meaning are added (for example, John Doe is told that Suds' soap manufacturing process is operating at 2.4 sigma quality level resulting in 1286 bars of defective soap each quarter). People transform information into knowledge by incorporating their experiences (for example, John Doe can explain what a *2.4 sigma quality level* means {a statistic indicating the number of defects per million}).

In addition, due to the Polanyists' influence, many of these same theorists and

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practitioners differentiate between tacit and explicit knowledge (Beckman, 1999; Garigue, 1998; Nonaka & Takeuchi, 1995; Santosus & Surmacz, 2001). Tacit knowledge is thought of as that which is intuitive and difficult to codify whereas explicit knowledge is that which can easily be described, codified and transferred.

Behavior-Analytic Paradigm

Whereas the traditional paradigm of knowledge could be described as structural and mentalistic, a behavioral paradigm could be described as functional and observable. I will offer a behavioral definition of the same terms to parallel the terms used in the traditional paradigm. While a behaviorist and a traditional KM practitioner would probably put examples of data and information into the same classifications, the critical distinction lies not in what they might identify as data or information but in what they would identify as knowledge and the implications implied by their operational definitions of data, information, and knowledge.

Data may be thought of as discrete and objective verbal stimuli, usually values of various measurable or observable attributes without the potential to affect behavior (verbal or nonverbal). Generally, various statistics, parameters, and quantified descriptions are thought of as data. For example, the fact that a stove is 150 degrees Celsius might be thought of as a datum. There are different presentations of data, such as individual, aggregate, and summary data, all of which could be considered a type of verbal stimulus.

Information may be thought of as either verbal stimuli or conditional stimuli

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with the potential to evoke a response. A conditional stimulus is a stimulus in which the elements "have their value or function only when they are combined; otherwise, the individual elements are relatively neutral" (Malott, Malott, & Trojan, 2000, p. 489). For example, the stove is 150 degrees Celsius—this in and of itself is just a datum (i.e., a verbal stimulus) that does not evoke any particular response. Water's boiling temperature being 100 degrees Celsius is also just a datum. However, if you pair the two verbal stimuli, that conditional stimulus might evoke a verbal response, a nonverbal response, or both. It might evoke someone to say to himself "that stove is really hot" or cause him to avoid touching the hot stove. Thus, information could be viewed as either verbal stimuli or conditional stimuli that evoke a verbal or nonverbal response.

However, it could also be said that data and information are both verbal stimuli along a continuum of context—the more context given, the closer you are to information (i.e., the more probable it is that the stimuli will evoke a response)—the less context, the closer you are to pure data (i.e., the less probable it is that the stimuli will evoke a response). Each piece of context is another datum (verbal stimulus) and so adding context to data is analogous to combining stimuli. You could say that a measure of having information is in the verbal or nonverbal response that the stimulus evokes. Even if information (or data with context) is given, if no response is evoked, then there was not enough context given for it to affect behavior and you could conclude that the stimuli were functioning more like data than information.

Knowledge should be thought of as a hypothetical construct, which is different

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than data and information. In other words, you cannot point to an example external to a person and label it a piece of knowledge like you can data and information. Knowledge does not exist apart from the knower (Alavi & Leidner, 2001; Cowley-Durst, 1999). You cannot see a piece of knowledge. Knowledge refers to a person's behavior. A behavior analyst would probably be more comfortable describing behavior as knowledgeable. For example, "that person acted knowledgeably." To say someone acts knowledgeably means that certain data and information are controlling their behavior. Therefore, the concept of *knowledge* is not a higher form of the concepts *data* and *information* as the information-systems model asserts in that "data [are] transformed into information, and information into knowledge" (Garigue, 1998, p. 8).

Skinner, who was the first to interpret the term *knowledge* behaviorally, said knowledge is as an intermediate condition that is detected later in a change in an individual's behavior (1957). According to Skinner, knowledge is the establishment of a new functional relationship evidenced by a change in a person's behavioral repertoire. However, we may do well to not use the noun "knowledge" or the verb "know", but rather to simply talk about behaving knowledgably.

Some KM practitioners and theorists from the traditional paradigm seem to support a behavioral interpretation of knowledge. Malhotra (2000), a leader in the KM field, supports this with his definition of knowledge as "potential for action" (p. 2). According to Newman (1996), knowledge is value-added behavior and activities. According to Berry (2000), KM is foremost about people and their performance.

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Furthermore, Huber has said that people learn if there is a change in the range of their potential behaviors (Malhotra, 1996). In fact, many practitioners acknowledge the fact that KM needs to equally consider technological and behavioral issues in order to be successful (Civi, 2000).

Consider the following example. A mother tells her child that the stove is hot. If the child has experienced touching something hot and has been burned in the past, and the word "hot" has been paired with a burning sensation repeatedly, society in general would say that the child "knows the definition of hot." What that means is that his behavioral repertoire has changed—the fact that if he is now told the stove is hot, he will not touch the stove. It will control his behavior—he does not touch the stove because in the past touching the stove has been followed with the punishing consequence of being burned. The relationship between the sight of the stove, the word "hot", and being told that the stove is hot, exerts control over his touching. In other words, the child is behaving knowledgeably.

Society in general might say that a child *knows* that a particular bike is blue when she is capable of saying that the bike is blue. Society might also say a child *knows* how to ice skate if she can ice skate; the evidence of her knowledge is in her behavior.

However, an argument could be made that one can *know* a particular functional relation without it controlling behavior. For example, most adults of normal intelligence understand that poor eating habits and not exercising will lead to health problems and yet that knowledge fails to change or control their behavior.

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Alternatively, the child who can ice skate may not be able to describe how to ice skate. Therefore, an alternative analysis might be that explicit knowledge is either a change in behavioral repertoire or the ability to describe the functional relationship whether or not it controls behavior, and tacit knowledge is a change in behavioral repertoire without the ability to describe the functional relationship.

Expertise may be thought of as fluency. Binder (1996) defines fluency as that combination of accuracy plus speed of responding that enables competent people to function efficiently and effectively. Johnson and Layng (1996) describe fluency as flowing, effortless, well-practiced, and accurate performance. Someone who teaches a foreign language is probably *fluent* in that language. Therefore, we might say that expertise is accuracy combined with speed of performance—that is, fluency.

Therefore, data can be interpreted behaviorally as stimuli without the potential to evoke a response. Information can be interpreted as verbal stimuli or conditional stimuli with the potential to evoke a response. Knowledge can be interpreted as a hypothetical construct describing a change in a person's behavioral repertoire or the ability to describe a functional relationship. Lastly, expertise can be thought of as fluency (refer to Table 2).

While the traditional paradigm differentiates between tacit, which could also be termed implicit (Malhotra, 1999a), and explicit knowledge, the behavior-analytic paradigm differentiates between contingency-controlled and rule-governed behavior. Although the concepts are not synonymous, there are correlations between tacit knowledge and contingency-controlled behavior, and between explicit knowledge and

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Table 2

Behavioral Interpretation of Terms

Term	Behavioral Interpretation
Data	Verbal stimuli without the potential to evoke a response
Information	Verbal stimuli or conditional stimuli with the potential to evoke a response
Knowledge	A construct that describes a change in behavioral repertoire or the ability to describe a functional relation
Tacit knowledge	Contingency-controlled behavior
Explicit knowledge	Rule-governed behavior
Expertise	Behavioral fluency or fluent performance

rule-governed behavior.

Skinner was the first to distinguish between contingency-controlled and rule-governed behavior (1966). *Contingency-controlled* is used to describe behavior that is controlled by its consequences and by stimulus changes (i.e., discriminative stimuli) correlated with the operative contingency (Catania, 1973; Skinner, 1969), whereas rule-governed is used to describe behavior controlled by an antecedent stimulus in the form of a description of a contingency (Braam & Malott, 1990; Cerutti, 1989; Malott, 1988, 1989, 1992b; Malott et al., 2000; Malott, Malott & Shimamune, 1992; Skinner, 1966, 1969). Cerutti (1989) explained it as follows:

> In contemporary analyses of human behavior, the term rule-governed behavior is used to describe responding determined primarily by instructions; rule-governed behavior is commonly distinguished from contingency-shaped behavior that is determined primarily by its direct consequences. (p. 259)

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Contingency-Controlled Behavior

While Polanyi described tacit knowledge as intuitive insight (Polanyi, 1966), Malott et al. (2000) describe the concept of contingency-controlled behavior as what the layperson might call *intuition*. They define intuition as behavior controlled by a concept or set of contingencies that are not adequately defined.

Malott et al. (2000) define a concept, or a stimulus class, as a "set of stimuli that all have some common property" (p. 215). A style of art is a concept. There are many styles of art (such as impressionism, abstract, cubism, and realism), which an art student could probably discriminate between but of which he or she could not give a concrete, irrefutable definition. A style of music is also a concept; there is Jazz, Rhythm and Blues, Pop, Classical, and many other styles of music. People are a concept with different colors, sizes, genders, nationalities, etc. Malott et al. use the following story to emphasize the many subtleties that make it hard to adequately describe or define any one concept.

> Plato defined a person as a two-legged animal without feathers. Sly Diogenes then plucked the feathers from a chicken and brought it into the academy. Academicians then realized they would have to change their definition. They thought awhile. "A person is a two-legged animal without feathers but with broad, flat nails," they finally claimed. In only a few minutes you can think of exceptions to this rule. You can think of a creature that fits this rule but is not a person. You also can think of a creature that doesn't fit the rule but is a person. A chimpanzee fits the rule but isn't a person. A human being without arms or legs doesn't fit the rule but is a person. It may well be an impossible task to give a set of rules that describes and defines the concept of *person*. Interestingly enough, we correctly use the concept of *person*, though we can't give a good explicit definition. (p. 213)

We discriminate people from non-people based on our experience with the

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contingencies that have shaped correct identification of people. Identifying people is a contingency-controlled behavior (Malott & Siddall, 1972; Malott et al., 2000). This is illustrated in a classic experiment conducted by Herrnstein and Loveland (1964) who used a concept-training procedure with pigeons to demonstrate intuitive control by pictures of people. Through a differential reinforcement procedure, the experimenters were able to shape the behavior of the pigeons so that they pecked a key when pictures included people and did not peck the key when the pictures did not include people. This experiment confirms that discriminating people from non-people is contingency-controlled behavior because non-verbal infrahumans were trained to do so.

As Malott et al. (2000) and Herrnstein and Loveland (1964) illustrated with the concept of people, contingency-controlled behavior, intuitively controlled behavior, is difficult to codify, and is gained by experience (as is tacit knowledge). In fact, in his explanation of tacit knowledge Polanyi used a similar example—people, discriminating one person from other people (1966), while Herrnstein and Loveland's experiment involved discriminating people from non-people in pictures.

Rule-Governed Behavior

Rule-governed behavior, on the other hand, refers to control by verbal stimuli exerted over the behavior of human beings with receptive verbal abilities[5]. There are

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[5]Receptive and expressive verbal skills are two distinct categories. A person may not be able to speak or use sign language (expressive), but may be able to behave appropriately when given a verbal stimulus (receptive).

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different opinions about the principles of behavior that are at work in rule-governed behavior. Some believe rules function as discriminative stimuli (Baldwin & Baldwin, 1981; Hayes, Brownstein, Zettle, Rosenfarb, & Korn, 1986; Galizio, 1979; Skinner, 1957, 1966, 1969; Vaughan, 1985; Zuriff, 1985), as discriminative stimulus classes (Catania, Matthews, & Shimoff, 1990; Cerutti, 1989), as function-altering stimuli (Blakely & Schlinger, 1987; Schlinger, 1993; Schlinger & Blakely, 1987), as verbal analogs to respondent conditioning (Alessi, 1992), and others have argued that rules function as learned establishing operations (Braam & Malott, 1990; Malott, 1989; Malott et al., 2000).

Without debating the underlying behavioral principles at work, there are characteristics of rule-governed behavior that are similar to Polanyi's *explicit* knowledge. The contingencies controlling rule-governed behavior can be described and defined adequately enough to exert control; thus, one could say it is codifiable (as is explicit knowledge). In addition, rules can exert control over behavior without a person first having contact with the contingencies described in those rules. For example, if the rule "the stove is hot and you will burn your fingers if you touch it" effectively controls behavior, then the person need not touch the stove first in order for that statement to suppress the behavior of touching the stove. In this way, rule-governed behavior is easily transferred through rules (as is explicit knowledge).

Importance of Defining Knowledge

It is important to agree on an operational definition of knowledge because it is

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what a KMS will be designed to manage (Malhotra, 1997c; Godbout, 1996). How one attempts to manage knowledge is greatly affected by whether or not knowledge is viewed as something over which the environment can have significant influence and control, or as an intangible concept that dwells inside of people that only people themselves can control. Furthermore, it will be difficult to specify KMS objectives and measures for those objectives without having a clear operational definition of knowledge and understanding the distinction between knowledge and information (Davenport, De Long, & Beers, 1998; Malhotra, 1993, 2000).

Viewing knowledge as a behavioral repertoire that can be shaped means that environmental contingencies can have a strong influence. The system would be conceptualized with different interactions taking place. A behavior analytic view might describe the mechanics of the system in this way (Figure 3):

1. Both verbal stimuli (data) without the potential to evoke a response and verbal stimuli with the potential to evoke a response (information) go to users.

2. Users combine those stimuli with other stimuli in their environment (or within the context of a specific situation), which interact with their past behavioral repertoire.

3. Users' behavior is affected in some way.

4. Novel behavior changes are captured and fed back into the system as verbal stimuli coming from users to the system.

According to this view, it would be logical to design the system to exert environmental control over the behavior of the users.

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Viewing knowledge as a mental construct that dwells inside people, unknown as to the how and where, means knowledge is virtually unaffected by environmental contingencies. This implies a very different view of the mechanics of how the system would operate (Figure 3):

1. Information goes from the system to users.

2. Information goes from users to the system.

In the behavior-analytic view, a KMS can and should affect behavior (verbal or nonverbal) and behavior changing is evidence that the users used the KMS. Only when people use information does it become knowledge. Thus, the word "knowledge" in "KMS" should not refer to the items contained in the KMS, but to the transfer of data and information contained in the system to people who then use it and, therefore, behave differently (thus, create or use "knowledge").

Using a behavior-analytic paradigm in the design of a KMS should affect not only how employees engage with the system (i.e., are they using it how and when

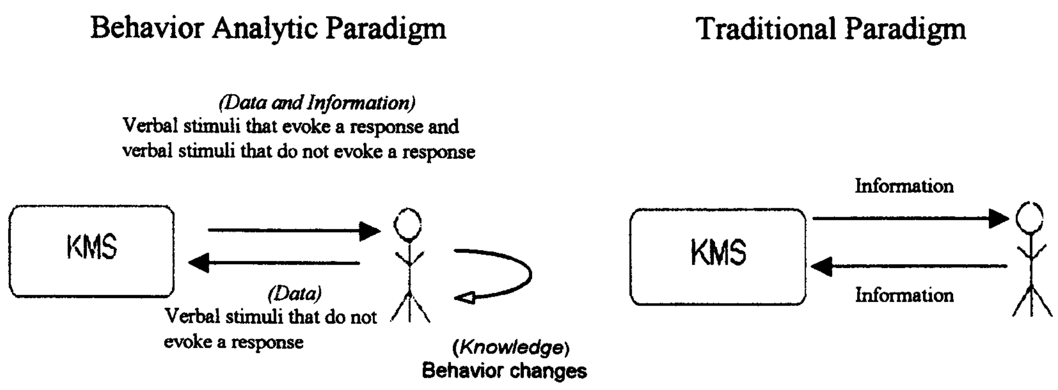

Figure 3. The Mechanics of a KMS: Behavior-Analytic vs. Traditional Paradigm.

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they should) but also the structure of the KMS and what goes into it. The most obvious design implication is that the KMS should include the appropriate contingencies to support people using it. This can be accomplished through giving clear rules to employees that will govern their behavior (rule-governed behavior) or, more rigorously through performance-management contingencies in which there are structured outcomes for using and not using the system.

Furthermore, the KMS should be designed so the rules for how and when to use the system are clear. This can be accomplished by several means, including having a simple taxonomy that incorporates how the organization functions and how people work independently of the system so that the rules transfer appropriately. In addition, there is a tendency for traditional KMSs to have an overload of information without clear rules for when and how to use the contents. This often causes knowledge workers to stop using it (Dunford, 2000). A behavioral approach, however, should filter what knowledge items go into a knowledge base so that only those knowledge items that are clearly linked to performance are included—this should help prevent the system from becoming an internal Web Site full of extraneous information.

If the KMS is viewed as an optional resource and the burden is on the knowledge worker to sort through an abundance of information, using what might be helpful only when he or she deems it helpful, the system will not control behavior appropriately. For example, when people search the Internet and discover an overload of information that they must sort through, they may use some piece of information if

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they happened to come across something helpful but they may not. According to Carlile, the intent of a traditional KMS is that users "will search the repository to find information on a topic and that the information found will be relevant to them" (2002, p. 39). The people "drive" the system (or control when to use it).

However, if the KMS is designed so that certain parts of the system should be used at certain times, then there is an aspect of the system driving performance. The goal of a KMS designed using the principles of behavior should be for the system to prompt and guide human behavior. This indicates a specific scope of information encompassed in the system and clear rules for using the system.

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CHAPTER III

BEHAVIOR SYSTEMS ANALYSIS

The most often-cited problems and challenges to successful KM programs are those that involve people and processes (Dyer, 2001). According to a survey of 200 information-technology managers conducted by InformationWeek Research (Davis & Riggs, 1999), 66% of those surveyed said "behavior modification on the part of the employees" is their biggest challenge (p. 46). Another survey, conducted by Kennedy Information, concluded that managing employee behavior is a significant challenge (Stone, 1999). Corporate leaders across America have begun to realize that in order to impact business results, the system has to affect key business processes, the behavior of people (Abramson, 1999), and their performance.

According to Malhotra, KMS-related research and product developments needs to consider how users "translate information into action" (1998c, on-line). To effectively change employee behavior—or get users to *translate information into action*—a company must have effective contingencies and explicit rules in place for maintaining and using a KMS. Without effective contingencies and explicit rules, even the best-designed KMS will not change employee behavior.

Behavior systems analysis focuses on three major conditions that influence behavior: (1) the motivation of the individual, (2) the immediate environmental cues, and (3) the consequences of behavior (Malott & Garcia, 1987; Suarez, 2001). This

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chapter argues that a behavior-systems-analysis approach to designing a KMS may hold the most promise for addressing often-cited challenges to KM, including changing employee behavior and improving performance. In addition, this chapter explains behavior systems analysis by giving an overview of the two contributing components—systems analysis and behavior analysis.

The Role of Behavior in Behavior Systems Analysis

Behavior systems analysis is the union of behavior analysis and systems analysis (Malott & Garcia, 1987). Behavior analysis contributes the science and technology of studying and managing behavior to the *behavior systems analysis* model. The goal of behavior systems analysis is to analyze environmental variables and contingencies in order to specify terminal system objectives and goals, and then to design, evaluate, and improve elements of a system in order to accomplish the objectives of the overall system. It is an attempt to organize unorganized parts so that they function as one connected system with all parts working toward the same set of terminal objectives (Malott & Garcia). This goal is not that different from any other systems model.

What differentiates behavior systems analysis from traditional systems models is (a) the method in which this is accomplished, (b) the principles that affect which conclusions are drawn during analysis, and (c) which interventions are selected based on the analysis. Malott, Vunovich, Boettcher, and Groeger (1995) differentiate between behavior systems analysis and traditional systems analysis as follows:

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> What distinguishes behavior systems analysis from any other systems analysis is not just that it deals with systems of human behavior, but also that a good practitioner is uniquely sensitive to the crucial role the failure of human performance plays in the failure of organizations to accomplish their goals. Furthermore, we are uniquely prepared to design the performance management contingencies needed to improve that lagging human performance. (p. 346)

The principles of behavior analysis are particularly useful when the *causes* of system deficiencies relate to human behavior. This is because behavior analysis prescribes various interventions for behavioral problems that are not typically explored by traditional systems analysts.

Behavior Engineering Model

Gilbert's (1996) behavior engineering model (BEM) specifies six variables that ultimately affect human performance (Table 3). Three of these variables are environmental supports and three concern a person's behavioral repertoire. Gilbert maintains that performance is always a result of these environmental and behavioral variables mixed together like a recipe. Although there is often no recipe, nevertheless the appropriate mix is essential to engineering worthy performance. Performance deficiencies can always be traced back to deficiencies in one or more of these six variables.

For example, if a paint store needs to hire a salesperson, it is not enough to hire a person with the requisite knowledge and skills (for example, sales abilities), or capacity (for example, the ability to lift 50-pound paint cans), or motivation (for example, a desire to sell products to people). The organization must also provide the

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Table 3

Behavior Engineering Model (Gilbert, 1996)

	Information	Instrumentation	Motivation
Environment supports	1. Data	2. Instruments	3. Incentives
Personal repertory of behavior	4. Knowledge	5. Capacity	6. Motivation

right data for the individual (for example, a clear set of job responsibilities), instruments (for example, product information), and incentives (for example, a paycheck contingent on performing the job duties).

Gilbert refers to the structure that mixes the person's individual repertoire of behavior with environmental variables to support that behavior as the management system. According to Gilbert's third leisurely theorem, the Management Theorem:

> For any given accomplishment, a deficiency in performance always has as its immediate cause a deficiency in a behavior repertory, or in the environment that supports the repertory, or in both. But its ultimate cause will be found in a deficiency of the management system. (1996, p. 76)

Performance Management

Managing these performance variables is essential to engineering worthy performance (Gilbert, 1996). Behavior analysis offers a method that assists with managing these variables, that is, *The Three Contingency Model of Performance Management* (Malott et al., 2000).

The three-contingency model of performance management is a model Malott

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et al. (2000) proposes for managing the performance of verbal human beings. Malott (1992b, 1996) states that we need performance management when the contingencies normally present are ineffective in supporting appropriate behavior. Relating this to behavior systems analysis, performance management is needed when one of the reasons for a system not functioning properly relates to human performance problems controlled by ineffective contingencies.

According to Malott et al. (2000), the model consists of three classes of contingencies—ineffective natural contingencies, performance-management contingencies, and inferred theoretical contingencies. When natural contingencies are not effectively supporting the behavior necessary for desired performance, performance management contingencies are added. With verbal adults, this usually includes an explicit description of the performance-management contingency—or rule (Malott et al.). At other times, the rule is implicit or self-generated. When a rule is stated (either by the employee or a manager) and the performance-management contingency described in the rule does not include an immediate consequence, but the rule appears to be controlling the response, then there is an inferred theoretical contingency controlling the response.

An inferred theoretical contingency is a contingency that is not directly observable and therefore must be inferred; for example, if an employee consistently arrives to work late (the natural contingencies are not supporting the appropriate behavior—that is, leaving early enough to arrive on time). Next, a performance-management contingency is added and a rule communicated to the employee; for

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example, "the next time you arrive late, you will be written up and when you are written up three times, we will fire you." The only way this contingency will effectively control the desired behavior is if it creates a state of anxiety for the employee because he or she does not want to be written up. If being written up is not an effective consequence, it will not generate the unobservable stimuli (such as anxiety or fear) necessary to control behavior and the employee will still arrive late.

In behavior systems analysis, this means that when the natural contingencies are not controlling behavior necessary to achieve the desired performance, performance-management contingencies can be added to support the desired behavior, and those performance-management contingencies should either directly control behavior or evoke inferred theoretical contingencies based on generating self-motivating stimuli (such as anxiety or fear).

This means that part of conducting a thorough analysis is analyzing not only the contingencies on individual behavior but the explicit and implicit rules in place that are governing behavior that result in the system deficiencies. Furthermore, an effective intervention should include ensuring that the right contingencies and rules are in place to support behavior necessary for the desired performance. Generally, when working in organizational settings with verbal human beings, this means adding rules describing delayed but probable and sizeable consequences instead of immediate consequences to manage performance (Malott, 1992a).

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The Role of Systems in Behavior Systems Analysis

Systems analysis contributes the method for analyzing human performance systems to the *behavior systems analysis* model. There are many models of systems analysis but *behavior systems analysis* uses the Human Performance Technology (HPT) model of systems analysis.

HPT is a field of practice that grew out of programmed instruction, which grew out of behavior analysis (Stolovitch, Keeps, & Rodrigue, 1997). HPT is a systematic approach to improving productivity and competency. "HPT uses a wide range of interventions that are drawn from many disciplines including, behavioral psychology, instructional systems design, organizational development, and human resources management" (ISPI, 2002 on-line; Stolovitch et al., 1997). The International Society for Performance Improvement (ISPI) defines HPT in the following way:

> Human performance technology is a set of methods and procedures, and a strategy for solving problems, for realizing opportunities related to the performance of people. It can be applied to individuals, small groups, and large organizations. It is, in reality, a systematic combination of three fundamental processes: performance analysis, cause analysis, and intervention selection. (2002, on-line)

A human performance system is any "whole" in which its "parts" (i.e., the components, elements, or subsystems) cannot function effectively in isolation but rather depend on interacting and relating to each other (Dams, 2001) and in which in order to improve the whole you must consider all of the parts. In addition, a human performance system is one in which human beings play a critical part contributing to the effectiveness of the system.

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This kind of systems analysis involves an organized and systemic approach to improving the performance of a system. It is not merely an analysis of business processes. A systems approach considers the larger environment and is made of interconnected parts, of which processes may be a part. Almost any system is probably subordinate to, or a subsystem of, some larger system. The HPT philosophy toward systems analysis is to look at a system and analyze not only the system's goals but also the goals of the system's parts.

On a philosophical level, systems thinking can be described as an outlook on life. A systems thinker views almost everything as a system—from the molecular to the molar, and always considers the effects of the parts within the system. For example, any college course is a system made up of parts such as lectures, homework, discussion, quizzes, tests, classroom, teacher, and students. For the course to function effectively, all of these parts must work in harmony with each other. An organization is a system made up of parts such as its processes, customers, people, suppliers, etc. A department in an organization is also a system—subordinate to the larger system, but a system just the same—and it is made up of its own processes, customers, people, suppliers, etc.

HPT advocates a particular model (Van Tiem, Moseley & Dessinger, 2000) for improving human performance systems (Figure 4). The main parts of the model are: (a) conducing an analysis of present and desired levels of performance (the difference between these two levels is referred to as a "performance gap"), (b) identifying the causes for the performance gap, (c) exploring a wide range of

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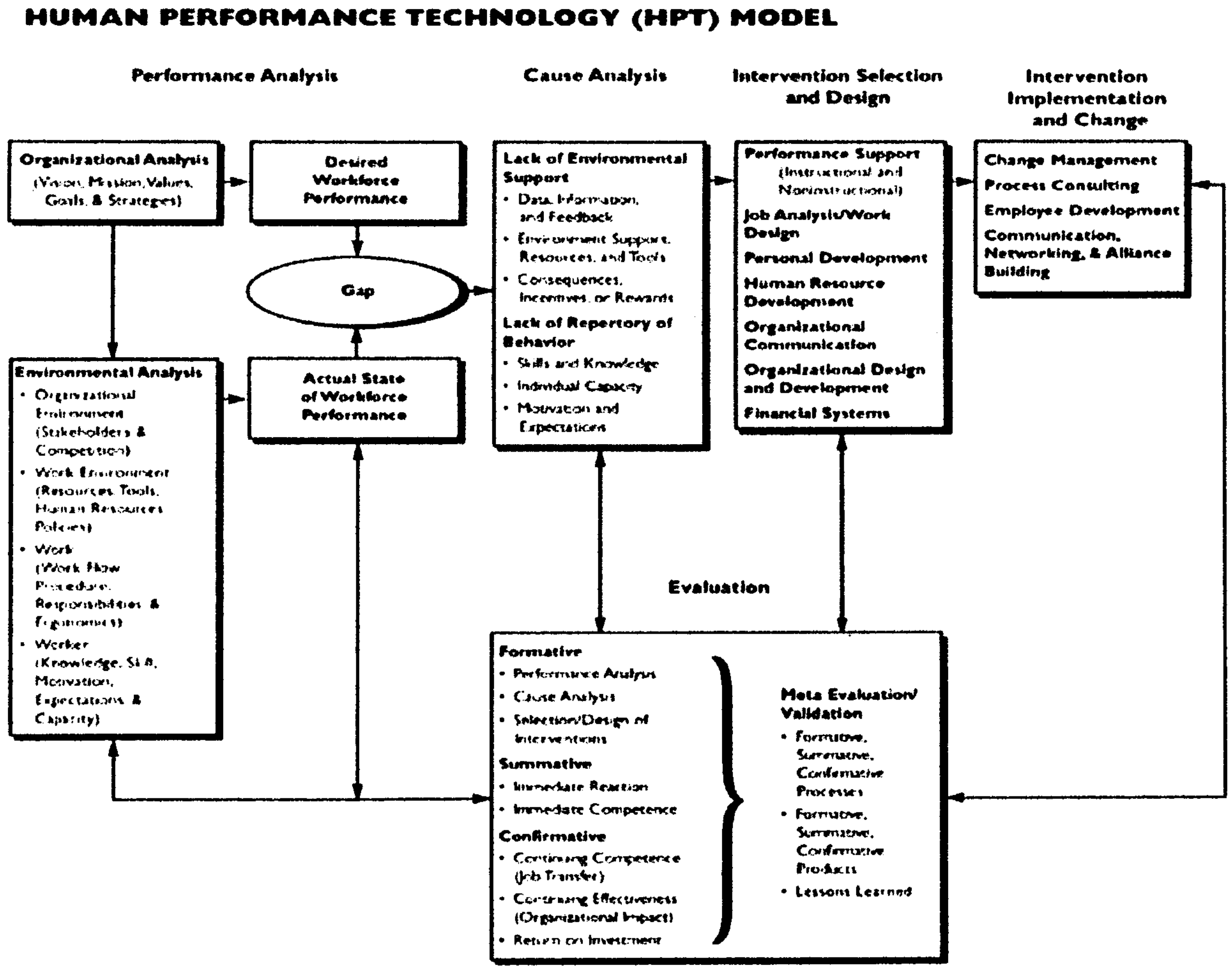

Figure 4. HPT Model of Systems Analysis (Van Tiem, Moseley, & Dessinger, 2000, p. 3). Reproduced by permission from the International Society for Performance Improvement.

interventions to close this gap, (d) managing change in the organization, and (e) evaluating the results.

Behavior systems analysis shares the HPT philosophy of human performance systems and incorporates some of the HPT model into its approach. The performance analysis and the cause analysis are the main components of the HPT model incorporated into behavior systems analysis.

Performance Analysis

The first phase in the HPT model is a performance analysis. In a performance analysis, the organization's desired state is assessed and described (this is often called a "should analysis"). The desired state is the organization's ideal performance (i.e., behavior and its accomplishments) aligned with its strategy for achieving its mission (ISPI, 2000). In addition to this should-analysis, an assessment is done of the organization's actual or "is" state (this is often called an "is analysis"). An actual state is the organization's current performance. The outcome of these two analyses (i.e., the should- and is-analysis) is the identification of the deficiencies in workforce performance, or of the performance gaps (ISPI). In this study, the term performance gap means: (a) something prescribed by the organization that is not happening now but should be happening, (b) something that is happening now that should not be, or (c) something that is not prescribed by the organization yet and thus, is not happening now but should be.

An is-analysis is generally done first when there is an idea of *where* problems

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are in the organizational structure; although *what* the specific problems are will not be completely identified until a should-analysis is done and the performance gaps are identified. When it is unclear *where* in the organizational structure improvement is needed, a should-analysis of the entire organization should be done first, which indicates *where* to focus improvement efforts. Then, any one of several is-analyses related to that part of the organizational structure can be done to identify *what* the specific problems are (i.e., the performance gaps). These two analyses, the is-analysis and the should-analysis, ought to result in identifying the performance gaps. The goal of HPT is to close this gap in the most cost-effective manner (ISPI, 2002).

Cause Analysis

The purpose of a cause analysis is to identify the performance variables that contribute to the performance gap. The HPT systems philosophy emphasizes identifying variables that cause a given performance gap, which requires a cause analysis. An analysis of the performance gaps can be conducted using Gilbert's BEM (1996). For example, suppose the productivity of telemarketers using a computer call system to sell widgets has been decreasing steadily over the last year. Rather than assume that the employees need to be trained on how to use the system, a cause analysis may conclude that the problem has to do with a lack of incentives. If a poor performer makes just as much money and is treated virtually the same as a high performer, over time the high performer's performance may decline. In this situation, the cause is a lack of incentives for good performance, which indicates a non-training

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intervention. "Solutions to performance problems often fail to achieve their intended goals because they are selected to treat only visible symptoms rather than underlying causes" (ISPI, 2002, on-line). Thus, a cause analysis is a critical step between identifying performance gaps and selecting the appropriate intervention(s).

According to Gilbert's BEM, the environmental variables are data, instruments, and incentives, and the personal repertory variables are knowledge, capacity and motivation. The principles of behavior analysis can be applied in the *data*, *incentives*, *knowledge*, and *motivation* variables more than with the other two variables (Table 4).

Table 4

Aligning the Principles of Behavior With Gilbert's Behavior Engineering Model (Gilbert, 1996)

	Information	Instrumentation	Motivation
Environment supports	1. Data (Rules)	2. Instruments	3. Incentives (Contingencies)
Personal repertory of behavior	4. Knowledge (Rule-governed and contingency-shaped behavior)	5. Capacity	6. Motivation (Establishing Operations)

In examining the data variable, a behavior analyst will attend to rules (verbal descriptions of contingencies) in place that govern behavior. These "rules" can be explicit, such as job descriptions, company guidelines on various topics; or implicit, such as particular behaviors and accomplishments consequated by people in the organization. In other words, the behavior analyst wants to know if employees have

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developed rules that control their behavior based on the contingencies that are operative in the organization, and whether or not those rules are explicitly endorsed by the organization.

A behavior analyst does not use the terms *incentives* and *motivation* in the same sense in which Gilbert used them. Regarding Gilbert's *incentives*, a behavior analyst attends to the specific existing or needed contingencies on individual behavior. Contingencies can include aversive consequences as well as reinforcing consequences that might be termed incentives. Regarding Gilbert's *motivation*, a behavior analyst attends to establishing operations in place, which both evoke behavior and affect the reinforcing effectiveness of specific stimuli, events, and conditions (Michael, 1993a, 1993b).

As an example of an analog[6] contingency that could become an implicit rule (*incentives*), does an employee receive more attention and praise for billing ten hours for completing one task than for billing five hours for completing the same task? Billing ten hours indicates the employee worked less efficiently, but the company earned more money for that inefficiency. Billing five hours indicates the employee worked more efficiently but the company may not have earned as much for that efficiency on that one task. However, working more efficiently on that one task may have satisfied the customer more than working less efficiently, which might result in the company having the ability to charge more for that employee's time in the future.

As an example of an analog establishing operation (*motivation*)—what

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[6] Analog refers to the fact that the consequence is not immediate. In other words, the contingency is not direct-acting.

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happens when a project manager creates an unworkable project schedule? Does that schedule cause employees to work more efficiently or to engage in disagreements and aggressive behavior (evocative effect)? Furthermore, does it make working on the project more or less rewarding (reinforcing effectiveness)?

Conducting a behavior-analytic analysis of these variables is key in order to identify all issues that may contribute to each performance deficiency. In addition, once all of the causes of each performance deficiency are identified, the principles of behavior analysis may indicate specific types of interventions for some types of causes. For example, if inefficiency is reinforced in the organization because it contributes to higher revenue in the short-term, the principles of behavior analysis indicate implementing different contingencies as opposed to assuming a skill deficiency is causing the inefficiency, which indicates a training intervention.

Total Performance System

The total performance system (TPS) is a framework with which to view performance systems that was first introduced by Brethower (1972, 1982, 1995).

Figure 5 shows the TPS and its seven foundational elements and Table 5 describes each of these elements. The receiving system has, what looks like, a bite taken out of it to illustrate that a performance system's receiving system can never be completely identified—there will always be unrecognized or unidentified receivers of system outputs.

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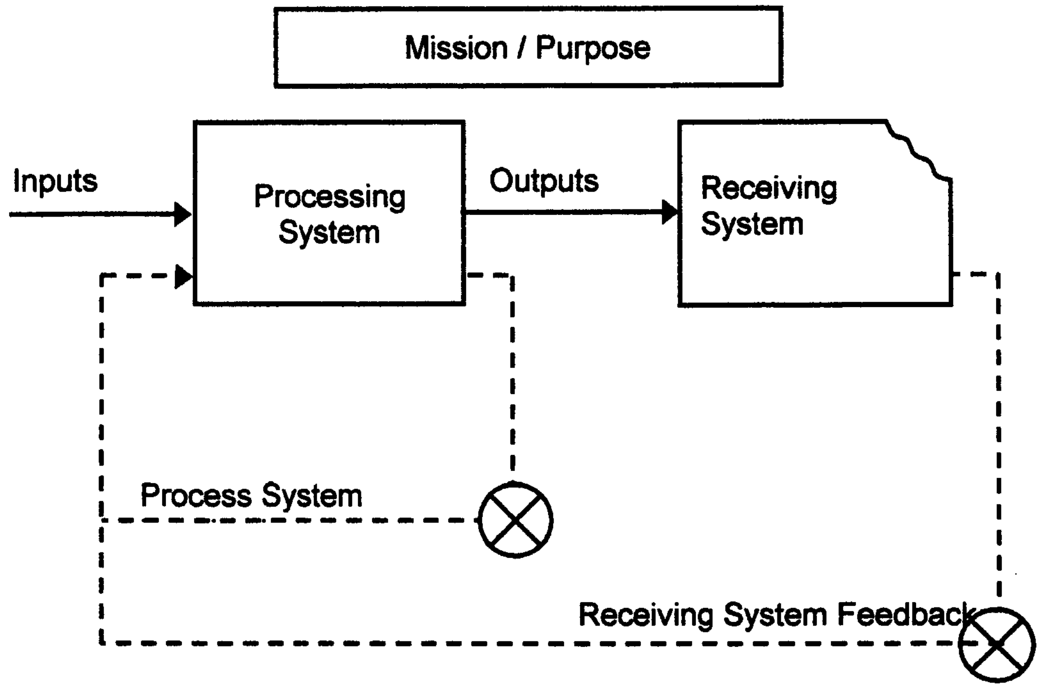

Figure 5. The Total Performance System (Brethower 1972, 1982, 1995). Reproduced by permission from Dale M. Brethower.

Total Performance System: KMS Design Implications

Using the TPS as a general framework for how work flows through any system, and through any process, helped us design the KMS. If you look at each business process and critically analyze what *inputs* are needed that should be captured in the form of knowledge items, you can separate the need-to-have from the nice-to-have from the junk that will clutter up the system. Additionally, you can identify which *outputs* must be stored and organized for later re-use. Triad used this framework to distinguish performance-support mechanisms, or PSMs (analogous to

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Table 5

The Seven Elements of the TPS

Element	Description
1. Mission/Purpose	The goal the system is designed to accomplish—the reason the system exists.
2. Inputs	Those resources that get transformed into outputs, or are consumed by the processing system, or stimulate it so that it will function effectively.
3. Processing System	The part of the system that makes outputs out of inputs—including one or more business processes and the relationships between those processes.
4. Outputs	The individual accomplishments that the processing system achieved or those products it produced.
5. Receiving System	Those entities, and the relationships between them, that receive system outputs.
6. Process System Feedback	Information coming from the processing system that can be used to assess system performance.
7. Receiving System Feedback	Information coming from the receiving system that can be used to assess system performance.

inputs), from work products (analogous to outputs) and organized its taxonomy (i.e., the hierarchical system of classification under which knowledge items are grouped) around this fundamental distinction. If a particular document were defined as a PSM, it would be stored in the application database; if it were defined as a work product, it would be stored on an archive server accessible through both the application and through a traditional folder structure. More will be discussed on PSMs and work products in the Method.

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Six Phases of the Behavior Systems Analysis Method

Behavior systems analysis is an approach that uses the following six phases to design and/or improve any human performance system (Malott, 1974): (1) analysis of the variables that affect the operation of the system, which includes both a performance analysis and a cause analysis, discussed earlier in this study; (2) specification of the objectives to be accomplished by that system; (3) design and development of the system components to accomplish those objectives with supporting performance-management contingencies; (4) implementation of the design and supporting performance-management contingencies; (5) evaluation of the extent to which the implemented design accomplished the specified objectives; and finally, (6) recycling through the previous five phases until the system objectives are met. Recycling is important because a system of any significance never accomplishes its objectives in its first iteration (Malott).

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CHAPTER IV

KNOWLEDGE MANAGEMENT SYSTEMS

This section contains a brief description of a KMS and compares it to other common information-management systems, and describes various strategic approaches to KM.

Information-Management Systems

In today's technical environment, it is easy to confuse the many information-management systems. Acronyms such as *KMS, DMS, LMS, CMS,* and *LCMS* abound representing the wide variety of systems that are available (Table 6). Practitioners must learn to recognize which system is needed and be able to differentiate among them.

Knowledge Management Systems (KMS)

Often, the knowledge that provides value to organizations is buried in documents and in employees' repertoires. A KMS helps companies codify that knowledge and organize it into a structure in which it can be maintained, retrieved, and distributed so that it can be re-used later. A KMS focuses on the relationships between an organization, its people and processes, and technology. As KM draws on

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Table 6

Information Systems: Comparison at a Glance

Feature	KMS	DMS	LMS	CMS	LCMS
Assemble course elements				X	X
Classify and organize documents and other items (such as hyperlinks)	X	X		X	
Control access through security settings	X	X	X	X	X
Control versions through automated editing workflows		X			
Create content				X	X
Import documents	X	X	X	X	X
Index items	X	X	X	X	X
Launch web-based training course			X		X
Offer class schedules and course catalogs			X		X
Offer course evaluation reports			X		
Offer on-line registration/enrollment			X		X
Offer tracking/grading systems			X		X
Provide access to external sources	X				
Provide ways for users to "pull" information	X	X	X	X	X
Provide ways to "push" information to users	X		X		
Scan documents		X			
Store information in databases	X	X	X	X	X
Tag elements of items as individual knowledge objects	X			X	X

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several disciplines and includes many types of services, the concepts of KM and KMSs are often not well understood. Computer applications with components such as search engines, document management, and content management are often individual elements of a KMS; however, these applications do not, by themselves, comprise a KMS. Users and vendors alike often make the mistake of referring to these types of applications as *knowledge management systems* when in actuality they are simply components of a larger system (Dyer, 2001; Santosus & Surmacz, 2001).

It is important to recognize that one cannot buy any one complete, working KM product (Mullett, 2000). KM is a concept or a practice that includes an organization's philosophy, strategy, business processes, and support tools to manage corporate knowledge assets. When these elements are managed together, there is a system in place to manage corporate knowledge; thus a KMS. Knowledge management systems are usually designed to do the following: (a) acquire new information or capture reusable information and data; (b) organize the data and information in an intuitive structure so users can easily retrieve the information; (c) store the data and information, usually electronically, in a way that protects the organization against losing it and facilitates content management; (d) maintain information so that it is always relevant and reliable; and (e) distribute the information and provide retrieval systems so that the corporate information can be *used by people*, thus transforming raw data and information into *knowledge*.

The failure to differentiate between a KMS and a document management system (DMS) is the most common mistake among practitioners today (Joia, 2000).

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Often, people incorrectly refer to a KMS when they are really speaking solely of the electronic tool(s) that automate(s) some part(s) of this process—they are really referring to a document management system. This may be due to the many vendors who "label their document management, database or groupware products as KM solutions" (Hildebrand, 1999, on-line).

Document Management Systems (DMS)

The purpose of document management systems (DMS) is to manage the sharing of electronic documents. These systems often include a method of restricting access across groups of users and adjusting access to allow either adding, deleting, reading, or editing documents. These programs often include document-imaging functionality to convert paper documents into electronic images on a computer (such as scanning). They also archive a variety of documents and provide the means to rapidly find, retrieve and share those documents. Document management systems are usually designed to do the following: (a) scan and import documents in order to bring them into a central database, (b) archive and store documents, (c) index and organize documents, (d) allow people to retrieve documents, (e) manage changes to documents, and (f) provide access control through security settings.

Learning Management Systems (LMS)

A learning management system (LMS) is an information-management system specific to education and training industries. An LMS administers and tracks both

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online and instructor-led, classroom-based learning events, as well as other training processes. An LMS is typically designed for *multiple* publishers and providers. It usually does not include its own authoring capabilities; instead, it focuses on managing courses created by a variety of other sources. Learning management systems are usually designed to provide the following: (a) class schedule, (b) course catalog, (c) student registration and enrollment, (d) web-based training courses, (e) grade databases, and (f) course evaluation reports.

Content Management Systems (CMS)

A content management system (CMS) is also an information-management system specific to education and training industries. A CMS manages and delivers various types of content, using various media, to assemble training materials. A CMS allows content to be quickly assembled and supports the creation of training agendas and other materials. They provide the infrastructure for organizations to cost-effectively create, store, and maintain learner-specific training materials in the form of knowledge items for deployment via the Web, CD-ROM, and print. Content-management systems are usually designed to do the following: (a) assemble course elements, (b) classify and organize documents, (c) control access through security settings, (d) create content, (e) import documents, (f) index items, and (g) store information in a central database.

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Learning-Content Management Systems (LCMS)

Learning-content, or integrated-learning, management systems (LCMS) are the latest in the family of information-management systems. An LCMS is also specific to education and training industries. They are a blend of a CMS and an LMS in one application. They offer assembly capability, including the ability to incorporate content from other programs. Some have authoring systems built into them, so that you can actually create content from within the product. Such systems enable authors to use and re-use existing learning objects (knowledge items related to developing training materials) in an easily accessible on-line environment. Learning-content management systems are usually designed to do the following: (a) import and assemble course elements, (b) create course content, (c) provide on-line registration and enrollment, (d) store print-based materials for students to download and print, (e) track and record student progress, and (f) deliver web-based courses.

Strategic Approaches

Just as it is important for executive leaders to agree on an operational definition of knowledge before designing a KMS, it is also important to agree on the strategic approach the organization will take toward KM before undertaking a KMS implementation. Obtaining management buy-in and making timely progress on the KMS design are easier to achieve when an approach has been selected that fits the organization's size, its services (whether or not their services are highly-customized or standard), its mission, and business objectives. The approach must be clear enough

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to guide the design team's tactical implementation steps and to help give direction when there is disagreement among design team members. The approach will also help delineate objectives by "reflecting the KM vision in a coherent framework" (Wiig, 1999, pp. 3-16). Furthermore, the approach greatly affects the scope of the knowledge items to be included in a knowledge base (i.e., the codified knowledge items).

The two most common approaches are personalization and codification (Hansen, Nohria, & Tierney, 1999). The codification approach to KM works best for companies that deliver standard, or homogeneous, services and products. The personalization approach to KM works best for companies that deliver highly customized services and products. Hansen et al. identified the following three questions to help organizations determine which strategy might work best for them:

1. Does the company offer standardized or customized products? Standard products are of the "one-size-fits-all" variety and do not require customizations unique to each customer. Therefore, a standard product indicates a codification approach and a customized product indicates a personalization approach.

2. Does the company have a mature or innovative product? Mature products usually do not change much. Innovative products will go through many iterations until they become mature and stable. Therefore, a mature product indicates a codification approach and an innovative product indicates a personalization approach.

3. Does the company employ people who rely on explicit or tacit knowledge to solve problems? Explicit knowledge is easily codified, whereas tacit knowledge is

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not. Therefore, explicit knowledge indicates a codification approach and tacit knowledge indicates a personalization approach.

Codification

With the codification approach, the aim of a KMS is to extract information from people and codify it so that other people can then re-use it. The approach strives to make corporate knowledge stand alone and apart from the knowledge workers who contributed it. In this way, the original knowledge worker is removed from the process. The knowledge is captured for the organization without the need for ongoing support from the contributing knowledge worker. Often one situation-specific document is dissected and various parts are made into distinct knowledge items. For example, a benchmarking report may be broken down into component parts such as financial information, best practices, and strategies. These individual knowledge items would be stored so that anybody else could search relevant pieces and not have to sort through information that was not needed.

Companies that use a codification approach benefit from *economies of re-use* (Hansen et al., 1999, p. 110) or *economies of scale* (Cardinal, Alessandri & Turner, 2001, p. 195) in that once knowledge is captured in the form of a knowledge item, it can be re-used an unlimited number of times at a low cost—provided it does not require much effort to revise it for each new situation. Companies that use a heavy codification approach usually have resources dedicated to finding reusable information and codifying it into the appropriate-sized knowledge items (Hansen et

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al.). Therefore, this approach requires a large investment in information technology (IT)—the company's IT network, hardware and software. Further, maintaining a KMS using a codification approach is labor intensive and costly because it requires dedicating people to packaging the appropriate-sized knowledge pieces into codified knowledge items.

Personalization

With the personalization approach, the aim of a KMS is not to remove the contributing knowledge worker from the process. With the personalization approach, the goal is not to codify as much knowledge as possible but rather to codify explicit knowledge that is easily codified and to facilitate connections between subject matter experts and knowledge workers, or between knowledge seekers and knowledge providers, to transfer tacit knowledge (Mullett, 2000; Myers, 1999).

Companies that use a personalization approach benefit from "expert economies" (Hansen et al., 1999, p. 110) in that their internal subject-matter experts share tacit knowledge internally with other knowledge workers and externally with clients. While the methods and processes used in this approach are highly dependent on people, time consuming and expensive, the companies that sell highly customized, innovative services that rely on tacit knowledge can charge more for their services than companies selling standard and mature services relying on explicit knowledge.

Companies using a personalization approach may still invest in IT systems such as document management systems, but the goal is not to codify all valuable

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information so that it stands apart from contributing knowledge workers. Instead, explicit knowledge is codified while there is no attempt to codify tacit knowledge. Knowledge workers may read relevant documents to become aware of the knowledge available on a particular topic or who is an expert on a particular topic and then approach the contributor or recommended subject matter expert to learn or acquire the context-specific information. The investment in IT systems is not as high as that required for the codification approach because there is not as much codified knowledge to be stored in a database, but an investment in labor can be just as high. This is because the culture sets an expectation for knowledge workers to spend time in mentoring relationships, communities of practice, and other people-to-people knowledge sharing endeavors. While this knowledge-sharing time may increase quality and customer service, it is usually not billable and can have a negative impact on immediate productivity.

Companies that take a strong personalization approach use elements such as communities of practice[7], apprenticeships, mentoring programs, discussion groups, and other venues in which there is person-to-person contact (Ardichvili, Page, & Wentling, 2002; Davenport & Prusak, 1998). Another option used with personalized approaches is expertise profiling, in which internal subject matter experts are profiled and their profiles are accessible via a KMS. The profile's purpose is to help knowledge workers identify with whom they should talk about a particular topic

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[7] The Cambridge Center for Behavioral Studies, Behavioral Virtual Community has various discussion groups on different topics such as verbal behavior. Each discussion group is an example of a community of practice.

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(Nelson, 1998). The personal contact facilitates the transfer of tacit knowledge within various contexts.

However, it has been suggested that "the only successful approach" for transferring tacit knowledge is through training (Wickert & Herschel, 2001, p. 330). On-the-job training (Wickert & Herschel), coaching, and computer-based and non-computer-based real-life simulations are the training mediums that are most likely to capture the contexts and subtleties of tacit knowledge that make it difficult to transfer. Apart from training, the only way that a KMS helps facilitate the transfer of tacit knowledge is to point a knowledge seeker to a knowledge provider and encourage them to interact (Dunford, 2000).

Integration

Some authors have suggested integration as a strategy, which incorporates both the codification and personalization philosophies. However, to effectively manage knowledge, you need a balance between people and technology that is appropriate to the business (Friedman, 2002c). Therefore, integration is a misnomer because there is always a mix of personalization and codification. Generally, there is an 80-20 split; 80% of one approach and 20% of the other (Hansen et al., 1999). Rarely are KMSs built using only one approach. Although some of the larger consulting firms claim one over the other (Hansen et al.), there are probably different aspects of their system design that are characteristic of the other approach.

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High-Impact

This study introduces the concept of a high impact approach to KM. A company's approach, which is identified before design, will still lean toward either personalization or codification, but it will also be either high-impact or not. High-impact KM is a notion taken from Brinkerhoff and Apking's concept of high-impact learning (2001). According to Brinkerhoff and Apking, high-impact refers to learning that affects business results because a clear, describable connection can be made between each training event and what needs to be done on the job to produce business results (Brinkerhoff and Apking refer to this as a "clear line of sight"). As shown in Figure 6, their high-impact framework to learning requires three elements: (1) create

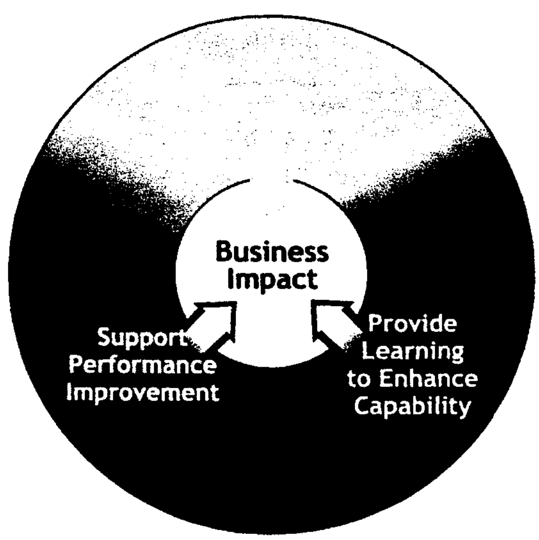

Figure 6. High-Impact Learning Model (Brinkerhoff & Apking, 2001).

Source: Triad Performance Technologies, Inc. (2001). *HIL Graphic*. Farmington Hills, MI: Author. Used with permission.

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focus and intentionality, (2) provide learning to enhance capability, and (3) support performance improvement.

While *creating focus and intentionality* and *providing learning to enhance capability* are not directly related to KM, *supporting performance improvement* after a training event is related to KM. Providing performance support is something that the organization should do both with, and apart from, its training events and programs.

While the decision to take a high-impact approach is made pre-design, it affects the design. The effect of designing a KMS with a high-impact approach is that the performance support provided through the KMS is clearly linked to performers' critical actions necessary to impact business. This can be accomplished in one of two ways:

1. The organization can identify critical work products for each key business process and then specify the knowledge items that are needed to support those processes. In order to do this, you must identify the critical business processes that have the most immediate effect on the bottom line, identify the major activities in each process, identify the key milestones and outputs of the process and identify the knowledge needs required to achieve those milestones and produce those outputs (AskMe Corporation, 2001a). When knowledge items are used to directly support a business process, there is a high probability that the KMS will be successful (AskMe Corporation; McDonough, 2000).

2. The organization may identify the critical work products for each role in the organization and then specify the knowledge items that are needed to support their

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performance. For example, a critical work product for a project manager is a work plan. There may be knowledge items that can support the project manager in preparing a work plan that should be included in the KMS

The same knowledge items may be identified when identifying critical work products connected to business processes as when connecting to roles, but instead of making the connection to roles explicit to knowledge workers, the connection to business processes is made explicit. For example, a work plan is probably a key output of a consulting firm's core business process. If a company has defined each role's critical work products as part of its approach to training, it may use the critical work products connected to roles. However, if the critical work products for each role have not been identified but the business processes have, the organization can make the connection to business processes instead of roles.

There are three major benefits to this high-impact approach:

1. It emphasizes the impact each role or business process has on the organization's business results by providing a "clear line of sight" (Brinkerhoff & Apking, 2001) between performance support and business impact. In other words, one could easily describe how each knowledge item supports performance that results in an output directly related to the company's operation or profitability. For example, it would be clear to a consulting firm's employees how well written, accurate work plans (for which a work plan template, for example) contribute to managing a project so that it creates profit for the company. You could easily describe how consultants who are designing a learning strategy for a customer might use a research report on

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the training industry. However, you might not be able to describe how an article reviewing current literature on the effectiveness of coaching supports any kind of job performance connected to business results.

2. Taking a high-impact approach helps both identify items to include in the KMS and filter the scope of those items. Getting useful information into the system instead of useless information will make it easier for knowledge workers to find knowledge items that truly support performance.

3. Making the connection between PSMs and key business processes or job roles explicit to users is a way of specifying rules about how and when to use the PSMs. Having clear rules in place will help guide user behavior and ensure that the system drives performance.

Performance-Support Mechanisms and Work Products

Related to the concept of a high-impact approach clearly linked to performance on the job, this study introduces a new concept—the distinction between performance-support mechanisms (PSMs) and work products. PSMs and work products are two different classes of knowledge items. A PSM is a class of knowledge item that is distinguished by its relevance to supporting either performers' critical actions necessary to perform their job or to supporting key business processes. A PSM is contrasted with a work product, another class of knowledge item (Figure 7). PSMs support doing work, whereas work products are the result of doing work. Work products are rich in context-specific content whereas PSMs are generic and do not

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Knowledge Items	
PSMs (inputs)	Work Products (outputs)

Figure 7. Two Classes of Knowledge Items: PSMs and Work Products.

contain context-specific content.

Work products help support knowledge workers when they engage in new situations in which they may be able to access previous work products and either alter the entire work product or use parts of it to help meet those needs. There is increasing awareness of the value in re-using project work (Business Process Resource Centre, 2000) and therefore including work products in a KMS in a way that retains the original context can help meet that need.

For example, a template used to write meeting minutes is considered a PSM because a knowledge worker may use it as a blank slate and starting point in writing those minutes. However, the completed minutes specific to a particular meeting are a work product because they contain the content relevant to that specific meeting.

Another example concerns a document describing a learning-intervention design. A sample design document, an example taken from another project may help knowledge workers create a design document because it shows an example of the format and structure; therefore, it is a PSM. Conversely, a design document from a specific project is considered a work product because it contains the design-related content specific to a project. This is not a completely unambiguous distinction

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because a document may be a work product and still support performance. However, the distinction should still be attempted because it benefits the users, the performance of the KM computer application, and potentially the IT systems and processes as is discussed later.

Work products are rich in context-specific content and may provide ideas for new content whereas PSMs are separated from specific contexts and provide generic information, format, and prompts for writing various sections of a document or doing various parts of a task. If a PSM is a sample, it is a sample of a standard type of document with all the required and optional sections completed so that the knowledge worker can see an ideal example. The content provided in the sample serves as an example of such things as writing style, treatment of various topics, and how issues particular to that document have been handled as opposed to a sample of context-specific information. A PSM is designed to help performers develop a work product that meets company standards, whereas work products include all deviations from the standard that are specific to a work situation. In billable types of work settings, that situation-specific context is usually an industry, client, or a project that deals with a specific subject (such as strategic planning).

The knowledge worker may know of a specific work product that was used on a specific project and may search for, find, and re-use parts of that work product in a new situation. Distinguishing between PSMs and work products helps knowledge workers be cognizant of what kind of knowledge item they are searching for, which, depending on the taxonomy and KMS configuration, may indicate where the

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knowledge item can be found. Additionally, making this distinction helps the design team, and later the management team, identify where a knowledge item belongs in the taxonomy.

The number of work products is limitless and will continue to grow in quantity as long as the company operates. From a practical perspective, separating work products from the rest of the knowledge items makes the KMS easier to maintain and the database easier to back up. PSMs will be continually monitored and updated to remain relevant and useful, whereas once a work product is finished, it is not monitored because it will not change. Work products contribute value to a KMS for their historical use and context; therefore, they are not modified to change with the changing environment.

Studies have shown that 85% of stored documents are usually never retrieved and after 18 months, and less than 5% of these stored documents are ever used again (Groeber et al., 1996). Providing an easy way for users to access past work products with enough context for users to be able to identify when particular work products have the potential to be re-used will help organizations leverage (or reuse at a low cost) stored knowledge.

During the design of a KMS, the design team works with PSMs at a micro-level—for example, the specific knowledge items that should be included in the KMS. Alternatively, the design team works with work products at a macro-level, for example, the organizing structure that stores all past work products regardless of the individual work products that structure includes. As an example, a company may have

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an archiving process and structure that holds all past work products (such as a folder structure). Identifying which types of work products to include (for example external work or internal work), ensuring that there is a process to store and retrieve them, and that the process is aligned and integrated with the KMS is sufficient for those work products to be accessed via the KMS. There is no need to spend time deciding which individual work products to include because all past work is by definition a work product and should be included.

This categorization has an impact on the scope of knowledge items included in the KM computer-application database, or knowledge base (i.e., the primary database that holds knowledge items), and makes it easier to identify knowledge items that support knowledge workers in doing their work and that support key business processes. For example, you would not include a sample of a design document used with each client to store in the application database. This is because knowledge workers could *access* a design document from each client through the *application interface* although it is *not stored* in the *application database*. Instead, there may be hyperlinks or shortcuts, for example, provided in the application that connect users to documents stored externally (such as a network folder structure).

Alternatively, you might include a sample design document used with each of the various types of media with which a training course is developed. This is because more users will be able to locate those samples if they can search for them in the KMS, than if they remain in an external folder structure with which only project-team members may be familiar. If the knowledge workers are familiar with the external

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folder structure, they can go directly to the folder structure, but knowledge workers who are not familiar with that folder structure can also locate them by searching the KM computer application.

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CHAPTER V

THE STATE OF THE KNOWLEDGE MANAGEMENT INDUSTRY

The market forecast for *KM software* is estimated to grow from $515 million in 1999 to $3.5 billion by 2004 with *KM consulting services* (hereafter referred to as KM services) growing to $8.8 billion over the same period (New Media Investor, 1999). International Data Corporation (IDC) predicts the KM services industry will grow to $10 billion by 2004 (Knowledge Asset Media, 2001) and to more than $12 billion by 2005 (Dyer, 2001; Newsbytes.com, 2001).

In light of this, a number of surveys and studies have been conducted to assess the strength of the KM industry. In the following paragraphs, I refer to two primary studies along with other sources to describe the current state of the KM industry. One of these studies was a comprehensive survey given via the Internet and conducted by *KM Magazine* and IDC (Dyer, 2001), hereafter referred to as the IDC survey. This IDC survey described the worldwide KM market from 2000 through 2001 and projected into the future. There were 566 respondents to the survey, 28% employed at companies with 10,000 or more employees (i.e., large businesses); 40% employed at companies with 500 or fewer employees, (i.e., implicitly, middle-market businesses; Dyer, 2001).

KPMG conducted the other primary study in which they surveyed chief executives, directors, and leaders with the specific responsibility of managing

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knowledge in 422 organizations across Europe and the U.S. with annual revenues of at least $270 million (i.e., middle-market businesses). The business sectors represented in this survey were as follows: financial services (22%), industrial products (20%), consumer markets (20%), chemicals, pharmaceuticals and energy (14%), government (2%); information, communication, and entertainment (2%), professional services (13%), transportation (5%), and others (2%). This study will be referred to as the KPMG study (Knowledge Asset Media, 2000).

Strategic Importance

The IDC survey indicates expenditures confirm that KM is being treated as a long-term, strategic effort rather than a discrete undertaking. The Delphi Group did a study that concluded half of U.S. firms have some sort of a KM effort underway (Bicknell, 1999). The KPMG survey found that nearly 75% of executive leaders surveyed were looking to KM as a significant strategy for improving their competitive advantage, marketing, and customer focus. A survey conducted by *Information Week* found that 51% of 200 information-technology executives considered KM strategic to their business (Davis & Riggs, 1999).

In fact, one of the top five consulting firms, KPMG, has decided to invest 1% of its worldwide revenues back into developing the organization's KM abilities (Fry, 2001). Buckman of Buckman Laboratories estimates that his firm spends 7% of its revenues on KM, McKinsey and Company spends 10% of its revenues on KM (Davenport, 1999; Dunford, 2000), and Ernst & Young spends about 6% of its

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revenues on KM (Dunford).

Business Reasons for Investing in Knowledge Management

Corporate management is recognizing the value of knowledge management in solving business problems. While technology improvements that made using computers easier and more useful may have been the initial impetus for companies to use KM, at least in the U.S., companies are beginning to realize the practical benefits of improving other aspects of their business through better KM practices (such as spending less time creating documents that are similar).

According to the IDC survey (Dyer, 2001), the top business needs that drive companies to pursue a formal KMS are: (a) retaining expertise, (b) improving customer satisfaction, and (c) increasing revenues and profits[8]. Similarly, other surveys indicate that primary needs include: improving decision making, faster response time, increasing productivity, and reducing costs (Mcluhan, 1999). The KPMG survey found that top business needs that justify an investment in KM are: (a) increasing competitive advantage (75%), (b) improving decision making (71%), (c) increasing innovation in order to respond to business issues faster and to deliver better customer service (65%), and (d) speeding employee development (57%). These business needs are addressed through a number of tactics; however, KM programs tend to help companies: (a) capture and share best practices (77.7%), (b) provide

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[8] However, in order to accomplish (c) "increasing revenues and profits", organizations must do (a) "retain expertise" and (b) "improve customer satisfaction".

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training (62.4 %), (c) manage customer relationships (58.0 %), and (d) deliver competitive intelligence (55.7 %; Dyer).

In 1996, it was estimated that 10%-15% of an organization's resources was spent creating, managing, and distributing documents and as much as 60% of people's time was spent working with documents (Groeber et al., 1996). These figures would probably be higher if the same survey were administered today. According to AskMe Corporation (2001b), 6-12% of an employee's time is spent searching for information— on average, 30 minutes a day, 7-20% of an employee's time is spent replicating answers, and less than 20% of the knowledge available to the company actually gets used.

Furthermore, various studies have concluded that less than an estimated 20% of corporate knowledge is currently documented while more than 80% remains uncaptured (AskMe Corporation, 2001a). In 1999, the IDC estimated (PR Newswire, 1999) that Fortune 500 companies would lose $12 billion that year due to ineffective KM practices. It further predicted Fortune 500 companies would lose $31.5 billion by 2003 (AskMe Corporation; PR Newswire). By 2001, two years later, that estimate had grown to more than $57 billion (AskMe Corporation, 2002).

According to the same report, an estimated 3.2% of corporate knowledge becomes obsolete each year because of inadequate tools and processes to capture, use, and manage organizational knowledge; and another 4.5% becomes unavailable due to employee turnover, information mismanagement, or knowledge hoarding.

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Governance

Due to the immaturity of the KM field, there are few commonly recognized roles. New organizational roles are emerging and traditional roles are being redefined (Mullett, 2000). However, the IDC survey found that executive managers lead 42% of all KM implementations (Dyer, 2001). Increasingly, chief executive officers (CEO) are involved in KM-related decisions; thus, CEOs are beginning to play a larger role in KM implementations. Although many companies try to use internal resources to implement KM programs, approximately 27% of KM budgets are allocated for external resources. Of these external resources, 34% of the money is allocated for information technology services, 39% for software, and 29% for consulting services (Dyer).

There are no traditional roles defined and generally recognized for maintaining a KMS (Zack, 1999). The role of chief knowledge officer (CKO) is an emerging role, used for both initial KM implementation and its ongoing maintenance, that is becoming more common. However, reviews are mixed as to whether or not instituting this position is the best practice (Bicknell, 1999; Newcombe, 1999). In fact, in a survey conducted by KPMG in 1998 of 100 leading UK companies, only 5% of the respondents reported using a CKO (KPMG, 1998).

The Delphi Group (Bicknell, 1999) concluded that because knowledge sharing happens within business units, having someone from information-technology or at the corporate level, such as a CKO, manage a KMS is often ineffective. It is thought to be ineffective because a corporate resource is not close enough to what is happening in

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the business units on a daily basis to be able to identify the knowledge gaps that exist. Therefore, instead of using knowledge managers or CKOs, many organizations use cross-functional teams[9] to manage corporate KMSs. This tactic also helps address cultural obstacles by facilitating buy-in across functional groups and business units.

Two common approaches companies take to maintaining their KMS involve using groups of people in the organization dedicated to either (1) managing clusters of knowledge (Tobin, 1998; Zack, 1999), or (2) managing the KM business process. These groups of people could be employed solely for this purpose or their KM role could be just one of many roles they have in the organization. In organizations that manage clusters of knowledge, people are responsible for a particular body of knowledge, usually a segment(s) of the taxonomy, and their responsibilities are particular to the knowledge cluster for which they are responsible. These responsibilities typically include: advocating the use of particular knowledge items, educating employees on when to use those knowledge items, reviewing codified knowledge, and identifying what knowledge needs exist in that knowledge cluster and how best to fill those needs.

In organizations that manage the KM business process, people are responsible for certain process outputs and the corresponding parts of the process. Thus, their main responsibility is to ensure specified process outputs are produced. This means they may invoke other people in the organization to do the steps in the process (for example, identify knowledge needs, acquire knowledge, and package it into

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[9] A cross-functional team is a group of employees representing relevant functional groups in the organization (such as sales, operations, finance, and manufacturing).

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knowledge items). In addition, these people often periodically review existing knowledge items for accuracy and relevance.

Time Duration for Implementation

A KMS is not a quick solution that can be implemented in just a few months. Implementing a KMS is a long-term strategic effort requiring careful technology integration, as well as investment in change management and business process design. According to Abramson (1999), large businesses should create a five-year plan with several smaller milestones during the first year to begin gaining buy-in across the company. According to the IDC survey, 63% of the respondents had an implementation schedule of approximately three years while 22% had not set a time limit on the effort. At the time of the survey (2001), respondents largely reported that their programs had been in place for fewer than three years and were mostly in review or initial planning stages.

Cost of Implementation

Simply put, KM is expensive (Abramson, 1999; Davenport, 1999). IDC estimated that the average KM implementation budget would increase from $632,000 in 2000 to more than $1 million in 2002. Because this survey represented a larger portion of the middle-market than past surveys, these figures were lower than previously anticipated. A similar survey conducted in 2000, in which 7% of the respondents represented the middle-market compared to 40% in this survey, estimated

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that the average budget was $2.7 million (Dyer, 2001). Expenditures in KM often include the technology and computer applications that capture documents and knowledge items electronically, the design of business processes, editing and packaging knowledge items, developing categorization schemes or taxonomies, and training employees on how to use all of the KMS components (Davenport, 1999).

However, IDC found that the budgets specifically designated for KM may have been masked as these efforts were often grouped with other corporate programs. For example, a company may have invested in a human-resources management computer application with significant KM capability but did not categorize the investment as KM.

Technology

KM implementations benefit from using integrated enterprise applications that join together business processes with databases, search engines, and data warehouses or corporate repositories of information (Stone, 1999). Industrial organizations may use enterprise resource planning (ERP) applications that offer this feature. An ERP is a complete enterprise-wide business solution that attempts to integrate all departments and functions in a company into a single computer system. "ERP systems are defined by their breadth of functionality and completeness of coverage of all key business areas for an industry" (Dmoz.org, 2002, on-line).

An ERP application generally consists of software modules for business areas such as: marketing and sales, field service, product design and development,

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production and inventory control, procurement, distribution, industrial facilities management, process design and development, manufacturing, quality, human resources, finance and accounting, and information services. These modules are usually integrated to prevent duplicate entry of information. ERP solutions are used in industries such as manufacturing, retail, banking, utilities, and education.

However, professional service organizations generally use professional services automation (PSA) applications. Professional service organizations deploy skilled people who track their time as either billable or nonbillable to client companies on a project-by-project basis (such as law and consulting firms). PSAs help those types of organizations track and manage their main commodity—that is, their people. In addition, many information technology groups in an organization are implementing PSAs to better manage their internal resources.

PSA applications blend the most important features of program/project management, customer relationship management (CRM), and enterprise resource planning (ERP) software packages. Others suggest that PSAs are the ERP for professional services organizations (PSAPortal.com, 2002). It is generally acknowledged that Aberdeen provided the first definition of a PSA (Spex, 2001):

> PSA is a suite of integrated applications designed for services-centric organizations that enables personnel across the services value chain to become more productive and profitable; those goals are attained by increasing efficiency through improved planning, increased collaboration and personnel utilization, enhanced financial management, and integrated knowledge management. (on-line)

A PSA application consists of software modules for business areas, such as: resource planning, project management, time and expenses, invoicing, knowledge

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management, supply chain, human resources, finance and accounting, and information services. As with ERPs, the various modules should be integrated either as they are purchased "off the shelf" or through customizations done by the purchasing organization. A summary distinction might be that ERPs have an internal focus—that is, on the internal operation of the company (Malhotra, 2000), while PSAs have an external focus—that is, on its customer relationships and its external work with those customers.

According to research analysts at Spex (2001), the PSA market will grow to more than $2 billion by 2004. These tools provide project management functionality and allow organizations to better forecast, manage, and allocate their workforces.

While many companies try to get as much out of existing computer applications as they can, they often need to make investments in ERP or PSA technologies (Table 7). The components these applications provide will enhance a company's ability to tie knowledge management to business processes. In addition, resources like the Internet, Intranets, and a help-desk contribute to the effective management of knowledge (Civi, 2000).

Challenges

While business executives acknowledge the strategic importance of effective KM, only a small percentage of KMSs are successful—some are modestly successful, but many are failures (Dunford, 2000). Some estimates of KM programs that fail to

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Table 7

ERP vs. PSA: Comparison at a Glance

Includes functionality related to the following:	ERP	PSA
Distribution	X	
Industrial Facilities Management	X	
Manufacturing	X	
Procurement	X	
Product Design and Development	X	
Production and Inventory Control	X	
Quality Assurance	X	
Supply Chain Management	X	
Asset Management	X	X
Finance and Accounting	X	X
Human Resources Management	X	X
Information Services Management	X	X
Marketing	X	X
Process Design and Development	X	X
Sales	X	X
Customer Relationship Management		X
Invoicing		X
Knowledge or Document Management		X
Project Management		X
Resource Allocation Planning		X
Time and Expense Management		X

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have any real impact are as high as 84% (Storey & Barnett, 2000). I provide a comparison of commonly reported challenges relating to effective KM from companies with a KM program to those without in Figure 8.

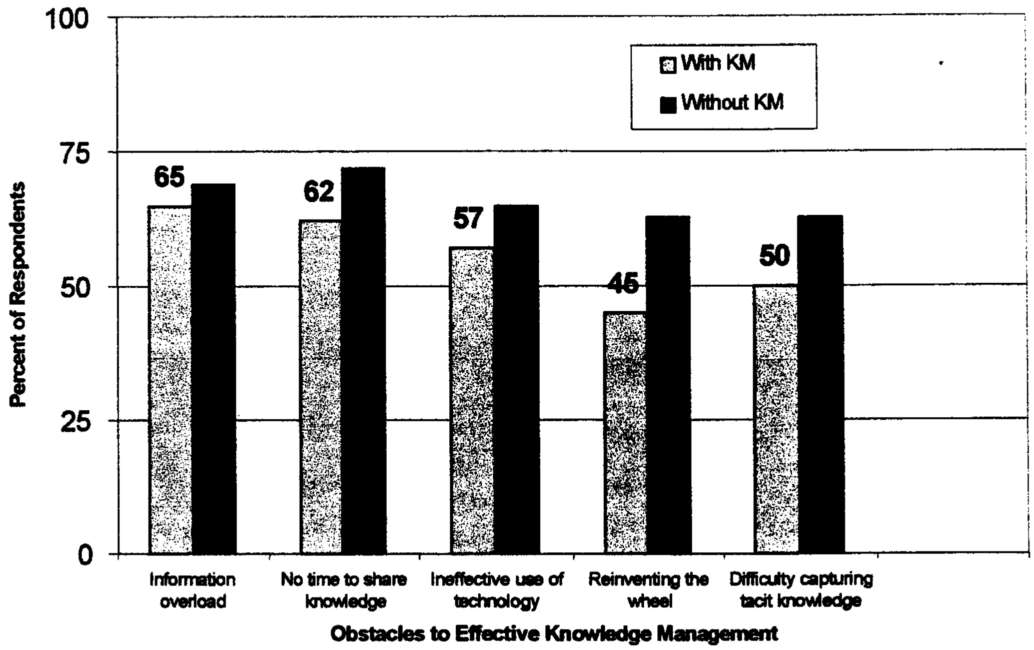

Figure 8. Comparison of Obstacles to Effective KM (Knowledge Asset Media, 2000).

Dyer (2001) found that the biggest challenge in implementing successful KM programs involves people and the culture of the organization. This is a consistent phenomenon reported across the world (Bollinger & Smith, 2001; Mullett, 2000; Storey & Barnett, 2000). Other studies have also reported that cultural challenges are often the main obstacle to implementation (Davis & Riggs, 1999; Knowledge Asset Media, 2000; Skyrme, 1997). KM will likely be unsuccessful if the organization has

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not fostered a "sharing" culture, and employees are not aware of what KM is and the benefits it offers, or do not value the effort (Mcluhan, 1999). Executives have noted that their main challenge is getting employees to share information willingly and consistently (Stone, 1999), rather than hoarding it. Similarly, the IDC reports the following specific inhibitors to success.

1. Employees do not feel they have time for KM.
2. The current culture does not encourage sharing.
3. Users do not understand KM and its benefits.
4. The company is unable to measure the financial benefits of KM programs.
5. The organization's processes are not designed to accommodate a KM initiative.
6. The company lacks incentives and rewards for sharing knowledge. (Dyer, 2001, p. 3)

Furthermore, KPMG found that 33% of 422 organizations surveyed had specified the priority of their knowledge elements, less than 33% had incentives and rewards for sharing knowledge built into their programs, and only 18% had a knowledge map indicating what information was available (Knowledge Asset Media, 2000). It appears that companies with the most difficulty obtaining success in KM view it as strictly a technology made up of things like the internet, intranets, data warehousing, document management systems, and groupware (Knowledge Asset Media), and do not include such things as a taxonomy, business processes, or incentives supporting the system.

Best Practices

Best practices in the KM industry include: (a) involving the entire organization in the KMS implementation, including information-systems or

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information-technology groups, and a cross section of the company's business units; (b) aligning KM efforts with corporate mission statements and business goals; (c) using management teams to lead these implementations; (d) the chief knowledge officer or director of information systems serving as a member of the steering committee; and (e) a senior executive sponsoring the effort with their supervision, support, and feedback (Davenport & Prusak, 1998).

It is essential that companies do not just implement a new computer application that promises to manage its knowledge, but rather view KM as a system made up of many parts. The size and specific knowledge needs of the organization will dictate which KMS elements are more important than others. However, the following are some critical system elements to consider.

1. *A taxonomy* that makes sense for the organization. There must be a unifying, organizing structure that aligns with a company's structure and core business in order to make finding the right information intuitive and less cumbersome (Davis, 2001; Lloyd, 2001a, 2001b; Morey, 1999; Ruby, 1999).

2. *A business process or processes* to integrate corporate knowledge into normal work practices which results in sharing the knowledge of one part of the organization with its other parts (Civi, 2000; Garigue, 1998; Huang et al., 1999; Skyrme, 1997).

3. *Change management strategy* to achieve the necessary cultural changes that need to take place. Effective change management tactics can include consistent internal communication emphasizing strategic importance, effective training, and

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visible executive support.

4. *A cross-functional KM steering team* made up of a sample of employees at all levels in the organization to foster buy-in and ensure a broader spectrum of knowledge needs are identified.

5. *Computer-applications with KM components* to automate searching for information and to store more knowledge in fewer places (Springsteel, 2001). These components can include any of the following: (a) databases, (b) dynamic search engines, (c) document management, (d) data mining, (e) content management, and (f) discussion boards

6. *A knowledge map* that illustrates what knowledge items are available, where within the organization's taxonomy they can be found, and the relationships among them (Davis, 2001). This provides users with an index to use to help them find particular knowledge items and helps knowledge managers maintain knowledge items. Depending on the complexity of the KMS, there may be several knowledge maps (Mullett, 2000).

7. A *glossary of common terms* (Chavez, 1997; Mullett, 2000) used throughout the organization that users can access in order to obtain clarification of terms. Some companies develop and use a KM glossary (Davenport, 1999); however, the key is for an organization to use terms related to their KMS consistently—to develop a shared vocabulary in the organization (Macintosh, 1999).

8. Build *cultural integration* by: (a) linking the KMS goal to the company's business mission statement, annual business goals and objectives (Fromm-Lewis,

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2000; Mullett, 2000), core values (McAdam & Reid, 2001); strategic plan (Weathers, 2000), reward systems, evaluation or feedback systems (Bicknell, 1999; Ledford, 1995; Pascarella, 1997) and job descriptions (Davenport, 1999); and (b) embedding knowledge sharing behaviors into key work flows and business processes (Fromm-Lewis; Mullett).

Market Providers

While the KM industry includes a host of service and technology providers, the IDC survey (Dyer, 2001) suggests that as of 2001 the market leaders for general information technology and consulting services are: Accenture, IBM Global Services, and KPMG, while Lotus and Microsoft are the leading suppliers of enterprise software. However, when it comes to PSA applications, as of 2000, Changepoint® was the market leader with Novient®, Evolve®, and Peoplesoft PSA® as other top market providers (Mitchell & Railsback, 2000).

Market Forecast

While a few skeptics have suggested that KM is just the latest buzz word in business, a fad that will not be around in another five to ten years (Loughridge, 1999; Malhotra, 1999b, 2000; Newcombe, 1999), that is not the general opinion according to a recent survey of 200 senior executives conducted by KPMG. In fact, 40% of those executives claimed to have a KM project underway (Mcluhan, 1999). A survey by the Garner Group Inc. indicates that the KM industry (both services and software)

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will grow from $13.2 billion in 1998 to $41.6 billion by the year 2003 (Stone, 1999). In fact KM is the only software market to have shown growth in 2002, estimated at $16 billion by the end of 2002 (Woods, 2003). IDC studied discrete KM programs (i.e., those that are not embedded in, or joined with, other strategic programs) and determined this segment of the market, worldwide, will increase at a compound annual growth rate of 41%, resulting in a market of over 12 billion by 2005 (Dyer, 2001). The overwhelming opinion is that KM is not a fad that will be forgotten anytime soon (Mcluhan; Skyrme, 1997; Zack, 1999)

According to the IDC's findings, in 1999, the U.S. was leading the worldwide KM market with 62% of the overall KM spending, but by 2005, it will likely reduce to 48% because other regions will spend more. The non-U.S. market includes Western Europe, Canada, Asia/Pacific, Japan, and the rest of the world (ROW). Of the non-U.S. market, Western Europe has the largest percentage of the KM market (Dyer, 2001). However, IDC anticipates that as service firms begin to "embed their KM offering in other solutions and move away from standalone KM solutions" (Dyer, 2001, p. 1), as is the trend, it will become increasingly more difficult to segregate pure KM revenue.

The KM industry is ready for growth as companies focus on retaining expertise and gaining operational efficiencies in order to increase profitability. There are software providers, consulting-service providers, and companies that specialize in both KM services and software. Service firms are those that offer services such as consulting, implementation, operation or outsourcing, maintenance, and training

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(Dyer, 2001). Table 8 compares KM services spending by category of service in 1999 with what is anticipated for 2005 (Dyer).

Table 8

Worldwide KM Services Spending by Category, 1999 and 2005 (in $M)

	1999	2005	2000-2005 CAGR* (%)
Planning (consulting)	385	2,031	27.7
Implementation	385	3,555	38.8
Operations management	265	3,301	48.3
Maintenance (support)	146	2,031	51.7
Training	146	1,777	42.8
Total	1,327	12,696	40.7

*Compound Annual Growth Rate

As the KM industry continues to evolve and grow, various market trends can be noticed. Some of these trends include: (a) increased interest from small and middle-market businesses; (b) increased demand for business cases and return-on-investment measures to justify the cost; (c) interest in peer-to-peer and wireless communication; (d) KM programs beginning as small pilot programs, then upgrading and improving over time; and (e) embedding KM into other programs as opposed to standalone KM programs—for example, as part of a customer-relationship management program (Dyer, 2001; Willis, Richards, & Hicks, 2000).

As the market reacts to reported challenges in implementation, executives are

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recognizing the importance of change-management and business-process design services (Dyer, 2001). Training will become the key to getting buy-in across the organization and getting the work force to actually use KMSs. As more companies progress from pre-implementation to maintenance, they will need help in the daily upkeep of their KM programs. The demand for performance-consulting services will increase as organizations need to modify their existing systems to adapt to the changing environment and to solve many of the problems discovered during implementation (Dyer).

The majority of companies in pre-implementation stages in 1999 will move to implementation and maintenance stages by 2005 (Dyer, 2001). Therefore, services to troubleshoot and improve existing systems will rise. According to Dyer, services that target challenges to KM programs will also be in higher demand. Those services include: (a) communities of practice, (b) leadership and user training, (c) measurement systems to measure intellectual capital, and (d) content management services.

IDC (International Data Corp.) research (Dyer, 2001; McDonough, 2000) indicates that business services (i.e., professional service organizations), such as consulting firms, are the top users of KM, followed by the communications industry (Table 9). Industries with more tangible commodities, such as manufacturing and retail, use KMSs less than do industries with knowledge workers. This difference in KM usage by industry might have to do with the types of services each industry delivers to its customers. Consulting firms compete with each other based on their

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accumulated knowledge (Dunford, 2000). These types of professional service firms use a KMS to help deliver knowledge products, such as when a consulting firm helps a client design a learning strategy for their learning and development function. This is much different than manufacturing and retail industries that use a KMS to help deliver manufactured widgets.

Table 9

Worldwide KM Services Spending Percent Share by Industry, 2000

Industry	Percent Share
Business services	23
Communications	10
Government	8
Education	6
Financial Services	5
Discrete Manufacturing	4
Process Manufacturing	4
Healthcare	3
Insurance	3
Retail	2
Transportation	1
Utilities	1
Banking	1
Wholesale	1
Chemicals	1
Other	27
Total	100

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The Benefits of the Present Study

This study is an important contribution to several fields of study in the scientific community and to practitioners of KM. First, it contributes to the fields of KM, behavior analysis, and human performance technology. It contributes to KM in that it documents a new approach to KM based on behavior systems analysis, an approach that has not yet been reported in the current KM literature base.

While half (in 1997, it was 53%) of the nation's workers are employed at companies with fewer than 500 employees (Nussbaum, 1997; Weathers, 2000), the research base for small business KMS implementations is lacking (McAdam & Reid, 2001; Weathers). This study describes designing a KMS for a company with fewer than 100 employees and less than $20 million in annual revenues, while most literature on KM reports from the perspective of large and middle-market businesses (Abramson, 1999; Mullett, 2000).

This study contributes to behavior analysis because it applies behavior systems analysis (Malott, 1974) to the design of a KMS in a real-world environment. To my knowledge, this study is the first to document an account of using behavior systems analysis in the design of a KMS. Further, it provides a behavior analytic interpretation of many KM concepts that are not apparent in the current research base. This study contributes to the field of human performance technology in that it adds to the knowledge base on applying principles of human performance (i.e., behavior and its accomplishment) and, more specifically, human performance systems as they relate to KMSs.

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Furthermore, this research contributes to KM practitioners in that it provides a general plan, and recommendations for design and implementation using an approach to KM that practitioners can use in creating KMSs for small businesses. KM as an industry is growing and the costs of services are increasing. Small business owners may value an approach that is simple enough for them to undertake in-house, yet impacts performance, and one that is cost-effective but scalable to grow with the business.

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CHAPTER VI

METHOD

This chapter describes how Triad designed its KMS, and begins with a description of Triad, the industry in which it interacts, and the services it provides. This chapter further provides a description of the KMS users, the timing and cost of the study, its purpose, critical elements of the system, and the procedure that was followed. The procedure is presented differently than most experimental or controlled studies in that it is described in terms of the six phases of behavior systems analysis, which are: (1) analyzing the variables that affect the design and operation of the system, (2) specifying the objectives to be accomplished by that system, (3) designing and developing the system to accomplish those objectives, (4) implementing that design, (5) evaluating the extent to which the implemented design accomplished the specified objectives, and (6) recycling through the previous five phases until objectives are met (Malott, 1974).

The Setting

The Organization

Triad provides learning and performance-support related services. Triad is a Michigan S corporation with two owners, each having a 50% share. There are three

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people on the board of directors.

Size

At the beginning of the first intervention (e.g., business-process standardization), Triad was approaching 100 employees with annual revenues over $11 million. Triad had sustained a 47% average annual growth rate over five consecutive years. Triad had four area offices in the Midwest, one of which was located with its corporate headquarters in Farmington Hills, Michigan. It was anticipated that the growth rate would continue. However, due to the economic downturn midway through the project, Triad had decreased in size to approximately 45 employees. Furthermore, by the post-implementation survey Triad had reduced the number of its employees to 31.

Every company is engaged in KM in some form or another (Myers, 1999) and every company can benefit from taking a systems approach to their KM (or implementing a KMS), even if there is just one person in that company. The sophistication of a KMS should be appropriate to the size and complexity of the company. A KMS as elaborate as the one Triad implemented would not be cost effective for a company as small as Triad had become by the conclusion of this study. However, anticipating that the economy would recover and that Triad would resume its growth, the investment was thought to prove worthwhile ultimately. In fact, Triad had resumed hiring employees during the writing of this manuscript.

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Industry

Triad operates in the employer-provided training industry. More specifically, Triad's work falls within the custom training segment of this industry. At the beginning of this study, the employer-provided industry was valued at $56.8 billion and the custom-training segment was valued at $6.1 billion annually (Galvin, 2002). By the conclusion of this study, the employer-provided industry was valued at $54.2 billion and the custom-training segment was valued at $3.3 billion annually (Galvin, 2002).

Service Lines

Triad provides two lines of service focused on helping learning and development groups achieve measurable business results for their organizations and their internal customers. The first service line, Learning Strategies, delivers big-picture learning and performance plans and strategies, such as: learning and electronic-learning strategies, curriculum architectures, and evaluation methodologies. Triad develops these plans and strategies with its clients' training groups. Triad's goal is to enable training groups to contribute more effectively to the business results of their own companies. The second service line, Learning Solutions, delivers tangible, custom materials and products. Triad designs and develops these materials and products to strengthen various performance variables (such as information, tools, incentives, knowledge, and skills) its clients' employees need to use more effectively, such as: instructor-led, Web-based and CD-Rom-based training courses, job aids and

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reference manuals, and measurement and feedback systems.

The KMS Users

The KMS intervention was targeted at all Triad employees with an emphasis on executive leaders, project managers, account managers, and sales representatives. This user description portrays the 45 employees Triad had employed mid-way through the project. The majority of Triad employees held graduate degrees in education, instructional design, or in behavior analysis. There were 2 employees with doctorate degrees, 29 with Masters' degrees, 7 with Bachelor's degrees, and 5 with either Associate-level degrees or high-school education.

Employees' experience with learning and performance-support ranged from 3 to 37 years. There were 19 males and 23 females including 8 males and 5 females with managerial or executive positions. The age of Triad employees ranged from 23 to 60 years.

Project Background

In the Year 2000 Triad Business Plan (Triad, 2000), the director of services and technology was charged with the following internal improvements:

> 1. Define, develop, and implement reproducible processes and tools to support Triad's service lines.
> 2. Research and determine the appropriate software tools, then show Triad people how to use them in the most efficient and effective manner.
> 3. Design Triad's integrated performance support system on-line environment to capture a wide range of resources, such as processes, applications, information, and advice that support Triad people's best work. (pp. 8-9)

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Before this KMS, Triad had a less elaborate system to manage corporate documents (they were not specifically referred to as knowledge items), such as policies, checklists, and job aids. It was a Microsoft Access database that Triad people called their *databank* (hereafter referred to as the old databank).

In the year 2000, Triad was continuing a trend of rapid growth, serving more clients, and, in turn, hiring more people. Due to the increase in work and a shortage of employees, it was more important than ever to train new people quickly. In keeping with the year 2000 business goal, achieving the targeted growth rate of 25%, and keeping the cost of labor to less than 55% of revenue, it was essential that Triad: (a) develop new staff quickly, (b) provide ways to assist staff with developing their skills as they perform work, (c) provide standard work processes and tools to do work more efficiently, and (d) provide a central place to store and find information relevant to project work.

To meet these needs, Triad decided to build an integrated performance support system (IPSS). An IPSS is a grouping of integrated resources supporting work across the organization as it is being done (e.g., in real time). This system was to include an Intranet site, database with search capabilities, applications to automate different business processes, and a KMS which was to be fully integrated into and across the organization (Figure 9). The IPSS was to accomplish the following objectives (Triad, 2000, pp. 8-9):

- Improve individual and organizational performance
- Support key initiatives and Triad's growth
- Reflect cohesion amongst all services and product offerings by:

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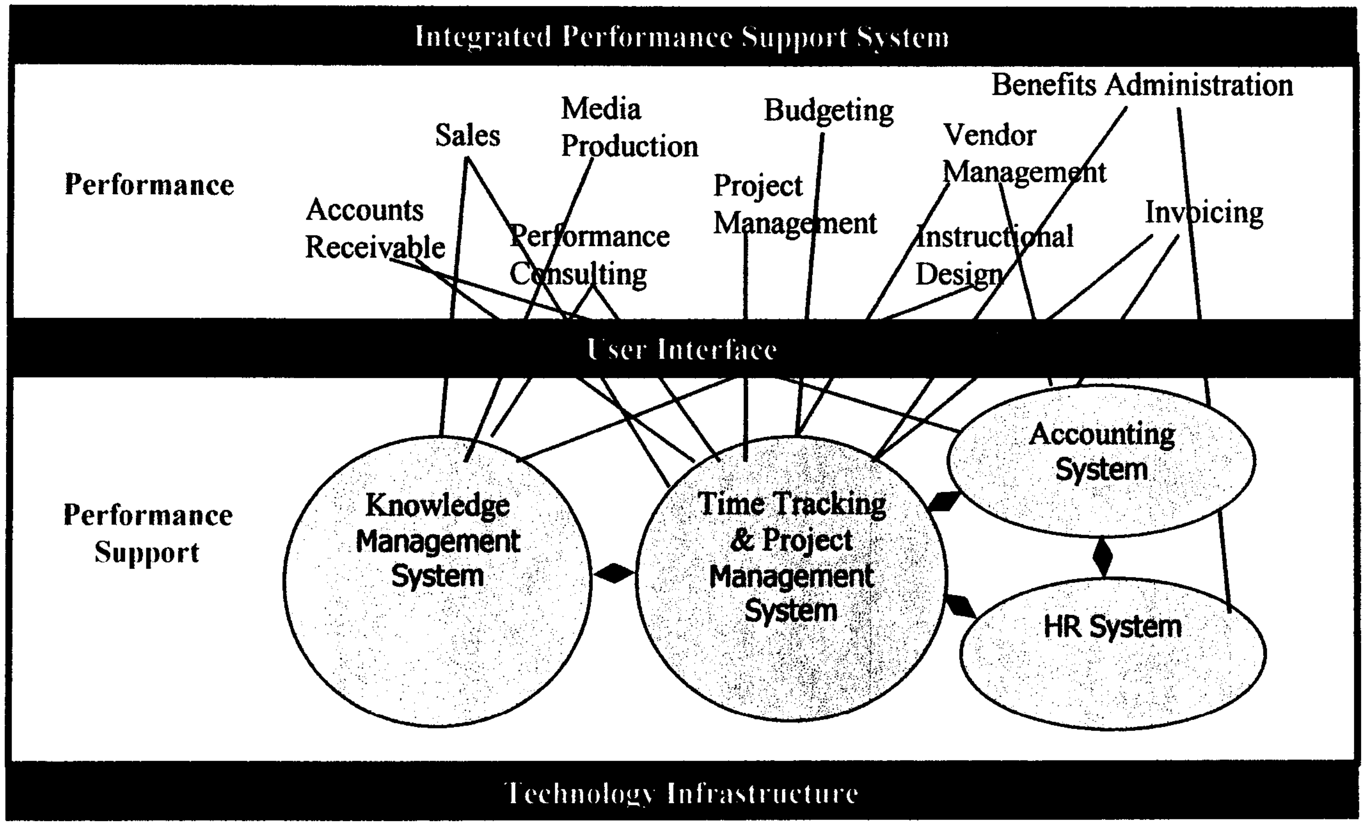

Figure 9. Illustration of Triad's Preliminary Plans for an Integrated Performance-Support System (IPSS).

- Sharing knowledge and best practices
- Recognizing areas of expertise
- Fostering ownership of continuous improvements made to processes and tools
- Providing a mechanism for coaching, mentoring and development activities
- Providing links to known external expertise

Triad began by standardizing its key business processes (business-process standardization intervention). Once those key business processes were defined and standardized, Triad was ready to build or buy separate computer applications and integrate them in order to automate each of its business processes, and the company began looking at the options available. However, professional services automation (PSA) applications had just emerged as a new product in the technology field. A PSA would include many of the features in one application that Triad's leaders had thought they would have to build or buy in several applications, design separately, and then integrate. Therefore, Triad purchased one of these PSA, database-driven applications—Changepoint®, an accounting package, and integrated them in order to automate and integrate its key business processes. The only element left to design from the original IPSS vision was a KMS, which could be designed using Changepoint's KM component. Therefore, Triad's leaders decided to dedicate a small team of employees to build its KMS using the KM component available in the Changepoint application.

Project Purpose

Therefore, the purpose of the KM initiative was to design a KMS that was of

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reasonable complexity and sophistication given Triad's reduced size and the declining economy but that was capable of being *upgraded* when Triad's growth resumed. The new vision was to provide Triad people with an on-line environment that supported their work through a wide range of resources, such as methods, tools, and information. Therefore, the Year-2002 Business Plan (Triad, 2002) committed the organization's resources to KM in the following strategic initiative: "Design and implement a KMS to improve Triad's operational efficiency and effectiveness" (p. 8).

Duration and Cost of Implementation

Timing

As stated earlier, the KMS (the independent variable) was part of an intervention package made up of three performance-improvement interventions: (1) business-process standardization, (2) business-process automation, and (3) the knowledge management system. The first two interventions were planned to occur whether or not Triad implemented a KMS, and were not considered key elements of this study. However, the analysis phase occurred with the first intervention (Figure 10).

The first phase, the Analysis, began in February of 2000 and the fourth phase, Implementation, occurred in March of 2002. Triad conducted several analyses as part of the Analysis phase (of the behavior systems analysis approach), which began before the business-process-standardization intervention. Next, Triad automated its key business processes with the Changepoint PSA (professional services automation)

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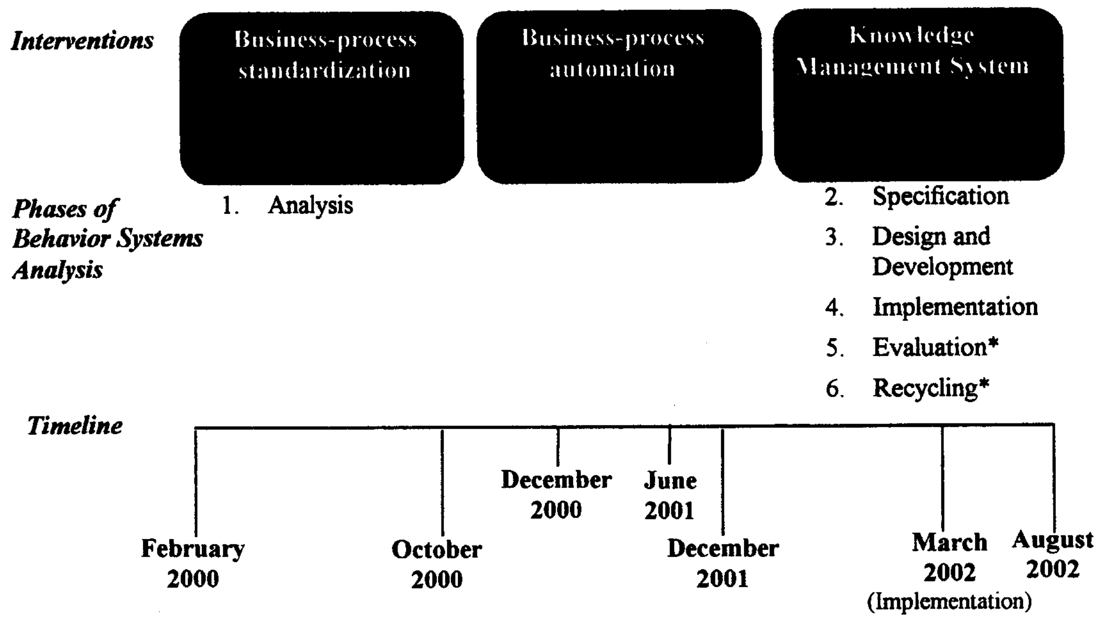

Figure 10. Timing of Triad's Three Interventions and the Six Phases of Behavior Systems Analysis Used for the KMS.

(* All phases are iterative and the evaluation and recycling phases were never actually completed, but this study ended in August of 2002.)

application, and integrated it with an accounting application. When the KMS intervention began, Triad conducted the second phase, the specification phase.

Cost

The first two interventions, the business-process standardization and the business-process automation, were not undertaken as a means to implementing the KMS and therefore the costs were not used in the return-on-investment calculations provided in the Results and Discussion section. However, both of these interventions

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were necessary in order for Triad to have the kind of rigorous, performance-based KMS that the core and design teams designed. In addition, the Analysis phase was conducted at the start of the business-process standardization intervention. Therefore, the costs of each of the three interventions are provided (Table 10).

The business-process standardization intervention cost Triad $200,982. The costs break down was as follows: 19 Triad people spent 2,068 hours over eight months at cost rates between $24 and $85 an hour resulting in $82,720, and $116,262 was paid to external consultants. It is estimated that the analyses that contributed to the KMS intervention accounted for 20% of the cost of the first intervention, or $40,196.

The business-process automation intervention cost Triad $405, 611. The costs break down was as follows: 11 Triad people spent approximately 1,852 hours over six months at cost rates between $24 and $85 an hour resulting in $83,340; $90,155 was spent on software, license fees and computer-infrastructure upgrade costs; and $232,116 was spent on consulting services and working meals.

Table 10

The Cost of Each Intervention

Intervention	Cost
Business-process standardization	$200,982
Business-process automation	$405,611
Knowledge Management System	$37,155 (+$40,196 from Business-process standardization, or a total of $77,351)

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The KMS intervention cost Triad an additional $37,155. The costs break down was as follows: 11 Triad people spent approximately 630 hours over 3 months at cost rates between $0 and $85 an hour resulting in $37,155. In addition, it is estimated that the relevant parts of the Analysis phase cost Triad $40,196, which Triad had already paid for with the business-process standardization intervention. Therefore, including the analysis costs the total investment in the KMS intervention was $77,351. The evaluation for this study was conducted without cost to Triad and the recycle phase will be an on-going cost to Triad embedded in its other operational costs.

Governance

Pre-Implementation

The Analysis phase was completed using a core team including an external consultant, a cross-functional design team, a review team and an executive sponsor (Table 11). Specification through Implementation was conducted using a core team and three design teams (Table 11). The core team consisted of four people including an executive sponsor. There were three cross-functional design teams, one each for (1) knowledge related to the client engagement process, (2) knowledge related to corporate services, and (3) information in the form of data-driven reports.

Post-Implementation

Triad decided to dedicate people to managing the KM business process instead

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Table 11

Pre-Implementation Roles and Responsibilities

Phase	Team	Responsibility
Analysis	Core Team	• Conducted a systems analysis of the organization (resulting in a super system map) • Conducted the performance-support inventory • Defined an "is" process for each area office • Created a blended "is" process • Managed design teams
	Design Team	• Identified disconnects in the blended "is" process • Drafted the "should" process
	Review Team	• Specified process specifications • Reviewed and finalized the "should" process
	Executive Sponsor	• Provided guidance, support and feedback
Specification through implementation	Core Team	• Specified KMS goal and objectives • Designed the taxonomy • Managed design teams • Populated the KMS with knowledge items
	Design Team #1	• Reviewed reporting needs and developed custom reports to meet those needs
	Design Team #2	• Identified PSMs connected to the core business process
	Design Team #3	• Identified PSMs connected to management and support processes

of designating different groups to manage different clusters of knowledge. To do this, Triad created three roles to manage the KMS after implementation: (1) KM Administrator, (2) Steering Team, and (3) Advisory Team. These roles and their

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primary responsibilities are shown in Table 12.

Procedure

Phase 1: Analysis

The analysis was conducted before the business-process standardization or business-process automation interventions began and included conducting a performance analysis in which Triad was defined as a human performance system, a

Table 12

Post-Implementation Roles and Responsibilities

Role	Responsibility
1. KM Administrator	• Maintain knowledge base (add, delete and change as necessary) • Ensure knowledge items remain relevant, usable, and accurate • Conduct an annual system evaluation • Participate in the KM steering team
2. Steering Team	• Monitor system performance • Approve of changes in the KMS scope, design, development, and use • Assess data needs and identify PSMs that people can use to acquire those data, and reports that need to be developed to disseminate those data to the right people. • Oversee an annual system evaluation process.
3. Advisory Team	• Provide user input into the on-going design and development of the KMS • Provide ad hoc input • Participate in an annual system evaluation process

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cause analysis, a business-process analysis, a performance support inventory, and an information-systems-infrastructure analysis.

Performance Analysis

We started by conducting an organizational analysis[10]. For the organizational analysis, we used Brethower's total-performance-system model (1982) and Rummler and Brache's super-system model (1995) to define Triad as a human performance system and to identify the relationships among the parts in the system (Figure 11). Next, we conducted interviews with a sample of people within Triad, including executive leaders. We used the information obtained in these interviews to define Triad's core business process (e.g., finding and fulfilling billable work) at a macro level (Figure 12). The purpose of defining this macro process was to identify the big elements concerning how work was generally being done and how those elements related to one another. The issues discussed among the team members while defining the Triad super system and its core-business macro process confirmed what executive leaders suspected to be the performance gaps. The performance gaps were: (a) inconsistencies in the way Triad people were finding and fulfilling work and in other support processes, and (b) that it was hard to be consistent because there was not a common language.

The disparity in the way people worked on projects made it extremely difficult

[10] An organizational analysis is part of conducting a performance analysis according to the HPT model of systems analysis.

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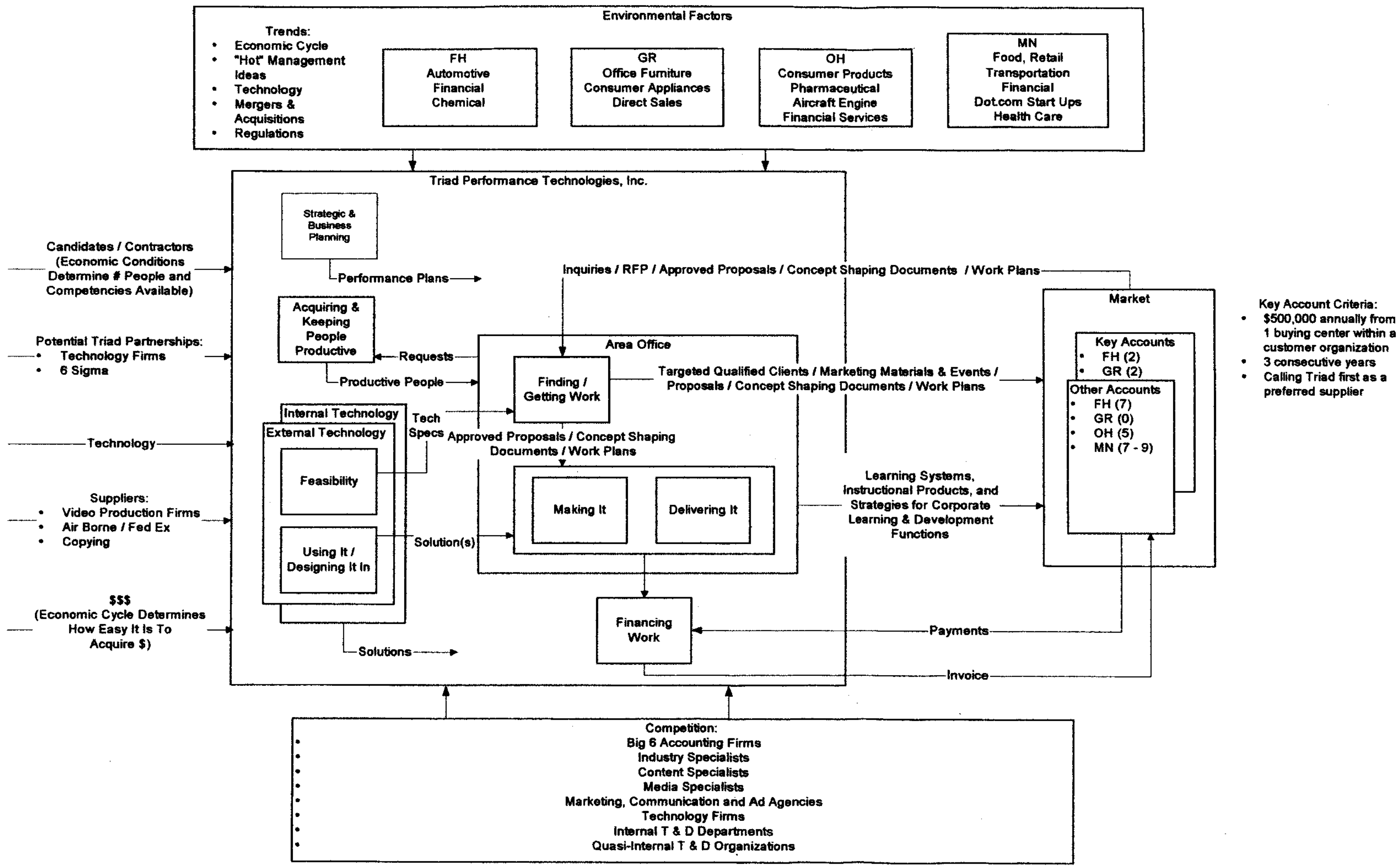

Figure 11. A Super System Map of Triad.

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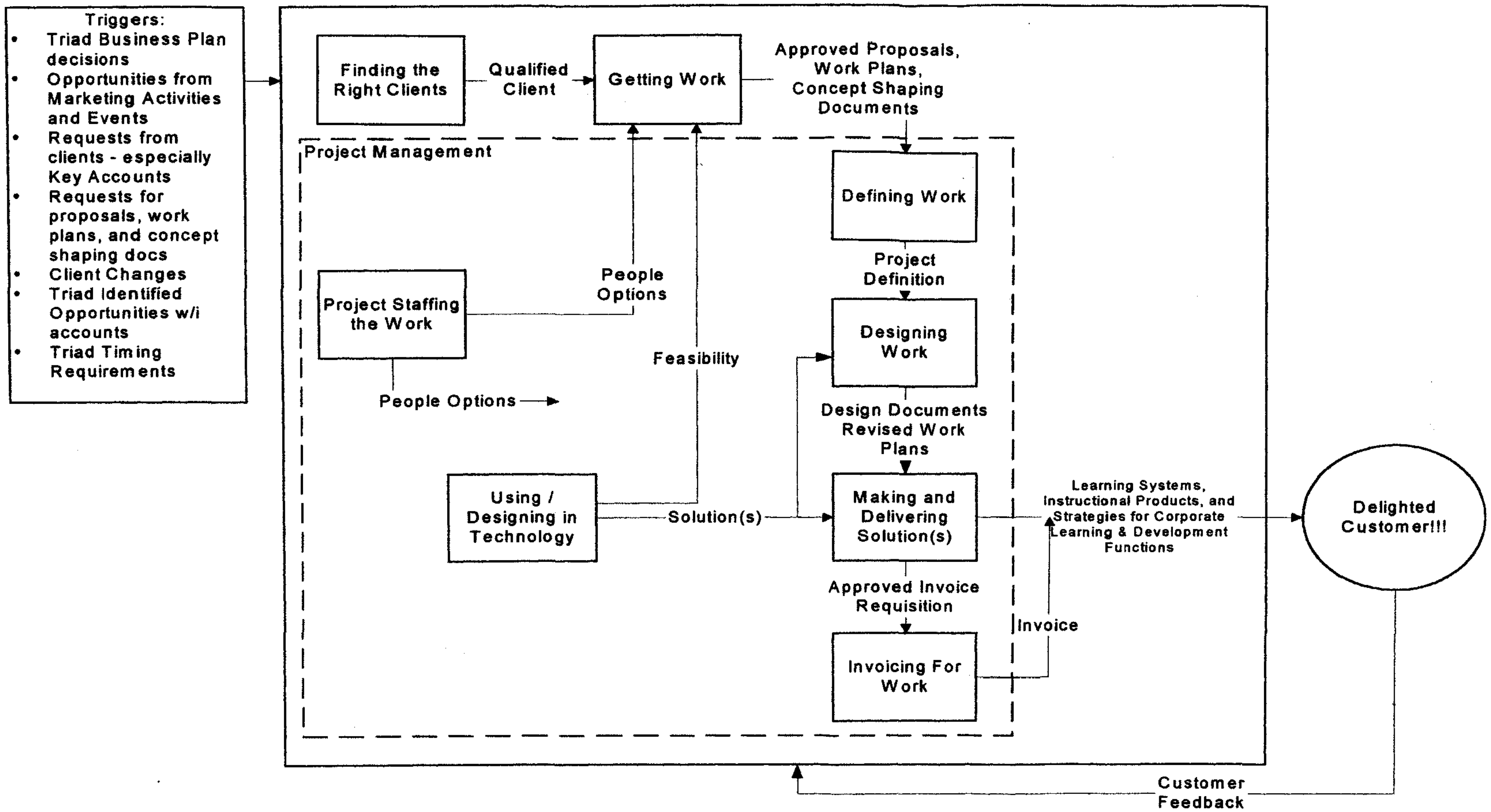

Figure 12. Triad's Core Business Process Relationship Map (or Macro Process).

for employees to discuss the business in a way that was consistently clear to everyone. In essence, not everyone was speaking the same language. For example, one term meant one thing to one group of people and it meant something different to another group of people. Therefore, not only were people not finding and fulfilling work in the same way, they were not talking the same way about the work they had to fulfill. Speaking and doing work consistently is critical in order for people to be able to effectively troubleshoot problems and make improvement decisions. For example, if a project was not profitable, isolating the problem was nearly impossible because everyone was doing work differently.

Cause Analysis

The cause analysis consisted of using Gilbert's BEM to systematically identify potential factors that could have contributed to these performance gaps (e.g., inconsistency in doing work and in talking about it). In order to do this, we involved a group of Triad people representative of various positions and departments in the company in a think tank. Given the performance gaps, the group discussed each performance variable and identified potential contributing problems. In addition, the group identified several potential interventions[11] that might close the performance gaps (Table 13).

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[11] Triad eventually implemented all of the potential interventions listed in Table 11.

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Table 13

Cause Analysis: Problems and Potential Interventions

Problems	Potential Interventions
Data	
• No clear or consistent expectations for doing project work • Each area office has developed their own language	• Standardize the core business process across area offices • Define an invoicing process • Define an expense-reporting process • Define key terms used in Triad (create a common language)
Instruments	
• Insufficient tools available to support work performance • Business processes were not integrated across functions which affects operational efficiency (for example, it usually took an average of 42 days to send an invoice once it had been created) • Inefficient project management application (too slow for the size of Triad) • Inefficient time tracking application (too slow for the size of Triad)	• Conduct an inventory of current performance support available • Assess performance support available and determine what needs to be discarded, updated and if any new ones needed to be created • Implement an application to automate managing projects, invoicing, time tracking and accounting
Incentives	
• Top performers are not consistently recognized for their contribution	• Implement a performance-based incentive system
Individual Knowledge	
• Project managers are not knowledgeable about best practices for managing projects • Some project managers lack the skills necessary to manage projects effectively	• Provide in-services for project managers to develop their skills and knowledge • Use a better project management application that does a better job of guiding project managers' behavior
Individual Capacity	
• No deficiencies noted	• No intervention necessary
Motivation	
• No deficiencies noted	• No intervention necessary

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Performance-Support Inventory

Brett (2001) of the Frontline Group points to the importance of conducting a performance-support inventory (also referred to as a knowledge audit) of an organization's codified knowledge before trying to manage it. This allows the company to understand what information already exists in the organization, who uses it, and when and how they use it (Rapport, 2001). In addition, identifying the knowledge that a company has at the beginning of the project allows the design team to build on what the company already has as opposed to starting with nothing (Frappaolo & Koulopoulos, 1999). Conducting an inventory may also result in identifying knowledge inconsistencies and knowledge needs (Mullett, 2000).

Therefore, to assess the performance support Triad had in place and the extent to which there were inconsistencies in that performance support, we conducted an inventory of the following types of items.

- Document
- Database
- Facilitated Delivery
- Electronic Media
- Physical Object
- System
- Software
- Hardware
- Privilege
- Binder
- Other (not documented)

While identifying each item, we classified them into one of the following subtypes:

- Template
- Sample
- Flow Chart
- Job Aid
- Activity Description
- Graphic
- List
- Form

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- Spreadsheet
- Report
- Procedure
- Manual
- Table
- PowerPoint Presentation
- Process Map
- N/A
- Interactive Program (e.g., computer application)

We found 277 items that supported performance in some way. However, this number included standard computer applications and incentive programs, for example. Excluding these types of things, we termed the remaining items performance-support mechanisms (PSMs). We reached the following conclusions based on the analysis of the inventory:

1. Different operational definitions were being used across groups for items, such as *process* and *template*.

2. Different processes and tools were used to support the same or similar performance or to achieve the same accomplishment across different groups (e.g., Invoicing and ISD Methodology Processes, work plans and proposals).

3. Some PSMs available for corporate-wide use (in the Triad databank) were not labeled with a name, although descriptions existed for their use.

4. No standards or common format existed regarding documentation of such things as processes, proposals, etc.

5. There seems to be a hierarchical relationship from systems to processes to performance support mechanisms.

Based on these conclusions, we made the following recommendations to the executive leaders:

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1. Specify operational definitions for various mechanisms (e.g., systems, processes, and supporting tools), criteria for their documentation, and develop documentation standards.

2. Label all mechanisms with a name and an accompanying objective statement so that similarities, redundancies, and differentiations can be identified.

3. Decrease the proliferation of unnecessary duplications and idiosyncratic PSMs and increase the number of standardized PSMs that could be used by everyone.

Business Processes Analysis

Rummler and Brache (1995) separate business processes into core, primary, support, and management processes. Malott (2003) separates business processes into core, support, and integrating processes. At Triad, the business-process standardization core team defined a core business process as the one process most critical for Triad's survival. If there are problems with a core business process, the organization will suffer because there would be no money to run the organization. Outputs of a core business process provide the financial support to the rest of the organization. In addition, we defined support processes as those processes that contribute to the organization's various operations and the success of the core business process.

The purpose of the business-processes analysis was to: (a) define Triad's current core business process and, in doing so, to identify the specific inconsistencies surrounding the way Triad people were finding and fulfilling work (one of the

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performance gaps) and to identify the specific problems (e.g., disconnects) that caused that gap; and (b) to define several key support processes.

A team was commissioned to define the then current "is-process" for finding and fulfilling work (the core business process). Using the relationship map as the starting point, an is-analysis was conducted for each area office. Next, we identified all of the system disconnects[12]. For each disconnect, we specified the following: (a) the performance variable in which the disconnect should be classified according to Gilbert's BEM, (b) the process steps in the is-process affected, (c) whether the disconnect's primary effect was at the individual-, process- or organizational-level, (d) which Triad roles should be responsible for approving a solution, and (e) the effect on Triad's business results.

Fifty disconnects were identified (Appendix B) relating to the client engagement process (e.g., finding and fulfilling work and not the sales or recruiting processes for example). All of the disconnects except for one were related to an environmental-support variable, according to Gilbert's BEM (1996). Of the disconnects related to environmental support variables, 68% related to the instrumentation supporting performance (Figure 13).

We divided "instrumentation" into three subcategories in order to identify the type of instrumentation affecting performance. Figure 14 shows that 9% were related to Triad's infrastructure, 42% related to KM practices, and 49% related to business

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[12] "A disconnect is anything that impedes the effectiveness or efficiency of a process" (Rummler & Brache, 1995, p. 119). According to Rummler and Brache, a disconnect can be an input, process step, or an output that is missing, unnecessary, misplaced, redundant, done by the wrong resources, not executed well or at the right time, etc.

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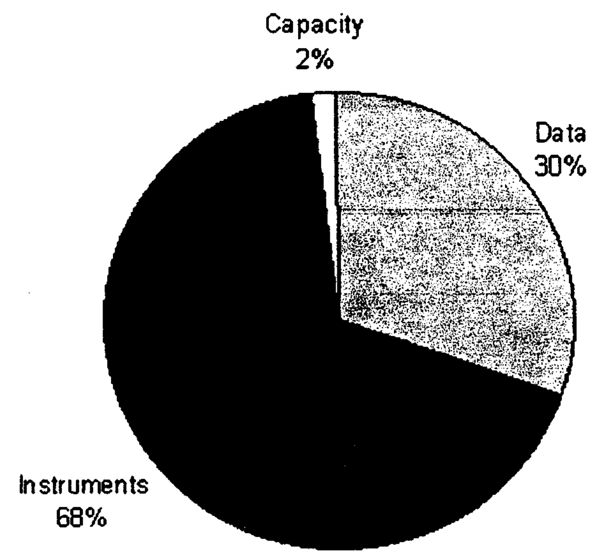

Figure 13. Distribution of System Disconnects Across the Three Environmental Performance Variables in Gilbert's BEM (Gilbert, 1996).

process issues.

We summarized these fifty disconnects into the following five issues, which were presented to Triad's executive leaders before continuing to the design phase:

1. It was unclear under which conditions area offices could and should deviate from targeting key accounts[13].

2. There were no clear procedures for selecting projects of the appropriate size and scope for Triad's personnel and technology capacity.

3. Triad people defined projects differently, which caused problems transitioning from finding work to fulfilling work.

[13] Triad defines a key account as client organizations with at least $1 billion in annual revenues and three years of consecutive work of at least $500 thousand.

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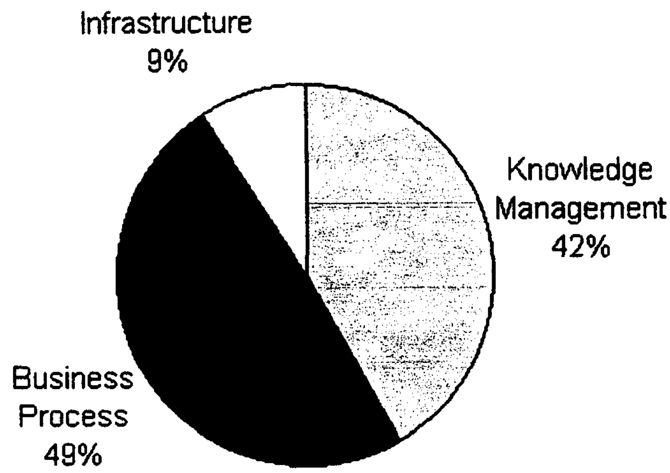

Figure 14. Disconnects Related to Instrumentation Classified Into Three Subcategories.

4. The following technology concerns: (a) insufficient and unstable infrastructure capable of supporting current and future work loads, and (b) no clear rules about when and how to integrate technology effectively into projects.

5. It was difficult to staff projects because it was not easy to find the right resources (Triad people and freelancers).

After identifying and summarizing the process disconnects, and presenting the main issues to Triad's executive leaders, we met with the executive leaders so that they could articulate characteristics they wanted the should-process to have. These characteristics and the system disconnects provided the necessary input for us to design a standard core business process for finding and fulfilling work (which became known as the *client engagement process*). Although the should-process that was designed is beyond the scope of this manuscript, the process disconnects were

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considered when designing the KMS. Only the should-analysis was done with the support processes (such as invoicing, recruitment and selection, partnering of performance [360-degree feedback], and an expense-reporting) and the groups responsible for them, specifically Human Resources and Accounting.

Information-Systems Infrastructure Analysis[14]

Finally, Triad had an assessment done of its computer hardware and software to assess Triad's technology capacity. An organization's technological infrastructure is the base or platform on which knowledge management solutions are built. It consists of the populations and management of the repositories of knowledge items (McDonough, 2000). The assessment covered: (a) local area network (LAN) and wide area network (WAN) bandwidth utilization, (b) error rates, (c) its cable plant, (d) the load on system and mail servers, (e) remote access, and (f) software and hardware configurations.

To summarize Triad's information systems infrastructure, Triad maintained a three-site LAN/WAN network headquartered in Farmington Hills, Michigan with a remote network in Grand Rapids, Michigan. The remote site was connected back to Farmington Hills via a DS1 leased line with digital circuits. Cisco for 29xx series 10/100 switches and Cisco 26xx series routers provided network connectivity. Triad also employed the Watchguard Firebox II security appliance for Internet security. Windows NT Server 4.0 was the network operating system used with Microsoft

[14] Information systems infrastructure refers to Triad's computer hardware and software, and the relationships between them.

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Exchange Server as the E-Mail handling system.

The assessment concluded that Triad's technical infrastructure was well built and there were no performance problems to interfere with implementing enterprise-wide applications to automate business processes.

For a summary of the steps involved in the Analysis phase, see Figure 15.

Phase 2: Specification

After both the business-process standardization and business-process automation interventions were successfully implemented, we continued on to the Specification phase. We specified the KMS goal, objectives, the constraints that needed to be considered during the design, the strategic approach and the scope (Figure 16).

Strategic Approach

We asked executive leaders what kind of strategic approach they wished to take toward managing knowledge. Triad decided to lean toward the personalization approach. This meant that Triad would not to attempt to support tacit knowledge needs[15] in its knowledge base. Triad's position was that people could add context and meaning to information that could be easily codified and it would not be cost-

[15] I define a knowledge need as n opportunity to support performance through the provision of data and/or information

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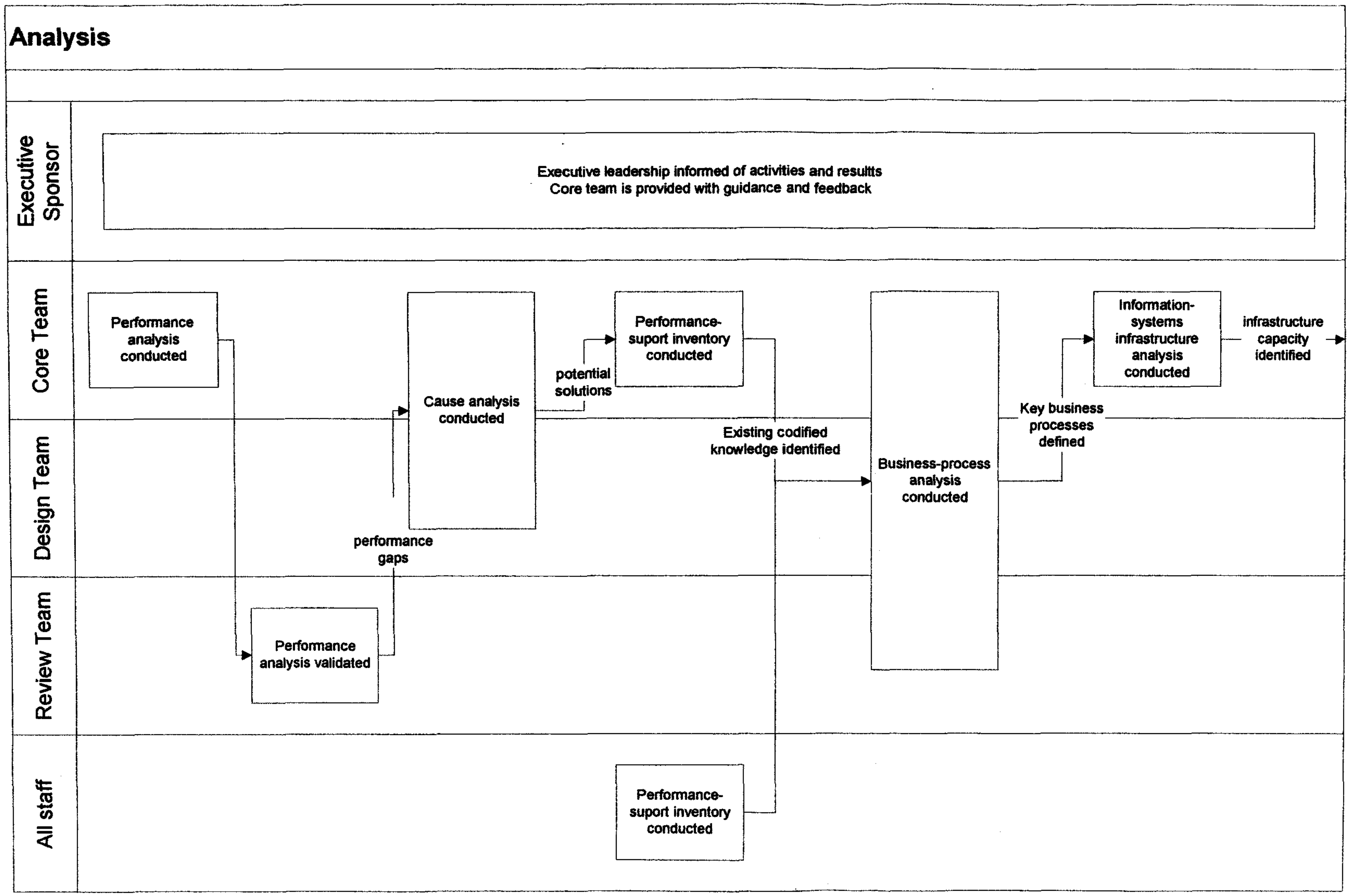

Figure 15. Cross-functional Process Map of the Analysis Phase.

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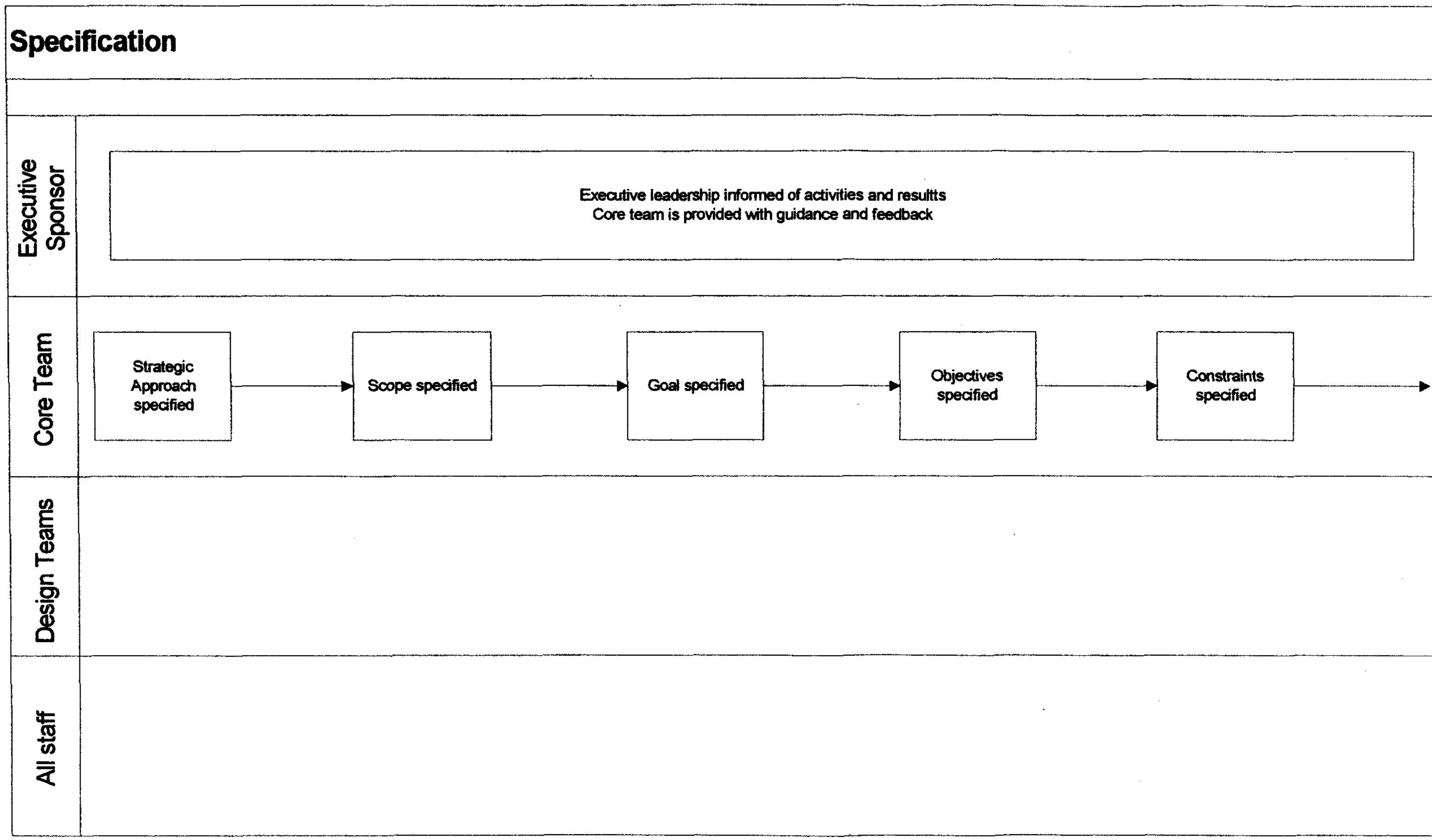

Figure 16. Cross-functional Process Map of the Specification Phase.

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effective to try to make that knowledge explicit. However, traditional elements of personalized approaches, such as communities of practice, were not attempted. Instead, only knowledge that could be easily codified was included and tacit knowledge would continue to be shared through informal mentoring and collaborating.

Scope

Knowledge management systems for larger corporations, such as Fortune 500 companies, are usually quite complex and contain a wide range of types of knowledge needs. For example, a company with offices in other countries and thousands of employees might design their knowledge system to include discussion boards, communities of practice, and external resources from the Internet. These types of components are appropriate for their knowledge-transfer needs.

In addition, some organizations design KMSs to support external knowledge seekers as well as the company's internal knowledge seekers. For example, Butterball developed an elaborate KMS designed to assist its group of employees in answering the more than 200,000 consumer calls a year regarding such things as selecting the right size turkey, how to thaw a frozen turkey, etc. (Tobin, 1998). If the knowledge seekers are external to the company (such as consumer callers or suppliers), there are aspects of the KMS design (such as the taxonomy) that should consider the external knowledge seekers.

However, Triad's KMS did not have to be designed to support external

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knowledge seekers; therefore, we decided to start specific in scope with the caveat that the KMS should be designed to grow with Triad when it begins to grow again. Using Brethower's total performance system and viewing each Triad person as a mini-processing system, we made a distinction between PSMs—inputs that support each individual's performance and work products—and the specific process outputs Triad people produce. After making this distinction between knowledge items, we decided the KMS should provide access to all work products connected to billable and non-billable client-project work but not to corporate or internal work.

Goal

Clear goals and objectives help give design team members guidance regarding what kind of knowledge to include in the system (Civi, 2000). Therefore, our team defined a KMS's over-arching goal and supporting measurable objectives. A KMS should provide knowledge items users will use and provide them in a way that users can retrieve them easily when they need them. Therefore, we reviewed the needs that surfaced from these organizational analyses, and considered Triad's mission statement and current strategic initiatives before formulating the following KMS goal:

> To provide a robust system of performance support for Triad people in an on-line environment that can be accessed as work is being done and is scalable to evolve as Triad grows, thus, creating operational efficiencies and developing industry-leading innovative processes, methods and tools for Triad.

Objectives

To support the accomplishment of this goal, we identified enabling, discrete,

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measurable objectives. It is important to get agreement on any system's objectives as they are used to guide the selection of measures to evaluate success. In essence, we identified the following objectives[16]:

1. To re-use explicit knowledge (PSMs and work products) throughout Triad. For example, to re-use the format of one work plan on subsequent work plans.

2. To identify the performance-support needs of Triad people. For example, to identify when people could benefit from a job aid designed to help them do something correctly.

3. To identify existing explicit knowledge items (PSMs and work products) that could meet those needs. For example, to identify a checklist that one account-team is currently using that could be reused by everyone or to identify a work product that should be genericized into a PSM.

4. To store and organize knowledge items (PSMs and work products) so that employees can easily find them. That is, people generally find what they are looking for without much effort.

5. To embed clear expectations for work products into PSMs so that individual performance meets Triad's standards. For example, to create a template for writing a work plan that has all of the sections that Triad expects to be in it.

6. To provide performance support (PSMs) to help employees become proficient in their job roles. For example, to provide process maps and checklists that Triad people can use to ensure they are doing the work the way it is supposed to be

[16] The objectives have been reworded without jargon for the purpose of this study.

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done.

7. To make explicit the connection between PSMs and Triad's core business process and business goals. That is, to make it clear where a PSM relates to the client engagement process and to make it clear how the output supported by the PSM affects Triad's business goals.

8. To foster a culture where Triad people develop and share new ideas for PSMs. That is, to encourage and reward Triad people for participating in the KMS by contributing to its improvement.

Constraints

Before we could begin to design the system, we needed to identify constraints on the design and development (for example, was there a budget to use external resources?), and on implementation (for example, what types of computer software would Triad's hardware accommodate?). Table 14 lists the constraints we identified before entering into the Design phase of the procedure.

Phase 3: Design and Development

Next, we designed the infrastructure and the taxonomy, identified the knowledge items to be included for initial implementation, and designed the KM business process, cultural-integration elements, and the implementation strategy.

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Table 14

KMS Constraints

Impact	Constraint
1. Design	• Designed and developed by internal resources • Designed to adapt to change and "scale up" when Triad resumed growth • Based on using current Triad-owned computer hardware and software
2. Development	• Developed by internal resources without interruption to billable work • Similar look and format across knowledge items
3. Implementation	• Easy to implement; not requiring time-intensive training

Infrastructure

We had to determine how users would access knowledge items and where knowledge items would be stored which involved defining how various computer hardware and software elements would be used and how they would relate to each other. The business-process automation application that Triad implemented, Changepoint®, included a KM component. A KM computer application builds on the KM infrastructure to provide individual and group access to the knowledge base. The KM computer application consists of an interface, search functionality, and an information portal to a database in which some knowledge items are stored. We decided to use this application as the primary KMS interface (Figure 17) for users in searching for and retrieving knowledge items (both PSMs and work products).

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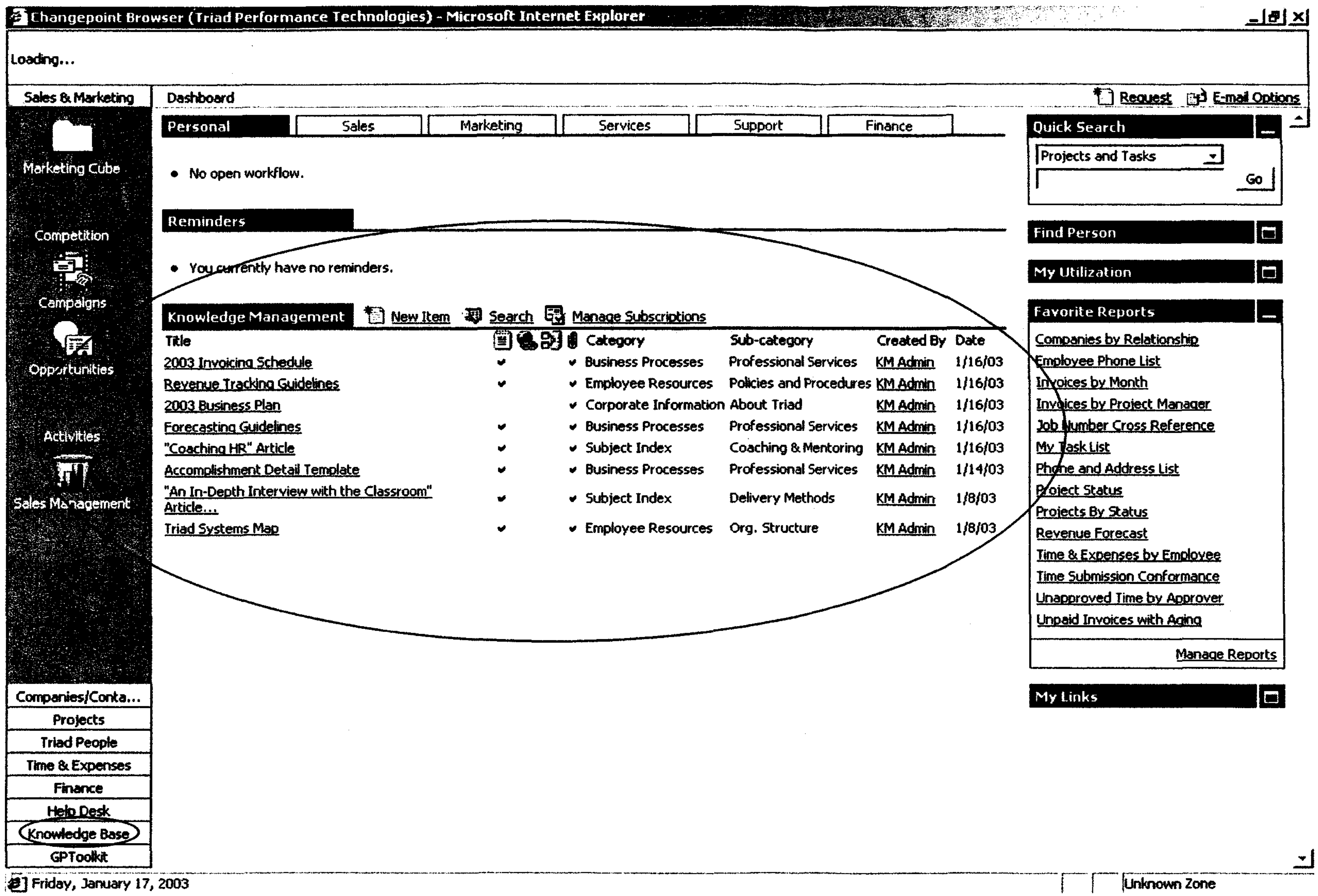

Figure 17. The Changepoint® User Interface.
The layout of the personal dashboard to which every user has access. New knowledge items are displayed in the Knowledge Management section on users' personal dashboards for 14 days.

In addition, we decided to store *PSMs* in Changepoint's KM database (hereafter referred to as the knowledge base). This is analogous to saving a Microsoft Word document inside of the Microsoft Word application (which is not possible to do) instead of to a folder structure located on a computer hard-drive.

However, we decided to store *work products* in a folder structure located on a network server but to allow *access* through the Changepoint interface. We decided not to *store* work products in the Changepoint knowledge base because there were far too many work products and the number would keep growing. Including each individual work product in the knowledge base would be a logistically difficult and it would likely slow down the application. In addition, in order to store all work products in the KMS, we would need project managers to load knowledge items which would require training all project managers in how to load knowledge items— a far more costly endeavor than keeping it a centralized function (e.g., having just one person load knowledge items).

In Changepoint®, there are records for each client account, project, competitor, Triad person, etc. In addition, the KM component allows a knowledge item to consist solely of a description and a hyperlink to a source outside of the knowledge base (for example, a folder structure on a network or to a Web Site on the Internet). For example, if a user were to click on a particular project in Changepoint®, there could be a knowledge item consisting of a hyperlink to another source (Figure 18). This hyperlink could take the user to the corresponding project folder located on the archive server from where the user could get a particular work product. In other

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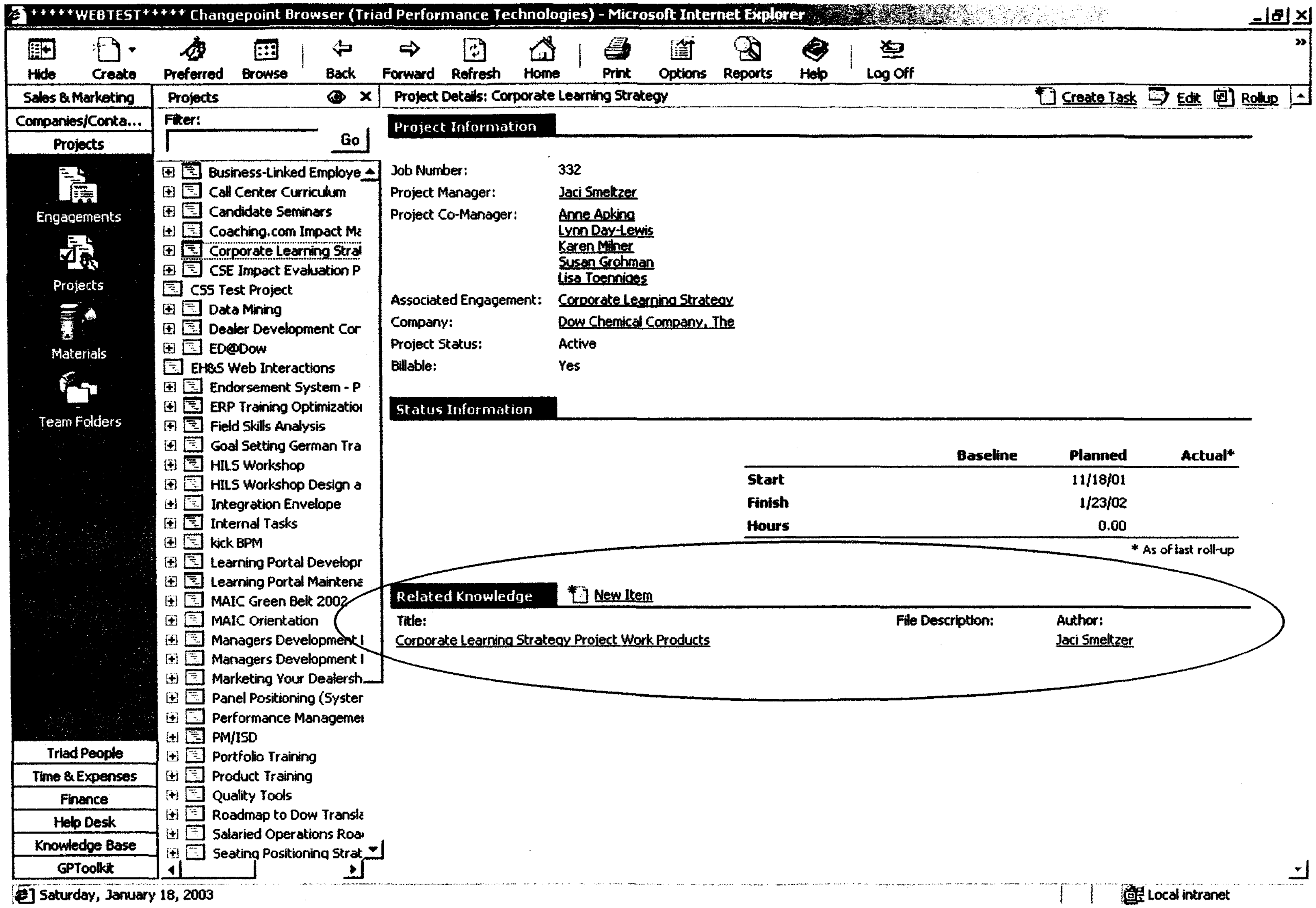

Figure 18. Accessing a Project's Work Products From a Project Record in Changepoint®.

words, there would not be individual knowledge items for each individual work product but rather a knowledge item for the project folder that contained all of that project's work products.

Including work products in a KMS is useful if they can be, and are, reused again in future situations. This is referred to as "leveraging" knowledge. In order to effectively leverage work products, they must be tied to the context of the project for which they were created. For example, suppose a project team designs a learning strategy for a company in the retail industry (project R). In addition, suppose the company has also created a learning strategy for a company in the food industry (project F). If the company is hired to design a learning strategy for another company in the retail industry (project R2), the work products from project R would be more useful to project R2 than the work products from project F. In addition, the probability of being able to re-use work products from project R on project R2 is higher than reusing the work products from project F.

Providing the ability for users to search the KMS and find project-specific work products and enabling users to recognize which work products could be of most value at any given time is expected and necessary to sustain use of the system. Therefore, we decided to dedicate a network server to archiving project work products in a folder structure that duplicates the folder structure on the server used for storing active project work. In this way, project-specific work products would be archived in an intuitive manner and could be retrieved easily. We decided to integrate these project-specific work products with the knowledge base so that users could search for

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PSMs and work products in the same place. We decided to integrate the work products by adding a knowledge items for each billable project that contained a hyperlink to the project folder archived on the archive server. In this way, the design provided users with the ability to search for context-specific work products.

In summary, this infrastructure would minimize the strain on the knowledge base, which prevented a time-consuming back-up process that would interfere with people doing their work. It also kept the maintenance of the knowledge base a centralized function, which prevented the need for more costly user training. Finally, it still provided a way in which work products could be tied to project-specific context.

Taxonomy

A taxonomy is a way of making information accessible by standardizing language and creating a unifying structure (Rapport, 2001). Users apply the standard language within the structure in order to navigate through a KMS (Mårtensson, 2000). Taxonomies should be intuitive to the users and not require extensive training or support (Offsey, 1999; Ruby, 1999). In addition to the structure—or the hierarchical tree of categories (Roberts-Witt, 1999) —a taxonomy also includes naming schemes and rules for creating key words (Adams, 2001; Delio, 2001).

We defined Triad's KMS taxonomy for Triad's knowledge items. Standardizing the core business-process allowed us to eliminate the inconsistencies across the organization, which was necessary in order to design an intuitive taxonomy for the users. We designed a unifying structure (Figure 19) based on Triad's

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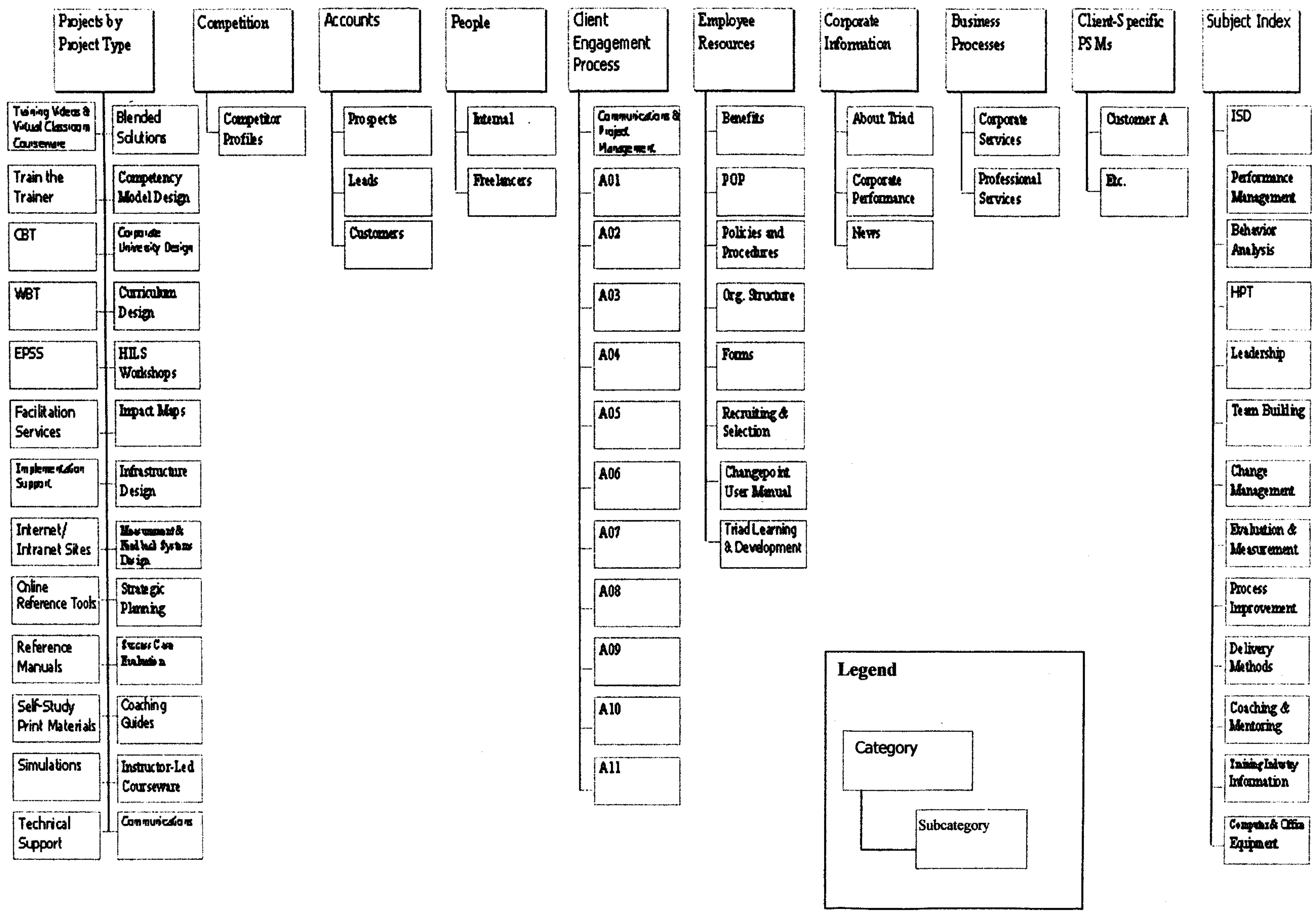

Figure 19. Triad's Taxonomy.

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organizational structure and its key business processes. The core team was able to construct a structure based on their own knowledge of Triad, its business processes, and knowledge needs. We began designing the taxonomy shortly before we began to identify knowledge items to include in the KMS, although the two activities were somewhat concurrent in that they overlapped. As we identified knowledge items, we continually refined the taxonomy. However, I do not recommend this approach. Based on my experience at Triad, I recommend a more systematic approach, which is presented in the Recommendations section.

Some of literature and research has stressed the importance of identifying types of knowledge items (Cowley-Durst, 1999; Mullett, 2000) to enable design teams to communicate effectively during various KMS design activities. Therefore, we specified a range of types of PSMs (such as samples and templates) and included that range of types in our naming scheme. That is, the name of every PSM ends with its type (for example, proposal *template*, HILS *graphic*, design document *sample*, or quoting *tool*). An additional reason we specified types of PSMs was to help guide users by providing a consistent language. In addition, we expected that a consistent language would allow users to form implicit rules about when and how to use the various types of PSMs. For example, users might begin to associate using templates when they were just beginning to create a document, they might associate using samples while in the process of creating the contents of documents, and they might associate a checklist as a resource to use when putting the finishing touches on a document to ensure it meets standards. While there are not definitive rules about how

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and when to use each type of PSM, we hoped that using consistent language would help users form implicit rules about when each type of PSM might be helpful to them.

Therefore, the steering team specified the initial types of inputs (Appendix C) that the steering team should review and endorse (thus, transforming them into PSMs) before implementation. Triad decided to broaden the types of knowledge items in the KMS (such as lessons learned, white papers found on the Internet, and state-of-the-industry and annual financial reports) after Triad resumed growth.

While we did not initially invest the time into creating rules for creating key words for knowledge items, we acknowledged it would be an improvement to the system in the future. In the meantime, we decided to have the KM administrator be responsible for selecting intuitive key words at the time each knowledge item was to be loaded into the system.

For large corporations, designing a taxonomy is often a time-consuming, effortful project in its own right. All of the relationships between the parts in an organization need to be considered and knowledge items need to relate to each other in the same way that the organization's parts relate to each other. However, there are fewer parts in smaller organizations and the relationships are not as complex or deep. Therefore, designing a taxonomy that unified Triad's knowledge items was not particularly challenging.

Changepoint®, the computer application that provided the interface for users to access knowledge items, allowed for only two levels of organization (e.g., categories and subcategories). Thus, the taxonomy had to be designed with two levels

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in the taxonomy's hierarchy.

The first level in Triad's taxonomy is a *category* and the second level is a *subcategory.* At the time of implementation, there were seven categories. It has since grown to eleven categories. All categories are at the same level in the hierarchy. Each category has several subcategories, all of which are at the same level. One category was dedicated to Triad's core business process, the *Client Engagement Process (CEP).* The CEP category has twelve subcategories representing the eleven accomplishments in the client engagement process (e.g., A01-A11) and a *communications and project management* subcategory that represents tasks cutting across all eleven accomplishments. Table 15 lists each category and a description of how the subcategories fit with key business processes since not each category is itself a business process.

Knowledge Items

We appointed three design teams to identify those PSMs (performance-support mechanisms) that were to be loaded into the knowledge base in time for the initial implementation. This involved identifying various documents that should be (a) discarded, (b) revised before implementation, (c) revised after implementation, (d) created before implementation, or (e) created after implementation. A final list of approximately 154 PSMs, identified during design, to be loaded into the knowledge base was created and used as an inventory tool to keep track of the status of each PSM (Appendix D).

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Table 15

Description of Categories and Subcategories

Category	Subcategory	Description	Attached to Changepoint Record
Projects by Type	Each Strategy- and Solution-type Triad offers	Work Products: Project folders will be attached based on the type of strategy or solution delivered.	Project Records
Competition	Competitor Profiles	PSMs: Profiles for several competitors	Competitor Records
Accounts	Prospect Lead Customer	PSMs: Accounts are organized according to where they are in the sales process, whether they are a prospect, lead or a customer.	No
People	Internal Freelancer	PSMs: Biographies of either Triad employees (internal) or freelancers	Triad people (internal) biographies are attached to their Triad Person record
Client Engagement Process	Each Accomplishment in the client engagement process and communications and project management	PSMS: Items relevant to Triad's core business process categorized by accomplishment in the process or by cutting across accomplishments (communications and project management)	No

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Table 15--continued

Category	Subcategory	Description	Attached to Changepoint Record
Employee Resources	Benefits POP (Partnering on Performance-Triad's Professional Development Process) Policies and Procedures Org Structure Forms Recruiting and Selection Changepoint User Manual Triad Learning and Development	PSMs: Items that connect to Triad support processes were put into these subcategories instead of a subcategory for each support process so that highly similar documents would be stored together. The only two subcategories that are named after support processes are *Recruiting and Selection* and *POP*	No
Corporate Information	About Triad Corporate Performance News	PSMs: These subcategories do not hold PSMs that connect to support processes but rather information about Triad and important communications	No
Business Processes	Corporate Services Professional Services	PSMs: These two subcategories are named after the two major divisions in Triad. Process maps for additional management and support processes along with items connected to those processes are stored in the subcategory of the division who is responsible for the process.	No

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Table 15--continued

Category	Subcategory	Description	Attached to Changepoint Record
Client-Specific PSMs	Each client with substantial client-specific PSMs available	PSMs: Hyperlinks to account-team folders in the network folder structure in which client-specific PSMs will be stored.	Customer records
Subject Index	Behavior Analysis Change Management Coaching and Mentoring Computer and Office Equipment Delivery Methods Evaluation and Measurement HPT ISD Leadership Performance Management Process Improvement Team Building Training Industry Information Training Industry	This category and these subcategories are for knowledge items that do not connect directly to a business process but may be of interest to, and could be used by, anyone at Triad. As a side note, there are fewer knowledge items in this category than in any other.	No

We accomplished this by having one design team focus on the part of the taxonomy that related to the core business process (referred to as Triad's client engagement process). This team identified PSMs connected to each accomplishment in the process. Another design team focused on other management and support

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processes.

A third design team had been working independently since the implementation of the business-process-automation intervention. This team identified Triad's reporting needs and managed the creation of reports to be custom built by Triad's media developers. As of December 2002, Triad has developed eight custom reports that are available in real-time and accessible by users (as opposed to someone else running the report and giving it to a user). Although, the custom reports are not searched for in the same way that PSMs are searched for, they do meet knowledge needs and, therefore, are considered within the scope of the KMS. Hence, the KM steering team is responsible for considering reporting needs on an on-going basis and maintaining the custom reports that are accessible in Changepoint®.

Business Process

In order for the system to be maintained and adapt over time with the business, we defined a process by which knowledge items would be updated, revised, discarded, created, etc. In addition, a system needs to plan for evaluation and recycling (phases five and six of the behavior systems analysis approach) to occur or evaluation will never be done. Therefore, we designed a KM process for Triad people to use and which the steering team would be responsible for managing (Appendix E). The scope of the process covered capturing knowledge, using knowledge, and maintaining knowledge—the parts and the whole system. In designing the KM process, we specified metrics connected to the process (e.g., process measures) to use

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in evaluating the KMS.

We identified three types of roles that would be responsible for maintaining the KMS and thus, had key responsibilities in the KM business process. Those new roles are: (1) an administrator, (2) steering team, and (3) advisory team. Their responsibilities are listed in *Roles and Responsibilities* in the Method section of this paper. The steering team consisted of three director-level, executive leaders and one mid-level, non-management employee. The advisory team consisted of five people from different parts of the organization.

Cultural Integration

It is important to embed KM into everyday work practices and specify rules for when knowledge workers should document new and improved insights, lessons learned, and approaches and methodologies that arise during client engagements (Dunford, 2000). Triad already had a core value that supported knowledge sharing "Share knowledge, processes and tools within Triad and the performance technology community" (Triad, 2002, p.1). In addition, Triad added an agenda item to the debrief agenda template consisting of discussing work products that have the potential to be reused by others. Triad also plans to add a responsibility regarding knowledge sharing and using PSMs on all Triad job descriptions and to the 360-degree feedback process. Finally, Triad has been in the process of developing one standard corporate glossary. At the time of the KMS implementation, there was a glossary for all Triad people to use that was specific to terminology used in the client engagement process and the

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Changepoint application, and a separate glossary to be used by the technology group. However, Triad plans to integrate these glossaries into one on-line glossary in the near future.

Implementation Strategy

Given the economic climate, a cost-conservative implementation strategy was necessary. In-depth user training on all aspects of the KMS was not needed because most of the responsibilities were centralized among the administrator, steering team, and advisory team. Therefore, the training plan involved creating print-based materials to be used on a self-study basis (Appendix F).

The communication plan consisted of the president and CEO giving a company-wide broadcast via voicemail and the executive sponsor, who was also a member of the steering team, providing a follow-up email message (Appendix G). This email message included specific information and expectations for users. The president and CEO emphasized the "championing" he expected from executive leaders in a leadership meeting before implementation. Finally, a brief review of the KMS and several key knowledge items were added to an all-staff meeting agenda, scheduled for a month after implementation.

Performance-Support Mechanisms

Triad had 80 PSMs in its old databank that the design teams determined should be included in the KMS. The only change that would be done to these existing

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PSMs was to the formatting, which was modified with Triad's styles to create a common look and form. In addition, the design teams identified: 8 PSMs from Triad's old databank that needed to be revised first and then loaded into the KMS; 59 PSMs existing outside of the databank that could be loaded into the system as they were without modification and revised if necessary after system implementation; 13 PSMs to be created and loaded into the system before system implementation; and finally, 23 PSMs to be created and loaded into the system after implementation.

Work Product Integration

A development team was assigned to develop an archiving process, and to standardize a folder structure to be used on both the network server that stored active project work and the archive-server that would be used for archived project work (work products). However, this effort was put on hold until Triad resumed growth. We designed the integration with the knowledge base (described earlier in Design) and a standard folder structure was drafted, but further implementation was withheld until proper resources could be dedicated. Therefore, at the time this manuscript was being written, work products have not been included as a part of the KMS. Adding work products to the KMS via integration with the archive server is planned as a later system improvement.

For a summary of the steps involved in the Design and Development phase, see Figure 20.

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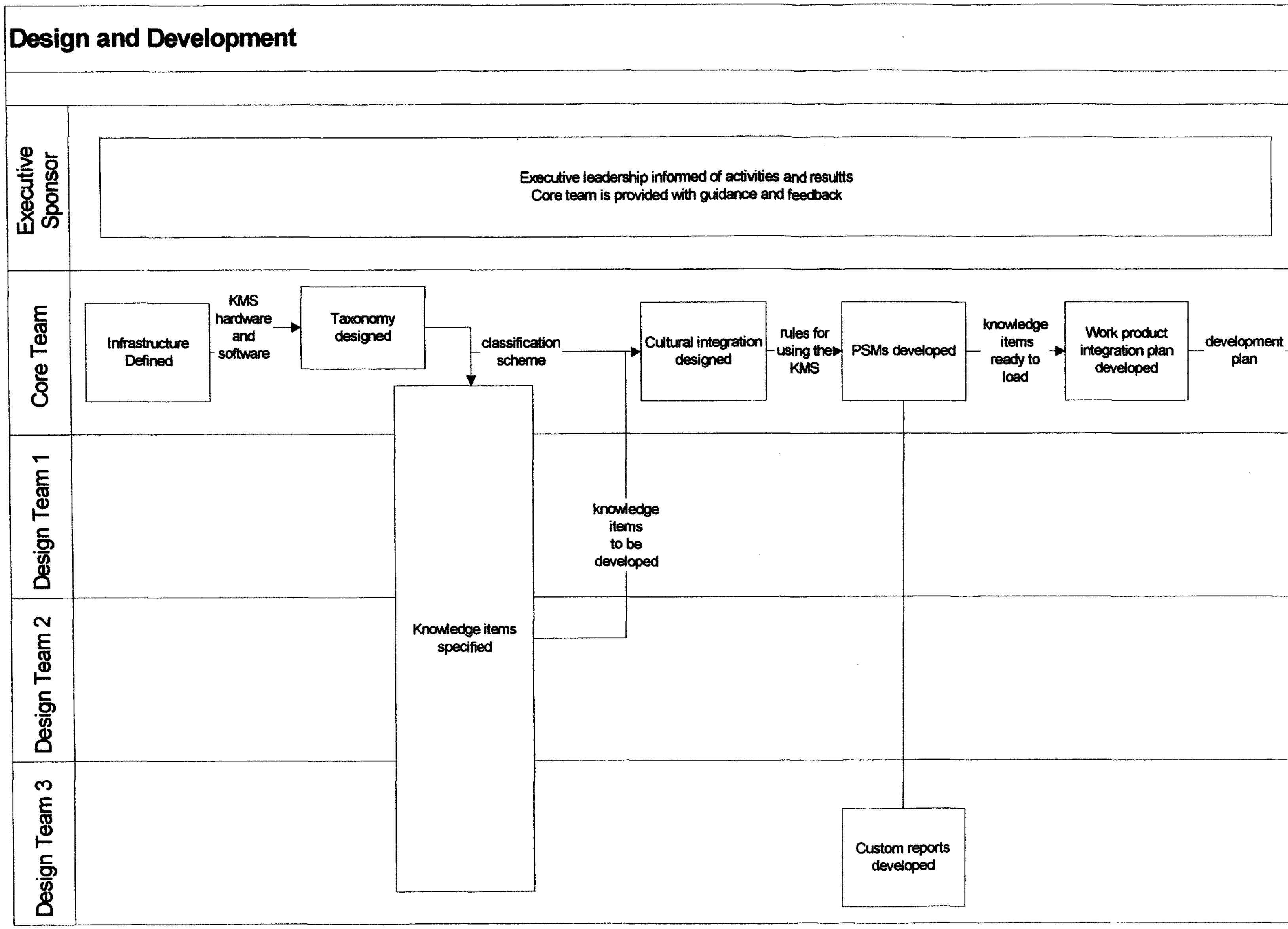

Figure 20. Cross-functional Process Map of the Design and Development Phase.

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Phase 4: Implementation

Triad introduced its new KMS to all of its employees on March 11, 2002. The implementation (Figure 21) began with an all-staff message from the President and CEO broadcast over the voice mail system and was followed up by an email message (Appendix G) from the executive sponsor. The email message included the KMS goal and objectives, an overview of how the system worked, instructions on how each person was to start using the system, an explanation of what was planned for the old databank, an overview of the improvements planned, and an invitation for users to contribute suggestions and knowledge. Along with the email message, print-based materials for using the KMS were distributed (Appendix F), and specific pages were given as reading assignments.

In a subsequent staff meeting that was held to cover a variety of topics, one of the steering team members used an overhead projector to demonstrate how to use the KMS, present an overview of its features, and review Triad's taxonomy. Finally, whenever appropriate, during other company-wide events (for example, an in-service on instructional design), leaders referenced various PSMs in the KMS and demonstrated where to find them in the taxonomy.

Furthermore, after the system was implemented, managers were quick to identify when work products were created that were not consistent with supporting PSMs available in the KMS and, when that happened, asked employees why they had not used the most recent PSM available. Thus, managers consequated not using the KMS when it was supposed to be used with verbal feedback. This is an important

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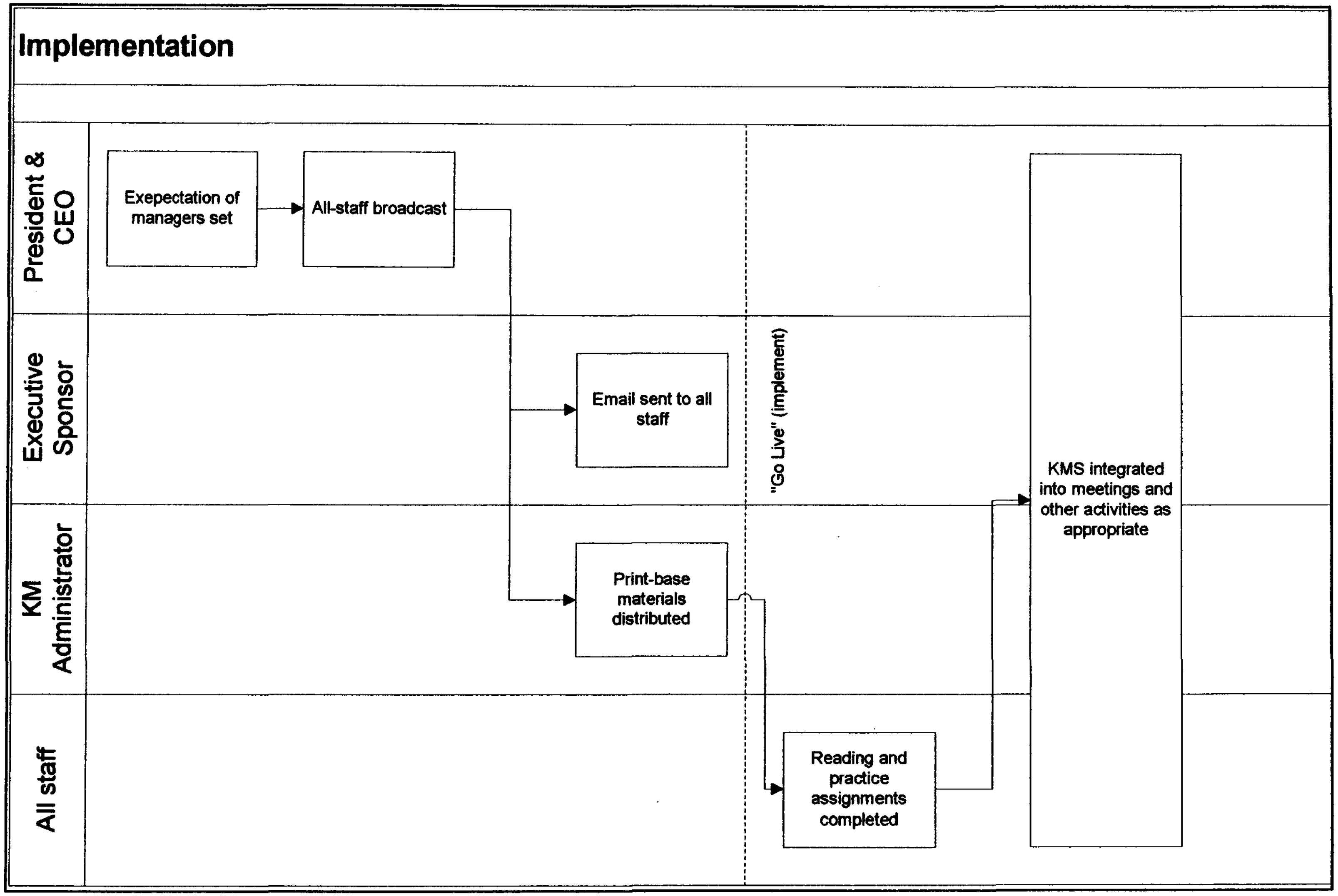

Figure 21. Cross-functional Process Map of the Implementation Phase.

concept and was critical to the success of Triad's KMS. Rules describing when and how to use PSMs can be provided but if there are no consequences, behavior will not change, and any initial behavior-change will not last. Managers were able to provide consequences because they valued the PSMs in the KMS and their link to supporting performance. Knowledge items that managers did not value were probably not PSMs linked to key business processes and therefore, were not a part of the KMS.

Phase 5: Evaluation

Qualitative and quantitative measures were obtained to evaluate the design and impact of the KMS on employee satisfaction and work performance. Designing the method for evaluating a system must be done before collecting the evaluation data (Figure 22). This is emphasized in behavior systems analysis because the evaluation and recycling phases are iterative and continue for the life of the system. It is critical to select metrics that measure the system against specified system objectives in order to ensure that the system accomplishes what it was designed to accomplish. We selected process measures, performance measures, and subjective measures to measure the system objectives.

Process Measures

Process measures are objective, quantitative measures that evaluate critical steps in a business process by assessing its outputs. A business process is designed to produce long-term outcomes. In the interim, measures assessing process outputs can

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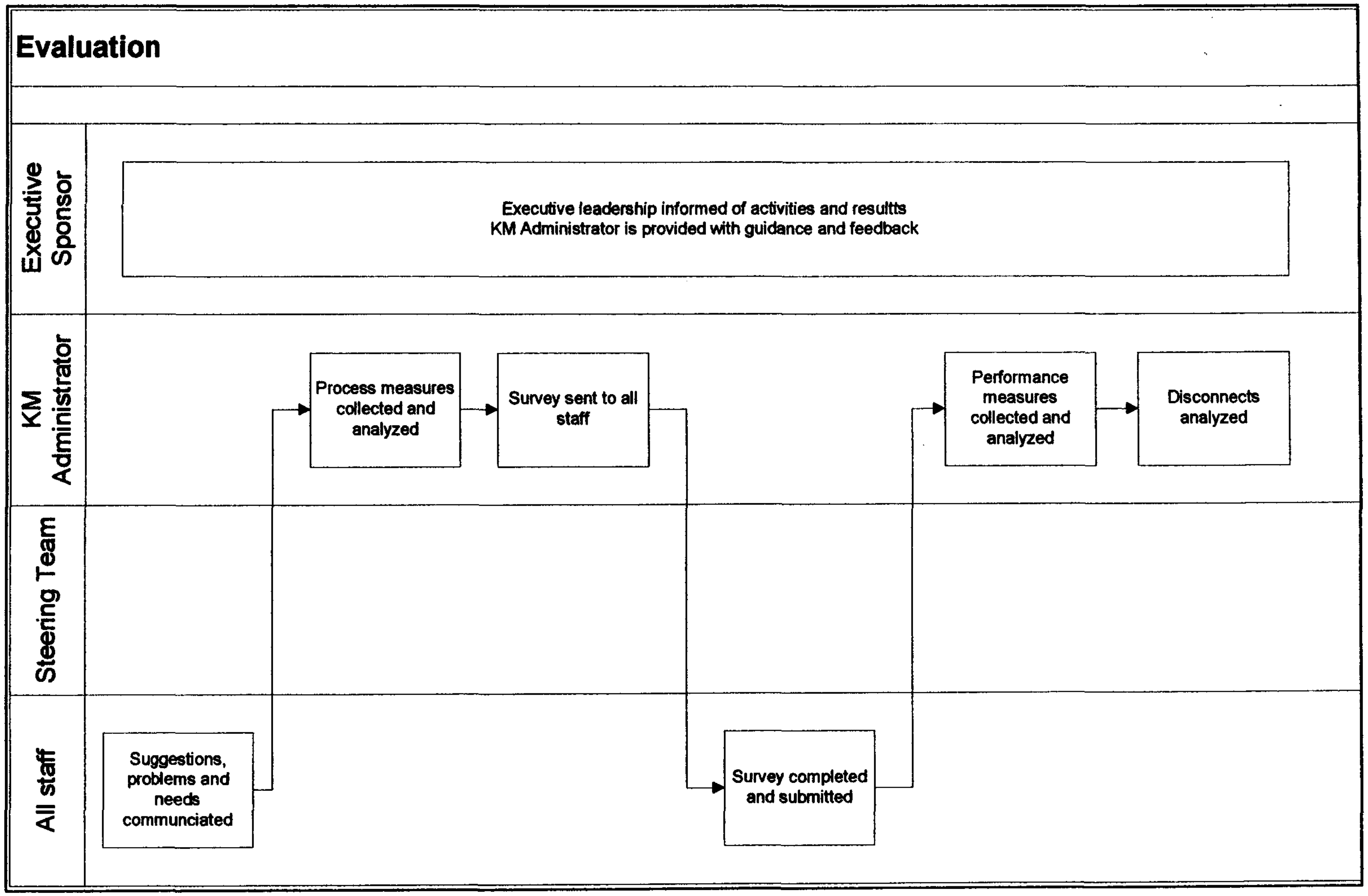

Figure 22. Cross-functional Process Map of the Evaluation Phase.

be used to infer outcomes (Dams, 2001). For example, conducting strategic planning sessions with three departments is a process measure (you can count the number of strategic plans as outputs); but you really want to know the outcome—whether or not the plans improved the department's bottom line and customer satisfaction, etc. Extending the study long enough to evaluate long-term outcomes is usually not feasible, so process measures are used instead. The assumption is that the process was designed to accomplish certain objectives that should result in the company achieving those outcomes; and if the process is functioning properly and is being followed, eventually the outcomes will be realized. Process measures can also reveal problems that could be addressed through changing the process.

Performance Measures

Performance measures are objective and quantitative data that measure employee performance. The purpose of a KMS is to support employee performance, which implies that an effective system will have a positive effect on work performance. Performance measures are measures of actual work products. These measures assess the extent to which PSMs actually supported performance. Table 16 lists the system objectives and the various measures intended to assess whether or not the objective had been met.

Subjective Measures

Subjective measures assessed users' perceptions of such things as timesavings,

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Table 16

KMS Objectives and Measures

Objectives	Measures
1. To re-use explicit knowledge (PSMs and work products) throughout Triad. For example, to re-use the format of one work plan on subsequent work plans.	Process measure: Number of work products converted or made into generic PSMs Performance measure: Frequency, percentage of projects having work plans
2. To identify the performance-support needs of Triad people. For example, to identify when people could benefit from a job aid designed to help them do something correctly.	Process measure: Number of suggestions Process measure: Number of new knowledge items created and implemented Process measure: Number of system-level improvements or needs identified
3. To store and organize knowledge items (PSMs and work products) so that employees can easily find them. That is, people generally find what they are looking for without much effort.	Process measure: Percentage of technical problems related to individual PSMs resolved Process measure: Percentage of system-level technical problems resolved Subjective measure: Percentage of employees using the KMS
4. To embed clear expectations for work products into PSMs so that individual performance meets Triad's standards. For example, to create a template for writing a work plan that has all of the sections that Triad expects to be in it.	Process measure: Number of templates Performance measure: Consistency, average score of work plans measured against standards/attributes embedded into the work plan template Subjective measure: Percentage of employees who think the KMS helps make expectations for work products clearer

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Table 16--continued

Objectives	Measures
5. To provide performance support (PSMs) to help employees become proficient in their job roles. For example, to provide process maps and checklists that Triad people can use to ensure they are doing the work they way it is supposed to be done.	Process measure: Number of knowledge items added Process measure: Number of knowledge items revised Process measure: Number of knowledge items discarded Subjective measure: Amount of time the KMS saves employees, on average, each week Subjective measures: Percentage of employees reporting a positive effect on employee development, productivity, quality of work, response time, development time, cost of sale, customer service, and customer satisfaction.
6. To make explicit the connection between PSMs and Triad's core business process and business goals. That is, to make it clear where a PSM fits in the core business process and to make it clear how the output supported by the PSM affects Triad's business goals.	Process measure: Number of PSMs related to the CEP Process measure: Number of PSMs related to other business processes
7. To foster a culture where Triad people develop and share new ideas for PSMs. That is, to encourage and reward Triad people for participating in the KMS by contributing to its improvement.	Process measure: Number of people who made suggestions Process measure: Number of suggestions Process measure: Number of employees who created or revised PSMs Process measure: Number of employees who reviewed PSMs

user satisfaction, and social validity. Social validity is the extent to which a system, its goals and objectives, are perceived to be socially significant (Wolf, 1978). Malott et al. (2000) defined social validity as the extent to which "the goals, procedures, and results of an intervention are socially acceptable to the client, the behavior analyst, and society" (p. 20). An intervention can be effective but not socially valid. Social validity is an important measure for assessing the extent to which employees perceived the intervention to be worthwhile.

Phase 6: Recycle

Recycling, or continuous improvement, was built into the KM business process to encourage on-going improvements to individual PSMs and to the entire system. The number of support calls made was tracked over the initial four months following the system's implementation. These support calls were used to assess user competency and system performance. In addition, the annual evaluation, which included collecting subjective and process measures, was designed to help the steering and advisory teams identify and prioritize large-scale improvements to be made the next year if money allowed.

Data Collection

Process Measures

A knowledge item intake form (Appendix H) was used to track all needs and

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suggestions, contributions and revisions to the KMS over 4.5 months following implementation. This form was used to track and calculate the process measures used in this paper.

In addition, the number of support calls made was tracked over the initial 4.5 months following the system's implementation. These support calls were used to assess user competency and system performance.

Performance Measures

I evaluated employee performance using only one kind of work product—work plans. I chose work plans because it is one of the only work products that should be consistent across all of Triad's projects that also had a supporting PSM—the work plan template (Appendix I) —with criteria embedded into it. The other consistently-produced work product I might have been able to use, was a design document. However, we had not included a design document template in the knowledge base yet. Eventually, we did add a design criteria checklist to the knowledge base but by then, it was not feasible to evaluate another work product due to time constraints.

I evaluated employee performance using two measures, a frequency measure and a consistency measure. Frequency refers to the number of work plans created (one of the PSMs contained in the KMS was a work plan template). Consistency refers to the similarity of the work plans that were created to the attributes provided in the work-plan template. For the frequency measure, an automated Changepoint report indicated how many billable projects were started during 8.5 months before the KMS

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implementation. The same report was used to count the number of active projects that were started during the 4.5 months after the KMS implementation. Work plans for each of the projects listed in this report were collected. For those projects where a physical copy of a work plan could not be located, project team members were interviewed to self-report whether or not the project team had used a work plan. If a project-team member was not available or could not remember, the project was not included in the total number of projects.

For the consistency measure, a sample of work plans was collected by randomly searching variations of work-plan file names on the network folder structure. The *date last modified* of a file dictated whether or not the work plan was included in the pre-implementation or the post-implementation analysis. Some of these work plans, created before the KMS implementation, were dated as far back as February of 1999; they were not from the same time period as the work plans assessed for the frequency measure.

Work products were evaluated against attributes embedded in a work plan template, a related PSM designed to support the writing of work plans (Appendix I). Since the KMS implementation, the work plan template became a corporately endorsed PSM available in the KMS and those attributes were then considered standards. However, before the KMS implementation, there were no corporately endorsed standards. Therefore, this was not a before/after comparison of quality but of consistency. In addition, the after-implementation consistency measure gave us an indicator of quality against standards after the KMS was implemented.

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Each attribute in the template was given a weight and work plans were scored according to these weighted attributes (Table 17). It was not required that work plans for one particular client (referred to in this paper as Chemical Company) include the *Project Background* section. Therefore, work plans for Chemical Company were given credit for having this section even if it was not included.

Instrumentation

A data sheet designed to measure work products against attributes embedded in the work plan template was used to collect the consistency data (Appendix J). A Changepoint report was used for the frequency measure to count active projects so that work plans for each project could be counted.

Reliability

Interobserver agreement was calculated on at least 30% of the work plans assessed for consistency from both Farmington Hills and Grand Rapids, and from both before- and after-implementation (Table 18). Interobserver agreement was calculated for each item (each attribute) by dividing the number of agreements by the number of opportunities for agreement and multiplying by 100.

Subjective Measures

This section describes the subjective measures I obtained, including an

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Table 17

Work Plan Attributes and Weights

Attribute	Weight
The work plan included a *cover page*	1
The *Triad logo* was on the cover page	1
The *project name* was designated as a heading somewhere in the work plan	1
The *client name* was designated as a heading somewhere in the work plan	1
A *table of contents* was included	1
Triad's *logo* was in the footer	1
The *date* (including the month, day and year) were included in the footer	1
The *page number* was included in the footer	1
The *project name* was in the header	1
The *purpose* for the project was stated	5
The project *background* was described	5
The *evidence of the project's success* was identified	5
The project *deliverables* were listed	5
Specifications were provided for each deliverable	5
The *project approach or process* to be followed was indicated	5
The project *schedule* was provided	5
The project *team members* were listed	5
Contact information for the project team members was provided	5
There was an appropriate *pricing section or quote* provided	5
Assumptions considered in the price were listed	5
There was a place for a *Triad representative to sign* the agreement	5
There was a place for the *client representative to sign* the agreement	5
Total points possible	74

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Table 18

Reliability of Consistency Measures on Work Plans Created Before and After the KMS Implementation

	Before		After	
	% Assessed	% Reliability	% Assessed	% Reliability
Farmington Hills	31%	98%	33%	99%
Grand Rapids	35%	96%	34%	97%

assessment of the client engagement process disconnects identified before the business-process standardization intervention, and other subjective measures obtained by conducting a pre- and a post-KMS implementation survey.

Client Engagement Process Disconnects

Each disconnect was subjectively evaluated to determine whether the KMS, or one of the PSMs contained in the KMS, addressed it either entirely or partially.

Survey and Instrumentation

In addition, two self-report surveys were used to gather employees' perceptions before the system was implemented and after the KMS was implemented. A pre-implementation survey was designed in Microsoft Word, and developed and delivered with an online application (Changepoint®). However, the online version was not saved and could not be recovered so the Microsoft Word version is available in Appendix K. Because the online survey application was no longer available at post-

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implementation, a survey was designed and developed in Microsoft Word and delivered through e-mail (Appendix L). Both surveys included three types of questions: Likert-scale, Yes/No, and open-ended questions. The pre-implementation survey also contained questions relevant to the business-process standardization and business-process automation interventions.

Reliability

Interobserver agreement was calculated for each disconnect (100% or 50 of 50) of the client engagement process disconnects by dividing the number of agreements by the number of opportunities for agreement and multiplying by 100. Interobserver agreement was 82%.

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CHAPTER VII

RESULTS AND DISCUSSION

This section presents system evaluation data including: (a) process measures, (b) performance measure, and (c) subjective measures.

Process Measures

The KMS was implemented on March 11, 2002. At the time of implementation, 160 knowledge items were contained in the KMS. During the final evaluation of the KMS, 322 knowledge items were contained in the KMS. During the 4.5-month evaluation period, 207 knowledge items were added, 54 were revised, and 45 were discarded.

Sixteen employees made 43 suggestions for new PSMs. Of these 43 suggestions, 37 were pursued resulting in the creation of 207 new knowledge items. Of those created 98.5% were implemented. On average, it took 36 hours (range: 1 to 126) for a need or suggestion to go through the process resulting in some kind of action (such as deciding to create a PSM, deciding against the suggestion, or tabling the suggestion). Twelve employees (including 5 managers) were involved in creating or revising PSMs, and 14 employees (including 7 managers) were involved in reviewing PSMs.

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Furthermore, there were 11 system-level needs or improvements identified (such as providing more samples of work products), two of which were completely fulfilled and one of which we have begun to address (Table 19). Twenty-three work products created for a client were made generic and converted into PSMs to be used across clients and projects. In addition, 100% of technical problems with individual

Table 19

System-Level Needs and Improvements Identified

Need/ Improvement	Addressed Yet?
• Develop rules for specifying key words for each knowledge item	No
• Develop a knowledge map (a customized report)	No
• Develop automatic triggers for each knowledge item to facilitate maintaining each item	No
• Customize the search field so that it assumes quotes for phrases	Yes
• Customize the search feature so that it searches titles as well as key words	No
• Customize the search display screen so that it displays more than 10 results at a time	No
• Link to client account-teams by incorporating hyperlinks to their account folders containing client-specific PSMs	No
• Provide samples of key deliverables (such as work plans and design documents)	Partially
• Expand the taxonomy to allow for highly-used items not relating to a business process (such as the ASTD state of the industry reports)	Yes
• Develop a process and the tools necessary to capture lessons learned	No
• Add all commonly used company graphics and logos	No

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PSMs (such as hyperlinks not working) were resolved. We identified two system-level technical problems that we could not solve. Although we created temporary solutions for those three problems (Table 20), the solutions are not ideal. However, these technical problems are design flaws with the Changepoint application and until Changepoint® corrects these problems in a later version of their product, we will use the work-around solutions described in Table 20.

The KMS steering team held two meetings after implementation during the 4.5 months of evaluation for this study. During these meetings, suggestions for, and problems with, specific PSMs reported by users were discussed and actions were taken (such as identifying people to work on the suggestion), new PSMs were reviewed, and system-level improvements and problems were discussed. However, after two months, the steering team postponed further meetings until the company could dedicate appropriate resources again. In place of formal monthly meetings,

Table 20

System-Level Technical Problems

Problem	Work-Around Solution
1. Cannot open Visio files through Changepoint®	Convert PSMs created in Visio to a PDF file and load the PDF file into the KMS while maintaining the source file (the Visio file) in the KMS back-up folder structure.
2. Cannot open Excel or PowerPoint files in Excel 97 or PowerPoint 97 through Changepoint®	Create a Word document with a hyperlink to the Excel or PowerPoint file and load the Word file. When the users open the Word file, they can click on the hyperlink that opens the Excel or PowerPoint file.

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steering team members continued to communicate through e-mail, informally in person, and through phone calls to make decisions and to review necessary documents.

While there were no clear expectations for the numerical goals of these process measures, the results obtained suggest that reasonable business outcomes will result. For example, there are a number of PSMs available in the KMS for consultants to use throughout the client engagement process, which should help improve the quality of work for some Triad people. It is also evident that approximately half of the Triad employees are involved in contributing to the KMS, which should help Triad address a breadth of knowledge needs that may not have been possible if only a few people were contributing.

Performance Measures

I evaluated employee performance using two measures, a frequency measure and a consistency measure.

Frequency

Frequency refers to the number of work plans created for projects with a Planned Start Date (as listed in Changepoint®) over a given period (e.g., before or after the KMS implementation).

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Farmington Hills Office

Before the KMS implementation, the Farmington Hills office had started 107 billable projects for 10 different client accounts over 8.5 months and had created work plans for 41 of these projects (38%). Of these projects, one client (hereafter this account will be called the Chemical Company) accounted for 40 (37%), all of which had work plans (100%). However, the Chemical Company was the only one of the ten client accounts active during this period (10%) that had at least one project with a work plan.

After the KMS implementation, the Farmington Hills office had started 42 billable projects for seven different client accounts over 4.5 months, all of which had work plans (100%). Of these projects, the Chemical Company accounted for 34 (81%).

The percentage of work plans created in the Farmington Hills office were analyzed in order to compare the percentage of work plans created before the KMS implementation (before) to the percentage created after the KMS implementation (after). Before the KMS implementation, 38.3% of 107 projects had work plans, whereas after the KMS implementation, 100.0% had work plans To determine if this increase was statistically significant, a chi-square test for independence was completed (Table 21). These data indicated a statistically significant increase in work plan creation at the Farmington Hills office after the KMS implementation.

In addition, before the KMS implementation, Farmington Hills consultants were creating work plans for only 10% (1 of 10) of their active clients, compared to

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Table 21

Frequency of Work Plan Creation Before and After
KMS Implementation: Farmington Hills

	Before		After	
	Number	Percent	Number	Percent
Projects with work plans	41	38.3	42	100.0
Projects without work plans	66	61.7	0	0.0
Total	107	100	42	100
χ^2 (1) = 44.04, p<.001				

creating work plans for 100% (7 of 7) of their active clients after the KMS implementation. This is further indication that the KMS had a positive effect on work-plan creation in the Farmington Hills office.

While creating work plans was a key output specified in the client engagement process that was implemented in October 2000, executive leaders had not enforced creating work plans in the Farmington Hills office with clients other than the Chemical Company until the KMS was implemented. Before the KMS implementation, in place of work plans, it was acceptable for Farmington Hills consultants to modify parts of a proposal document that was highly similar in content to the work plan. Therefore, these results may be positively confounded by the introduction of a different expectation, which was enforced by executive leaders. Furthermore, the Chemical Company client-account team began using a work plan template several months before the KMS implementation. In addition, the work plan

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template designed for the KMS was based on the work plan template that this client-account team was already using.

Grand Rapids Office

Before the KMS implementation, the Grand Rapids office had started 79 billable projects for 23 different client accounts over the 8.5 months and had created work plans for 55 of these projects (70%). Of these projects, one client (hereafter referred to as the Furniture Company) accounted for 35 (44%), all of which had work plans (100%). Eleven of the 17 client accounts (65%) active during this period had at least one project with a workplan.

After the KMS implementation, the Grand Rapids office had started 34 billable projects for 14 different client accounts over 4.5 months and had created work plans for 24 of these projects (71%). Of these projects, the Furniture Company accounted for 12 (50%), all of which had work plans (100%). Nine of the 14 client accounts (64%) active during this period had at least one project with a workplan.

The percentage of work plans created in the Grand Rapids office were analyzed in order to compare the percentage of work plans created before the KMS implementation (before) to the percentage created after the KMS implementation (after). Before the KMS implementation, 69.6% of 79 projects had work plans, whereas after the KMS implementation, 70.6% of 34 projects had work plans. To determine if this increase was statistically significant, a chi-square test for independence was completed (Table 22). These data indicated that the increase in

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Table 22

Frequency of Work Plan Creation Before and
After KMS Implementation: Grand Rapids

	Before		After	
	Number	Percent	Number	Percent
Projects with Work Plans	55	69.6	24	70.6
Projects without Work Plans	24	30.4	10	29.4
Total	79	100	34	100
χ^2 (1) =<.001, p=.999)				

work plan creation after the KMS implementation was not significant at the Grand Rapids office.

In addition, before the KMS implementation, Grand Rapids consultants were creating work plans for 65% (11 of 17) of their clients with projects compared to 64% (9 of 14) after the KMS implementation. This is further indication that the KMS did not have much of an effect on work-plan creation in the Grand Rapids office.

The non-significant increase in work-plan creation may be because the Furniture Company account team, which constituted the majority of projects in Grand Rapids, had been using a work plan template for several years before the KMS implementation. In addition, there were two senior staff members who simply did not believe work plans were necessary for projects staffed with only one person (which were the kind of projects that they routinely did), and they were not readily influenced by the corporate expectation for work plans.

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Consistency

Consistency is defined as the degree of similarity found between work plans created and the work-plan template contained in the KMS. The degree of similarity is measured by comparing the number of attributes specified in the work plan template to those found in the work plans. These attributes were not corporately defined and endorsed before the KMS implementation. In essence, one of the things that the work plan template was designed to do was make corporate expectations explicit for both the look and feel, and the content of work plans, whereas it was not a corporate standard or expectation before the KMS implementation.

Farmington Hills Office

I reviewed 58 work plans created by consultants in the Farmington Hills office that were created before the KMS implementation and 36 that were created after the KMS implementation. Of those created before the KMS implementation, 54 were created for Chemical Company projects (93%). Of those created after the KMS implementation, 11 were created for Chemical Company projects (31%).

The average score of Farmington Hills work plans created before the KMS implementation was 61 out of a possible 74 (range: 19 to 69), or 82% of the possible points; while the average score after the KMS implementation was 66 out of a possible 74 (range: 19 to 73), or 89% of the possible points.

A t-test for two independent samples was used to determine if there was a significant difference between the average score of work plans created before the

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KMS implementation (before) compared to the average score of those created after the KMS implementation (after). The results (Table 23) indicate a statistically significant increase in the consistency of work plans created before the KMS implementation (before) with an average score of 61.16 (*sd*=13.61) compared to an average score of 66.46 for those work plans created after the KMS implementation (after) (*sd*=9.32).

Table 23

Consistency of Work Plans Created Before and After
KMS Implementation: Farmington Hills

	Number of Work Plans Evaluated	Mean	SD	DF	t-Value	Sig of t
Before	58	61.16	13.61	91.03	-2.24*	.028
After	36	66.46	9.32			

*p<.05

In addition, an error analysis was conducted for each attribute (Table 24), which indicates the percentage of work plans having each attribute. Average percentages were calculated for both one-point and five-point attributes. The average percentage of one-point attributes decreased from 93% before the KMS implementation (before) to 92% after the KMS implementation (after), while the average percentage of five-point attributes increased from 81% to 89%.

Furthermore, numerical scores for one-point attributes and five-point attributes were calculated for each work plan. One-point attributes had a total possible score of

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Table 24

Error Analysis of Work Plan Attributes: Farmington Hills

Attribute	Weight	Percent Containing Each Attribute	
		Before	After
One-point Attributes			
1. The work plan included a *cover page*	1	100%	94%
2. The *Triad logo* was on the cover page	1	98%	94%
3. The *project name* was designated as a heading somewhere in the work plan	1	100%	100%
4. The *client name* was designated as a heading somewhere in the work plan	1	100%	100%
5. A *table of contents* was included	1	76%	75%
6. Triad's *logo* was in the footer	1	83%	92%
7. The *date* (including the month, day and year) was included in the footer	1	93%	94%
8. The *page number* was included in the footer	1	98%	94%
9. The *project name* was in the header	1	88%	89%
Average of one-point attributes		93%	92%
Five-point Attributes			
10. The *purpose* for the project was stated	5	90%	97%
11. The project *background* was described	5	93%	92%
12. The *evidence of the project's success* was identified	5	90%	94%
13. The project *deliverables* were listed	5	91%	97%
14. *Specifications* were provided for each deliverable	5	85%	96%
15. The *project approach or process* to be followed was indicated	5	95%	97%
16. The project *schedule* was provided	5	95%	100%

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Table 24--continued

Attribute	Weight	Percent Containing Each Attribute	
		Before	After
17. The project *team members* were listed	5	84%	94%
18. *Contact information* for the project team members was provided	5	81%	78%
19. There was an appropriate *pricing section or quote* provided	5	81%	92%
20. *Assumptions* considered in the price were listed	5	93%	97%
21. There was a place for a *Triad representative to sign* the agreement	5	78%	92%
22. There was a place for the *client representative to sign* the agreement	5	0%	36%
Average of five-point attributes		81%	89%
Total points possible	74		

9; whereas five-point attributes had a total possible score of 65. A t-test for two independent samples was used to determine if there was a significant difference between the average score of one-point attributes in work plans created before the KMS implementation (before) compared to the average score of those created after the KMS implementation (after). The results (Table 25) indicate that while there was no significant difference in one-point attributes, there was a statistically significant increase in five-point attributes between work plans created before the KMS implementation compared to those created after the KMS implementation.

The lack of significant difference in one-point attributes may also be because the Chemical Company client-account team was using a work plan template before the KMS implementation and 93% of the work plans evaluated in the pre-KMS

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Table 25

Consistency of One-Point and Five-Point Attributes Before and After the KMS Implementation: Farmington Hills

	Number of Work Plans Evaluated	Mean	SD	DF	t-Value	Sig of t
One point attributes						
Before	58	8.36	.87	62.08	.13	.89
After	36	8.33	1.10			
Five point attributes						
Before	58	52.76	13.05	91.56	-2.37	.02
After	36	58.05	8.64			

*p<.05

implementation analysis were for this client. In addition, the work plan template designed for the KMS was based on the work plan template that this client-account team was already using. However, after the KMS implementation, only 31% of the work plans evaluated were for the Chemical Company. This may indicate that after the KMS implementation, more Triad people with less experience writing work plans, or less experience using a similar template, were writing work plans that were highly consistent with: (a) the attributes embedded in the work plan template and (b) consistent with the more experienced people who were already writing work plans before the template became available in the KMS.

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Grand Rapids Office

I reviewed 45 work plans created by consultants in the Grand Rapids office that were created before the KMS implementation and 29 that were created after the KMS implementation. Of those created before the KMS implementation, 31 were created for Furniture Company projects (69%). Of those created after the KMS implementation, six were created for Furniture Company projects (21%).

The average score of Grand Rapids work plans created before the KMS implementation was 48 out of a possible 74 (range: 10 to 55), or 65% of the possible points; while the average score after the KMS implementation was 64 out of a possible 74 (range: 25 to 74), or 86% of the possible points.

A t-test for two independent samples was used to determine if there was a significant difference between the average score of work plans created before the KMS implementation (before) compared to the average score of those created after the KMS implementation (after). The results (Table 26) indicate a statistically

Table 26

Consistency of Work Plans Created Before and After KMS Implementation: Grand Rapids

	Number of Work Plans Evaluated	Mean	SD	DF	t-Value	Sig of t
Before	45	48.27	7.03	38.06	-5.65*	<.001
After	29	63.52	13.40			

*p<.05

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significant increase in the consistency of work plans created before the KMS implementation (before) with an average score of 48.27 (*sd*=7.03) compared to an average score of 63.52 (*sd*=13.40) for those work plans created after the KMS implementation.

In addition, an error analysis was conducted for each attribute (Table 27), which indicates the percentage of work plans having each attribute. Average percentages were calculated for both one-point and five-point attributes. The average percentage of one-point attributes increased from 46% before the KMS implementation (before) to 64% after the KMS implementation (after), while the average percentage of five-point attributes increased from 68% to 88%.

Table 27

Error Analysis of Work Plan Attributes: Grand Rapids

Attribute	Weight	Percent Containing Each Attribute	
		Before	After
One-point Attributes			
1. The work plan included a *cover page*	1	2%	62%
2. The *project name* was designated as a heading somewhere in the work plan	1	98%	100%
3. The *client name* was designated as a heading somewhere in the work plan	1	24%	72%
4. The *Triad logo* was on the cover page	1	0%	66%
5. A *table of contents* was included	1	0%	7%
6. Triad's *logo* was in the footer	1	24%	100%
7. The *date* (including the month, day and year) was included in the footer	1	91%	100%

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Table 27--continued

Attribute	Weight	Percent Containing Each Attribute	
		Before	After
8. The *page number* was included in the footer	1	100%	100%
9. The *project name* was in the header	1	76%	72%
Average of one-point attributes		46%	64%
Five-point Attributes			
10. The *purpose* for the project was stated	5	96%	100%
11. The project *background* was described	5	96%	97%
12. The *evidence of the project's success* was identified	5	96%	97%
13. The project *deliverables* were listed	5	98%	97%
14. *Specifications* were provided for each deliverable	5	2%	66%
15. The *project approach or process* to be followed was indicated	5	96%	100%
16. The project *schedule* was provided	5	100%	97%
17. The project *team members* were listed	5	91%	97%
18. *Contact information* for the project team members was provided	5	18%	66%
19. There was an appropriate *pricing section or quote* provided	5	96%	100%
20. *Assumptions* considered in the price were listed	5	93%	97%
21. There was a place for a *Triad representative to sign* the agreement	5	2%	62%
22. There was a place for the *client representative to sign* the agreement	5	0%	62%
Average of five-point attributes		68%	88%
Total points possible	74		

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Furthermore, numerical scores for one-point attributes and five-point attributes were calculated for each work plan. One-point attributes had a total possible score of 9, whereas five-point attributes had a total possible score of 65. A t-test for two independent samples was used to determine if there was a significant difference between the average score of one-point attributes in work plans created before the KMS implementation (before) compared to the average score of those created after the KMS implementation (after). The results (Table 28) indicate statistically significant increases in both one-point and five-point attributes between work plans created before the KMS implementation compared to those created after the KMS implementation.

Table 28

Consistency of One-Point and Five-Point Attributes Before and After the KMS Implementation: Grand Rapids

	Number of Work Plans Evaluated	Mean	SD	DF	t-Value	Sig of t
One point attributes						
Before	45	4.16	.67	33.46	-7.80	<.001
After	29	6.79	1.74			
Five point attributes						
Before	45	44.11	7.09	40.93	-5.15	<.001
After	29	56.72	11.90			

*p<.05

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The significance in these results may be because while many Grand Rapids consultants were already writing work plans before the KMS implementation, the template available in the KMS was considerably different from the one they were previously using.

Subjective Measures

Disconnect Analysis

While 28 of the original 50 client engagement process disconnects identified during the business-process analysis were subjectively assessed to have been addressed entirely or in part by either the business-process standardization, business-process automation or KMS interventions, the KMS or one of the PSMs contained in the KMS addressed only 14 of those disconnects. Those disconnects that were addressed with the KMS, or PSMs contained in the KMS, are listed in Table 29.

Furthermore, it is plausible that improvements to the KMS or designing new PSMs could address the following seven additional disconnects (the numbers in parentheses reference the disconnect number in Appendix B):

1. (#2.) No tools available for selecting prospects.

2. (#17.) No method for capturing lessons learned across area offices when we get and/or do not get awarded projects.

3. (#24.) At project definition, not consistently asking about housing of materials produced (e.g., will it be on the web?). Failing to discuss how we can meet

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Table 29

Disconnects Addressed by the KMS

Disconnect*	Manner Addressed
#5. Current account plans do not have a set of criteria for qualifying prospects across different area-office markets.	An account plan template was designed that is available in the KMS.
#9. There are no tools for follow-up to sales, marketing or project management.	There are several PSMs available in the KMS for sales, marketing and project management activities.
#10. Customers ask the same or similar questions, yet we do not strategically use those questions to prepare for presentations.	We have packaged several of our presentations into reusable presentations available in the KMS.
#11. No capability to determine Triad staff qualifications by: • Project work • Type • Length or size • Dollar value • Number of people involved • Education or years of experience • Area of expertise	Changepoint® has a feature to profile each Triad person and that profile contains much of this information. In addition, we have biographies for each Triad person available in the KMS that include much of this information.
#12. Different titles & terms across area offices.	We standardized many terms when we designed the client engagement process and the Changepoint application. In addition, we have developed two glossaries available now that support consistent language and plan to consolidate those two glossaries into one glossary and expand the terms contained in it.
#14. Proposals are tedious to write and are not boiler-plated into pieces that can be easily extracted and reused.	There is a template for a basic proposal available in the KMS. In addition, there is standard text describing the project change process available in the KMS.

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Table 29--continued

Disconnect*	Manner Addressed
#15. Quoting template is based on activities while the proposal is based on deliverables and there is no clear link between activities and deliverables.	Revised the quoting template to align with both proposals and work plans and it is now available in the KMS.
#22. Available templates & tools is not known in new area offices (what, when to use, and how to use).	All tools and templates can be found easily in the KMS. In addition, most knowledge items have a description for use.
#23. Need fresh set of templates for freelancer contracts. They do not take into account all situations for using freelancers.	Revised all freelancer templates, which are available in the KMS.
#25. Time for long-term maintenance is not always built into the original budget.	The quoting tool was revised to address this in the Assumptions section and is available in the KMS.
#26. Do not have a robust template for defining scope of fixed fee projects.	The quoting tool was revised to address this and is available in the KMS.
#35. There are no internal technical specs, technical standards document, or technical style guide that can be used from one project to the next.	Our style guide, available in the KMS, touches on some of this. Although a more organized effort is probably necessary.
#36. New area offices are reinventing the wheel. Best Practices examples would be helpful.	Several templates for, and samples of, common work products are available in the KMS.
#39. PCNs (project change notices) can become a way to disappoint first-time clients, especially in a competitive-bid situation.	The PCN procedure has been revised and the template revised, which is available in the KMS. In addition, we have written standard text to be used in all work plans and proposals. This text is also available in the KMS.

*The number refers to the number listed in the original list of disconnects provided in Appendix B.

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both short- and long-term needs for product or service delivery.

4. (#27.) Need to include D3 information in Status Report.

5. (#32.) No systematic way to do internal reviews.

6. (#41.) Need an internal audit of items to hand over to client at the close of the project for Triad to use to help deliver the solution. Archiving is inconsistent and files are not quickly retrieved when needed for area offices not located in Farmington Hills.

7. (#43.) Inconsistent in holding debriefs meetings. Lessons learned are not captured and there is no methodology that integrates those lessons into the process or performance support mechanisms, etc.

These data indicate that the KMS has improved the client engagement process by addressing various issues that at one time were client engagement process disconnects.

Self-Report Survey

Twenty-five of 45 employees (60%) responded to the pre-implementation survey (Appendix M) and 25 of 31 employees (81%) responded to the post-implementation survey (Appendix N). While the pre-implementation survey was anonymous, the post-implementation survey was confidential but not anonymous. The lack of anonymity in the post-implementation survey could have positively biased results. In addition, there could have been a selection bias. It is possible that the people Triad had to lay off between the pre-implementation and the post-

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implementation surveys could have been people who were less likely to use performance support whether or not it was available in a KMS.

The number of survey respondents from each department is proportional to the number of employees in each of the four Triad departments (Table 30).

Table 30

Percentage of Triad People and Respondents From Each Department

	Consulting Sales and Services		Practice Development Group		Digital Design & Development		Corporate Services	
	% Triad People	% Respon-dents	% Triad People	% Respon-dents	% Triad People	% Respon-dents	% Triad People	% Respon-dents
Pre	60%	68%	9%	8%	16%	16%	16%	8%
Post	48%	52%	13%	8%	23%	20%	16%	20%

Efficiency and Return on Investment

Based on the post-implementation survey, it is estimated that each employee saved an average of 68 minutes each week[17] (Figure 23). At an average cost rate of $45.00 per hour over a 48-week work year, a savings of 68 minutes each week for 31 employees accumulates to a savings of $72,317.00 per year or $6,026.42 per month.

Triad has not tracked the on-going KMS costs after implementation. However, I am estimating that it will take 48 hours of time annually (or 4 hours per month) for people with an approximate cost rate of $85 an hour and 240 hours of time annually

[17] Using the median for each category on the Likert scale; for example, 15 minutes was used to make this calculation for the category of 0-30 minutes.

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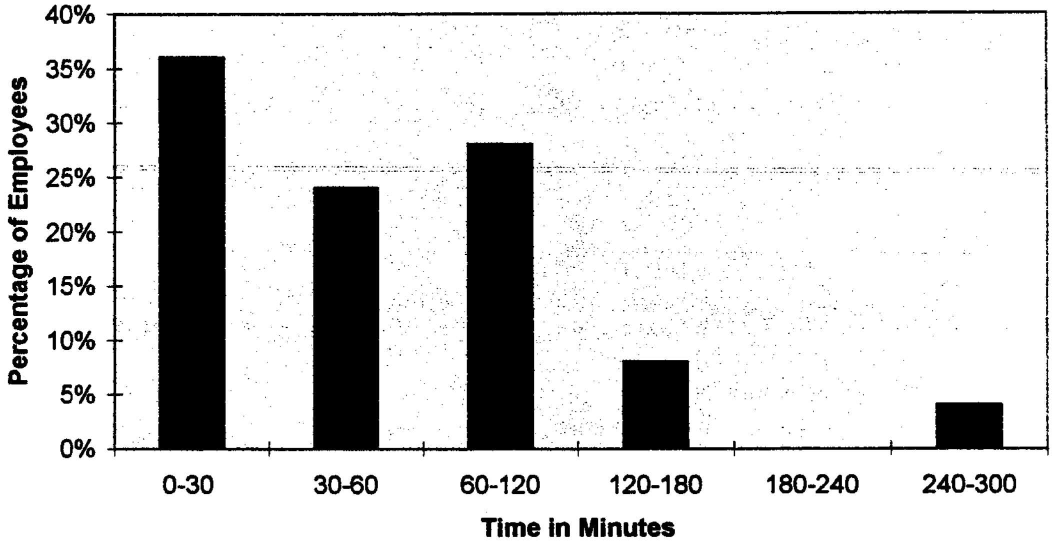

N=25

Figure 23. Estimated Total Time Savings Per Week as a Result of Using the KMS.

(or 20 hours per month) for people with an approximate cost rate of $45 to maintain the KMS. This results in an estimated annual cost of $14,880 for on-going maintenance, or $1,240 per month.

Given a monthly savings of $6,026.42 and a monthly maintenance cost of $1,240, Triad should expect $4,786.42 in monthly net savings. Given the initial cost of $77,351, Triad should expect to receive 100% payback on its investment in 16.2 months[18]. After 16.2 months, Triad should expect a return of $4,786.42 in efficiencies a month, or $57,437 annually.

System Usage

Forty-eight percent (48%) of the respondents reported that before the KMS

[18] Without interest considerations.

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they frequently used the old databank, compared to 64% who reported frequently using the KMS after its implementation. Seven of the 25 respondents (28%) were from one client account team who used their own set of PSMs that were customized for that client. These client-specific PSMs were not available in the KMS but rather in a network folder structure. Four of the respondents from this account team reported that they did not frequently use the KMS for this reason (which was noted in the comments section of the survey). This accounts for 44% of the respondents who reported not using the KMS.

In addition, five of the respondents (20%) were from the corporate services department. Three of the respondents from this group reported that they did not frequently use the KMS. The KMS was not designed to provide maximum benefit to these users but rather to users from the Consulting Sales and Service, Practice Development, and Digital Design and Development groups—those groups that find or do billable work. This accounts for an additional 33% of the respondents who reported not frequently using the KMS.

Therefore, of the people for whom the KMS was primarily designed to support, who were not considered part of the one client-account team who were using their own set of PSMs, or part of Corporate Services, 89% (16 of 18) of those respondents reported that they frequently use the KMS. It would have been a better survey question to simply ask users if they used the KMS or not instead of asking about frequency of use since I cannot be sure of how each respondent defined "frequently used."

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While client-specific PSMs were not included in the KMS, according to informal reports, this one client-account team probably would not have used them through the KMS anyway. It is probably easier for that one client-account team to use their own folder structure on the network to retrieve client-specific PSMs because it may be quicker for them to access the network folder structure than to open Changepoint® and they have probably memorized the folder structure, which allows them to find specific PSMs quickly. However, including client-specific PSMs in the KMS is not intended to benefit any one client-account team. Rather it is intended to benefit Triad people on other client-account teams who might be able to search for and re-use those PSMs. In addition, employees new to a client-account team, who will not have initially memorized that team's folder structure, may find using the KMS helpful.

Therefore, one of the planned system improvements is to provide knowledge items in the KMS that consist of hyperlinks to client-specific PSMs. This will allow client-account team members to continue using the folder structure if they wish and, yet, allow other Triad people to search for, and access, client-specific PSMs through the KMS. The taxonomy has been expanded to allow for this improvement and a method for accomplishing this has been agreed upon, but the knowledge items have not yet been added to the KMS.

Effect on Performance

Employees were asked in what way the KMS affected their performance or

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that of Triad. Eighty-four percent (84%) of the respondents reported the KMS positively affected productivity, 88 % indicated it positively affected the quality of their work, 80% reported it positively affected response time (i.e., the amount of time it takes to respond to a request), 60% reported it positively affected development time (i.e., the amount of time it takes to develop work products), 56% reported it helped control costs (such as helping project teams stay within budget because of working more efficiently), 60% reported it positively affected customer service (e.g., Triad's ability to serve its customers), and 40% reported it improved customer satisfaction (e.g., the customers' perception about the service they receive). These data indicate that the KMS had a positive effect on variables that have a considerable effect on business outcomes.

Employee Development

Based on the performance-support available before implementation, 35% of the respondents believed it would take approximately 3-4 weeks for a new employee to become fully competent using tools available and creating satisfactory deliverables based on their role. Unfortunately, the question on the post-implementation survey was changed and a pre/post comparison was not possible. However, after the KMS implementation, 92% of the respondents reported that the KMS would improve the time it takes a new employee to become fully competent using the tools available and creating satisfactory deliverables based on their role. These data indicate the KMS decreases the time to develop new employees.

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Employee Satisfaction

Eighty-eight percent (88%) of the respondents indicated the KMS positively affected employee satisfaction and 76% indicated it made expectations for work products clearer. These data indicate that the KMS had a positive effect on Triad people's attitudes and understanding of work assignments. However, the corresponding survey questions were not directed to respondents' own experience, but rather to their perception of the experience of all employees.

Triad's KMS Features

In the post-implementation survey, we asked employees which features they believed Triad's KMS included (Figure 24). The last two features shown on the right side of the chart (e.g., "provide work samples" and "provide easy access to past work products") were not part of the initial implementation and, as of the close of the evaluation period, the system still had not included providing easy access to past work products and had included only a few samples.

In addition, of those features that the KMS did include (e.g., the 8 left-most attributes), none of them show that 100% of the respondents acknowledged them as being included. These data indicate that respondents may not have understood this question, which make data relating to this question less credible.

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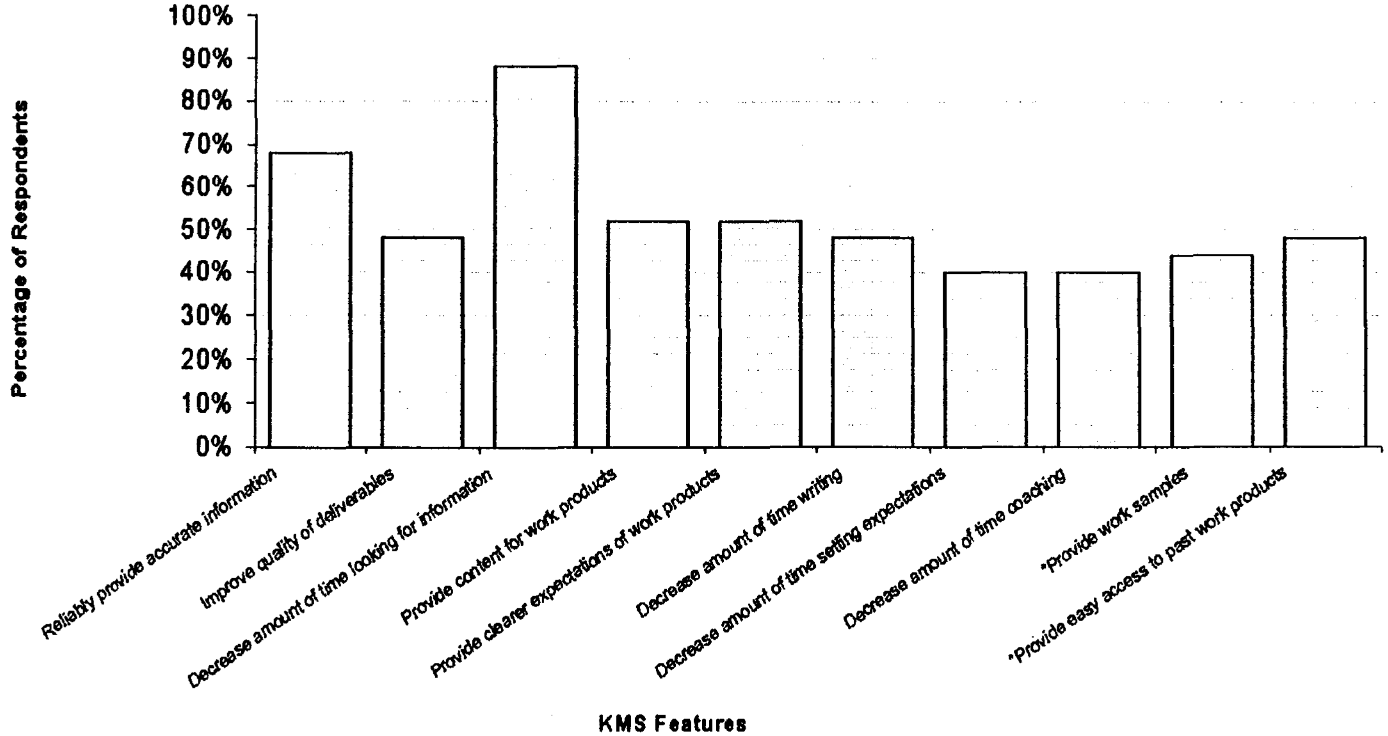

Figure 24. Perceived Features Included in Triad's KMS.

Summary of the Measures for System Objectives

While we did not have clearly specified numerical goals for the measures, we now have numerical results. It was not practical to try to determine optimal goals. The system should continually change to meet new needs. Therefore, it is difficult to predict how that change should affect the KMS. However, the results indicate Triad is managing its corporate knowledge better than before it implemented the KMS and the business outcomes should be positive.

The data provided in Table 31 are the results of the measures related to the KMS objectives. In a way, these data are baseline data in that this is the first full evaluation of the KMS. Triad has committed to an annual evaluation that will include a survey and some of the process measures presented in this research. Though it will not be as formal as required for this study, it will make comparisons possible. Triad should add a question included on the next survey that asks Triad people to estimate the percentage of time they find what they are searching for in the KMS. This, together with the data on problems identified and resolved, should help enable the KMS steering team to better assess the results.

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Table 31

Results: KMS Objectives and Measures

Objectives	Results
1. To re-use explicit knowledge (PSMs and work products) throughout Triad. For example, to re-use the format of one work plan in subsequent work plans.	Process measure: 23 work products converted into generic PSMs Performance measure: 100% of Farmington Hills projects have work plans and 71% of Grand Rapids projects have work plans
2. To identify the performance-support needs of Triad people. For example, to identify when people could benefit from a job aid designed to help them do something correctly.	Process measure: 43 suggestions Process measure: 204 new knowledge items created and implemented Process measure: 11 system-level improvements or needs identified
3. To store and organize knowledge items (PSMs and work products) so that employees can easily find them. That is, people generally find what they are looking for without much effort.	Process measure: 100% of technical problems related to individual PSMs resolved Process measure: 100% of system-level technical problems resolved (temporarily) Subjective measure: 64% of employees [frequently] using the KMS
4. To embed clear expectations for work products into PSMs so that individual performance meets Triad's standards. For example, to create a template for writing a work plan that has all of the sections that Triad expects to be in it.	Process measure: 29 templates Performance measure: 66 out of 74 average score in Farmington Hills, and 64 out of 74 average score in Grand Rapids for consistency of work products according to standards/attributes in the work plan template Subjective measure: 76% of employees think the KMS helps make expectations for work products clearer

Table 31--continued

Objectives	Results
5. To provide performance support (PSMs) to help employees become proficient in their job roles. For example, to provide process maps and checklists that Triad people can use to ensure they are doing the work the way it is supposed to be done.	Process measure: 207 knowledge items added Subjective measure: KMS saves employees, on average, 68 minutes each week Subjective measures: 92% of employees reporting a positive effect on employee development, 84% on productivity, 88% on quality of work, 80% on response time, 60% on development time, 56% on cost of sale, 60% on customer service, and 40% on customer satisfaction
6. To make explicit the connection between PSMs and Triad's core business process and business goals. That is, to make it clear where a PSM fits in the core business process and to make it clear how the output supported by the PSM affects Triad's business goals.	Process measure: 102 PSMs related to the client engagement process Process measure: 82 PSMs related to other business processes (e.g., recruitment and selection, KM business process, invoicing, and expense-reporting)
7. To foster a culture where Triad people develop and share new ideas for PSMs. That is, to encourage and reward Triad people for participating in the KMS by contributing to its improvement.	Process measure: 16 people made suggestions Process measure: 43 suggestions Process measure: 12 employees created or revised PSMs Process measure: 14 employees reviewed PSMs

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CHAPTER VIII

RECOMMENDATIONS

This section contains: (a) general recommendations concerning KM targeted for practitioners and researchers; (b) process recommendations regarding the implementation of a KMS; (c) design recommendations for Changepoint® regarding the KM functionality in their PSA (professional services automation) application, and for businesses wishing to implement a KMS; and (d) suggestions for future research.

General Recommendations

This section contains recommendations based on my experience of designing and implementing a KMS at Triad, the results from the study, and the literature I reviewed.

Collaboration Between Knowledge Management and Training and Development

When reviewing the literature, I was struck by the vagueness of the concept of KM. Depending on the descriptions and definitions you accept, KM could become an umbrella topic—a monster that is too large to manage effectively. Having a personal history in the Performance Improvement and Training and Development (T&D) fields, I was particularly aware of the blurry line between KM and T&D, and few

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authors commented on the resulting implications and problems. For example, Nonaka and Takeuchi define *organizational learning* as *knowledge creation* (Nonaka, 1994; Nonaka & Takeuchi, 1995). I can imagine how this type of thinking might eventually foster a fight for budget and corporate standing between T&D and KM if they are distinct functions in the organization.

In my opinion, performance improvement is the ultimate goal of both KM and T&D. While KM and T&D are both tools that can contribute to improved performance, neither field should attempt to improve performance by themselves or advertise they do (Carlile, 2002; Murray, 2000). KM and T&D "are two interrelated areas that, together, can support learning and performance in ways that differ from traditional training alone" (Carlile, 2002, p. 40).

The word *knowledge* in KM is misleading. It implies a responsibility to make individuals knowledgeable (knowledge creation) and to manage that knowledge creation. I believe that KM should focus on: (a) providing performance support and making it accessible at the time of need and (b) protecting the company from losing reusable intellectual assets; rather than making individuals knowledgeable (Mullett, 2000; Novins & Armstrong, 1997). Making individuals knowledgeable is too vague and too general. Helping individuals perform better should be the ultimate goal and that requires many environmental variables and tools in addition to T&D and KM (such as reward, measurement, and feedback systems).

However, several practical things can be done by both T&D and KM which will cumulatively accomplish a working level of collaboration. This collaboration will

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help both fields be more effective in contributing to performance improvement. For example, it is an accepted practice for T&D functions to have a learning strategy in place. "A learning strategy creates the foundation essential to align learning with business goals, and specifies a learning infrastructure, systems, and processes that are relevant and efficient" (Apking, 2003, on-line). This learning strategy should include a KM strategy (Coulson-Thomas, 2000), possibly owned by different business leaders in the organization. The KM strategy should outline how it will work with the T&D function to provide the appropriate performance support—explicit knowledge— on the job, after individual training events.

Furthermore, if the best strategy for transferring tacit knowledge is through training in the forms of on-the-job training, coaching, and mentoring (Wickert & Herschel, 2001), KM should work with the T&D function. The KM strategy should include how it will leverage the T&D function to achieve tacit knowledge transfer for each of the tacit knowledge needs it has identified.

Both researchers and practitioners need to develop, and then disseminate, agreed-upon, common standards and processes for KM (Loughridge, 1999), and better define the necessary collaboration between KM and T&D. Future research should focus on these common standards and processes for KM and on identifying areas of collaboration, practical tactics to achieve collaboration, and obstacles to, and outcomes of, collaboration.

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Quantity of Knowledge Items Contained in a KMS

As I was helping to design and implement the KMS at Triad, I was faced with a concern by a few managers that if we kept up the current pace of adding to the KMS, there would eventually be too much in the KMS and that might make the KMS become less user friendly, and ultimately less used. Recognizing that as acting KM administrator and author of this dissertation, my inclinations to add to the KMS might be biased, I have held off forming an opinion until now.

I have concluded that there should not be a concern about the quantity of knowledge items contained in a KMS (Dunford, 2000). This is supported by a survey conducted by KPMG in 1998 of 100 leading UK companies. They found that only 14% of the respondents reported that too much knowledge was a barrier to the success of their KM (KPMG, 1998).

I believe effort should not be spent on monitoring how much goes into a KMS for fear that there will be too many knowledge items from which to choose. Rather, effort should be spent on ensuring: (a) only items that clearly link to performance are included, (b) there are explicit rules that guide user behavior, and (c) that the system is functioning in a way that users can find what they are looking for and that it is always reliable (not out-dated). However, there are a few challenges that make these objectives hard to achieve.

In order to identify items that clearly link to performance, there needs to be a plan for identifying knowledge items to include for initial implementation, which I discuss later in this study. In addition, there needs to be a set of criteria for adding

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knowledge items to the KMS that clearly link to performance after implementation. The following questions may be helpful in determining whether items should be added to a KMS (Figure 25) after initial implementation.

1. Does this item clearly link to work performance?

2. If yes, is there a high probability that this item could and would be reused?

3. If yes, is the company at risk for losing significant time and resources if this item were lost?

4. If either yes or no, would using this item affect the quality of performance?

In order to instill rules that will guide user behavior, leadership needs to determine what those rules are and what the opportunities are for making those rules explicit. In addition, those rules need to be consistently enforced by management. Culturally integrating rules about how and when to use the KMS in everyday work practices and corporate expectations, and providing effective consequences, is essential in order to get users to use the KMS when and how they are supposed to use it.

In order to help users find what they are searching for, the KMS needs a taxonomy with effective naming conventions and a strategy for specifying the right key words that help users find what they are looking for. In addition, there need to be sufficient triggers built into the maintenance of the system that alert KMS managers when individual knowledge items need to be revised. This can be hard to achieve because of the domino effect. In other words, if you revise one knowledge item, you may need to revise three additional knowledge items as a result. If knowledge items

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are not maintained, users will not find the KMS reliable.

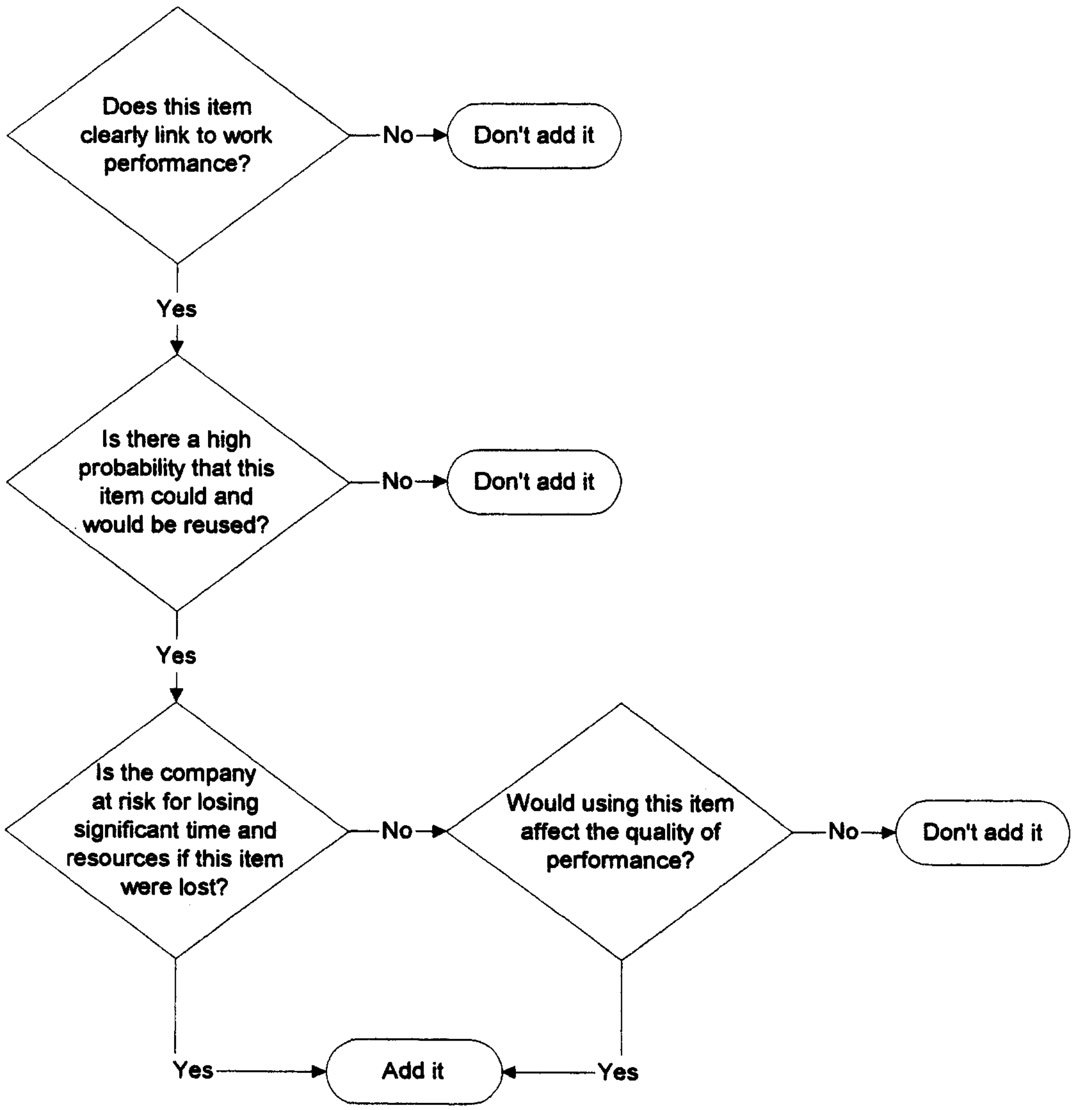

Figure 25. Decision Aid for Adding to the KMS.

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Process Recommendations

Identifying Knowledge Needs

As a Triad employee, I had a familiarity with their business and knew of various knowledge needs. If I were asked to design a KMS for a company without having this familiarity, I would not have the benefit of such a personal history. Identifying knowledge needs and supporting knowledge items is a huge task, which so far, I have not given practical recommendations for accomplishing. The following is my suggestion for how KMS designers or practitioners might work with a client company to identify knowledge needs and supporting knowledge items.

First, return to Brinkerhoff and Apking's concept of high-impact learning (2001). They created the concept and tool of *impact maps,* which they define as follows:

> An impact map is a visual representation of the linkage, or the *line of sight*, between a job position or a functional role and how the capabilities (skills and knowledge) for that role influence key business results of the organization. In other words, the impact map shows how learning is linked to *impact*. (2001, p. 60)

Impact maps can be used during the design of instructional interventions (either systems or products), during the evaluation, anywhere in between, or all along the way. In addition, Brinkerhoff and Apking (2001) suggest various variables (portrayed in impact maps as columns) that may be useful, depending on the situation.

I recommend applying the *impact map* concept to identify performance-supporting knowledge items. In a KMS application of impact maps, I recommend that

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an impact map is used to link knowledge needs to (a) performance, (b) business processes, and (c) business results. In addition, if the client already uses impact maps as part of their learning strategy, KMS designers may use existing impact maps as a starting point and modify them.

See Table 32 for an example of how an impact map might be constructed if it were used to identify knowledge items to support performance. The table is intended to indicate the linkage that might have been identified at Triad using a few real examples. However, at Triad, we used an abbreviation of this method. Because of our familiarity with, and expertise in, high-impact learning, we intuitively applied this logic when we identified knowledge items for Triad's KMS during the Design phase (as evidenced in Appendix D).

The following is a description of the actual steps that a consultant might use to identify these variables for any given company.

1. Identify the desired business results that are driving the request, or opportunity, for a KMS.

2. Identify the business processes that are in place to achieve those business results. However, specifying roles instead of business process might also work if the company has already documented impact maps using organizational roles, and if (a) those roles were mapped to business results, and (b) those business results are consistent with the business results driving the KMS implementation.

3. Specify the performance requirements indicated by those business processes—both behaviors (or "critical actions") and work products.

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Table 32

An Impact Map Used to Identify Knowledge Needs

4*.	3.		2.	1.	
Knowledge Needs	Performance		Process	Results	
Knowledge Items	Critical Actions (Behavior)	Work Products (Accomplish-ments)	Business Process or Role	Unit Business Goal	Business Goal
Work Plan template♣ Work Plan samples (exemplary examples) ♣ Project Status Log template♦ Project Status Report♦ Past work plans (work products) ♦	Manage project scope and budget	Work plan approved by client Project status communicated to client	Client engagement process	Profitable projects 100% customer satisfaction	Increase sales

♣ Already exists, can be used without modification

♦ Create after implementation

* Numbers indicate a suggested order in which these variables might best be defined or identified.

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Table 32—continued

4.	3.		2.	1.	
Knowledge Needs	Performance		Process	Results	
Knowledge Items	Critical Actions (Behavior)	Work Products (Accomplish-ments)	Business Process or Role	Unit Business Goal	Business Goal
Design Criteria checklist ♥ Web Infra-structure Questionnaire form♥ Design Document samples (exemplary examples)♠ Past design documents (work products) ♠ Articles on common topics in the training industry (e.g., leadership) ♠	Design deliverables	Design document approved by client Client technological capabilities identified	Client engagement process	Profitable projects 100% customer satisfaction	Increase sales

♥Create before implementation
♠Exists, revise after implementation
* Numbers indicate a suggested order in which these variables might best be defined or identified.

4. Identify the various types of knowledge items that could support those performance requirements.

This is consistent with Brethower (1995), who suggested "we can identify the knowledge-base needed for specific results and products if we work backwards from results to identify products, from products to identify competent performance, and from competent performance to identify knowledge, skills, and attitudes" (p. 21). Brinkerhoff and Apking (2001) created the impact map tool to help identify these linkages and I have applied the impact map tool to the design of a KMS.

In addition, consider applying a symbolic convention that specifies follow-up action for each knowledge item identified. This should be valuable information that can be used when creating a tactical work plan to manage the development of the KMS. Use this convention to specify:

1. The knowledge items that already exist in some form that can be used without modification for initial implementation.

2. Those that need to be revised in time for implementation.

3. Those that can be included as they are but need to be revised after implementation.

4. Those that need to be created before implementation.

5. Those that need to be created after implementation.

Designing the Taxonomy

To review, I defined the term *taxonomy* as an organizing structure—or a

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hierarchical tree of categories (Roberts-Witt, 1999)—in which are contained knowledge items, naming schemes, and rules for creating key words (Adams, 2001; Delio, 2001).

I recommend that KMS designers use the impact map tool to identify knowledge needs and related knowledge items first, and then design the taxonomy. At Triad, we identified knowledge items and designed the taxonomy somewhat concurrently. Again, due to my personal history at Triad and because Triad is such a small company with a small organizational structure, designing the taxonomy while selecting knowledge items at the same time proved to be somewhat successful. However, in a new or unfamiliar setting, or when the company is large with a complex organizational structure, identifying knowledge items to support various knowledge needs first may be necessary in order to design an effective taxonomy.

Design Recommendations

This section contains design recommendations to Changepoint® and to businesses wishing to implement KM in their companies.

Changepoint®

Triad was using the Changepoint PSA application to manage its business processes and since it contained KM functionality, Triad decided to use Changepoint® to implement its KMS. The Changepoint application has other functionality that Triad is also using that is not classified as KM, but that also assists

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Triad in managing knowledge. For example, the customer relationship management component helps Triad manage its clients more effectively than without it. The following design recommendations are based on the KM functionality available in the Changepoint application, version 6.3.

1. Allow more levels of organization for the taxonomy. Changepoint® allowed for two levels of organization (e.g., categories and subcategories), whereas three or four would have been better for Triad's knowledge needs. Other companies may require a different number of levels.

2. Provide a mechanism to mark knowledge items with dates for expiration so that knowledge managers are automatically notified when individual knowledge items need to be reviewed for either removal or revision. Similarly, provide a mechanism to link knowledge items so that when one knowledge item is removed or revised, knowledge managers are alerted to the domino effect on the linked knowledge items. This could be accomplished by providing a field in the Add Knowledge-Item dialog box, which allows the knowledge item creator to select other knowledge items that might be effected if this knowledge item were removed or revised. In addition, there should be a field to select various environmental triggers (for example, hiring new employees and the months of the year) that may affect whether or not this knowledge item needs to be reviewed.

3. Provide more control for knowledge managers to restrict access to knowledge items based on departments, roles, or resources. Changepoint® allowed the individual who created the item to restrict access to everyone else (e.g., private

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access) and for users to subscribe or unsubscribe to the category or subcategory in which the knowledge item was categorized (e.g., public access). In neither case, could knowledge managers or system administrators restrict access to certain groups of people (e.g., roles or departments) or to individual people (e.g., resources).

4. Modify system administrator access so that knowledge managers or system administrators can open and edit all knowledge items regardless of who created the knowledge item. Changepoint® only allowed the person who created the knowledge item to edit or delete that knowledge item. If that person leaves the company, it is difficult to edit or delete any knowledge items they added. To address this, we had to create a user ID to be used by whoever added a knowledge item so that anyone with access to that user ID would be able to edit or delete it. However, this user ID takes up a license and appears as a resource (a person) on any Changepoint reports that include resources (such as on an employee list).

5. Provide a counting mechanism on knowledge items to track the "number of hits". Individual knowledge contributors can use these data to see how often their contributions are accessed, which is a way for contributors to seek out non-threatening feedback on the value of their contribution (Dorey, 2000). In addition, knowledge managers can use these data to assess the value and usefulness of individual knowledge items.

6. Offer a configurable interface that can be designed to accommodate the organization's structure, business processes, and culture; and that uses visual cues to help users find what they are looking for. For example, other vendors allow

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companies to design and use graphics of things like organizational structures or business processes. Users can click on parts of these graphics to drill down to the knowledge items they are looking for. This kind of interface may help users interact more frequently and more meaningfully with the taxonomy, which may help shape their ability to find what they are looking for.

7. Allow users to search knowledge items by various attributes such as date of creation or type of knowledge item (such as hyperlink or Microsoft Word document). Changepoint® only allowed searching by key word or phrase, and by category and subcategory. This makes it more difficult for users to narrow their search. In addition, the search feature should search titles of knowledge items instead of only specified key words.

8. Provide more help to knowledge managers in specifying key words. This might take the form of sharing best practices when consulting with the purchasing organization during initial system design or providing automated prompts when users add a knowledge item. In addition, do not limit the number of characters on the field where key words are entered.

9. Once full integration with the Microsoft Outlook application is achieved (which Changepoint® plans to do), allow email messages, notes, and other Outlook items to be added as knowledge items.

Businesses

The following design recommendations are for businesses wishing to

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implement a KMS.

1. Invest in a computer application that will help you manage your core business processes that also has KM functionality (such as a PSA or an ERP) rather than a stand-alone KM application. This kind of application will help integrate KM with the larger business activities and key processes of the organization. If investing in a new computer application like this is not feasible, start with a small database (such as Microsoft Access) that is easy to use and relatively inexpensive to implement and maintain. This will require applying the right resources (possibly external resources) to design a taxonomy and user interface to help users readily find what they are searching for (Wickert & Herschel, 2001).

2. Reward knowledge sharing. In a survey conducted by KPMG in 1998 of 100 leading UK companies, 39% of the respondents reported that their organization did not reward knowledge sharing and considered this their biggest drawback to storing and sharing knowledge (KPMG, 1998). If a company is unable to invest in elaborate or monetary reward systems, executive leaders and managers can provide effective rewards in the forms of recognition and praise for contributing to the company's knowledge base and for using items contained in the KMS. In addition, incorporating knowledge-sharing behaviors into performance reviews and feedback systems will provide the necessary prompts to executive leaders and managers to give users feedback on knowledge sharing.

3. Conduct an annual KM think tank session internally to identify knowledge gaps. Maintaining and continually improving a KM system requires focused effort

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and must be visibly supported by executive leaders and managers. Many organizations hold annual (SWOT) sessions in which they involve their employees in identifying the organization's Strengths, Weaknesses, Opportunities, and Threats as a precursor to annual business planning. Similarly, an annual effort should be organized to include all employees in brainstorming improvements to, and problems with, the KMS. This should not only reap good suggestions that can ultimately be implemented for the betterment of the system, but will be a visible sign to employees that executive leaders and managers are committed to KM and expect the same of their employees.

4. Culturally integrate KM into the organization. There were many suggestions for this earlier in this paper. However, some of the most important are incorporating KM goals into the annual business plan, job descriptions, and formal feedback systems (Smith, 2000). In addition, managers should reference relevant knowledge items in staff meetings and provide feedback when work products are inconsistent with the PSMs provided in the KMS.

5. Use the KM database for explicit knowledge and rely on training interventions for tacit knowledge needs. Do not try to address tacit knowledge needs in a knowledge base. Trying to accomplish this will make the implementation more expensive and it will likely have minimal success. In order to transfer tacit knowledge, companies should invest in training- "the only successful approach" (Wickert & Herschel, 2001, p. 330).

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Suggestions for Future Research

The following are suggestions for future research that may help complete the KM literature base and provide useful direction to KM practitioners and businesses wishing to implement KM programs.

Gather and analyze data from companies exploring the issue of centralized vs. decentralized management of KM. I found very little information in KM literature on the issue of centralized vs. decentralized KM management practices. At Triad, we kept the KM administration role centralized in that only a few people in one location were responsible for physically adding knowledge items to, and removing knowledge items from, the KMS. It would be helpful to know of the problems, and solutions to those problems, of having more groups spread throughout the organization responsible for this function.

Document and evaluate methods for capturing lessons learned and best practices. The idea of capturing lessons learned and best practices is appealing and the benefits are not hard to imagine. However, from a practical perspective, how do organizations actually accomplish this in a way that leverages those lessons learned and best practices? I have not found any research that documents how to go about incorporating this objective into everyday work practices. In addition, how, other than keeping a list, would a company store lessons learned and best practices? Having one single list for each would not be user friendly because it would be difficult to find the right lessons or best practices at the right time in the right situation in order to apply

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them. Researchers need to focus on identifying what kinds of lessons learned need to be captured for various kinds of businesses and what types of technology can be used to store and organize those lessons learned and best practices in a way that users can apply them in new situations.

Develop and test KM evaluation methods and tools. The impact of KM is hard to measure (Mullett, 2000; Myers, 1999). To date, it has largely been literature on intellectual capital that has focused on KM measures (Petty & Guthrie, 2000). However, this literature base seems to be written for an audience with an accounting background such as Chief Financial Officers who are largely not involved in the design and implementation of KMSs. Therefore, there seems to be a gap in knowledge for KM practitioners regarding useful KM measures. This is evidenced in a survey conducted by KPMG in 1998 of 100 leading UK companies, where less than one-third of the respondents reported developing or planning to develop an intellectual capital measurement initiative (KPMG, 1998). Furthermore, in a survey conducted in February and March of 2002 with 740 respondents, 65% of the respondents reported that they do not have performance metrics in place to measure the financial impact of their KM efforts (McDonough, 2002). Even within the accounting field, there is difficulty evaluating intellectual capital by the prevailing accounting rules that are traditionally used to evaluate physical capital (Nasseri, 1996). You cannot measure intellectual capital or KM return on investment by sampling physical activity or units per day of output (Barker, 2001). Chief Financial Officers often find it difficult to measure the benefit their companies are reaping

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because there are no general tools for measurement that can be used across companies to provide competitive comparisons. Abramson (1998) finds that there is no consensus about how to measure a company's return on investment for knowing and learning, or for building and managing a company's knowledge (Mullett, 2000). Researchers from both the accounting and KM fields need to develop measures that provide useful return on investment for KM programs and these measures need to be disseminated clearly in the KM literature base.

Develop standard KM terms and processes. All "methodologies and tools for effectively performing knowledge management are in their infancy" (Mullett, 2000). As the field of KM is in its infancy, most literature is either conceptual or does not clearly document detailed procedures in a way that future studies can replicate. There seems to be a fight to the finish line for branded methods, each offering a slightly new twist on KM instead of a concerted effort to identify common success factors, standard terms and effective processes (Weathers, 2000). One area that needs substantial more research is that of taxonomy design. For example, in order to design a taxonomy that largely contains explicit rules and facilitates implicit rules for using the knowledge items it contains, I believe the types of knowledge items it will contain should influence how the taxonomy is designed. However, more research needs to be done in order to: (a) more completely and credibly identify the various types of knowledge items, (b) identify potential relationships between types of knowledge items and types of performance, and (c) identify the resulting implications to the taxonomy.

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Appendix A

Glossary of Terms

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Appendix A: Glossary of Terms

Term	Definition
Contingency-shaped behavior	Behavior controlled by direct consequences.
Corporate knowledge	The "umbrella" for all subordinate knowledge within an organization—also referred to as intellectual capital or business intelligence.
Cross-functional team	A group of employees who represent the different functions in the organization such as, sales, operations, finance, or manufacturing.
Data	In this paper, data are verbal stimuli without the potential to evoke a response.
Expertise	In this paper, it is defined as behavioral fluency or fluent performance.
Explicit knowledge	In this paper, it is defined as rule-governed behavior.
External capital	Customer-related knowledge and customer relationships.
Functional group	Employees from one organizational division such as sales, operations, finance, or manufacturing.
Human capital	The collective knowledge that comes from all workers, including tacit knowledge.
Information	In this paper, it is defined as verbal stimuli or conditional verbal stimuli with the potential to evoke a response.
Intellectual capital	The economic value of two categories of intangible assets of a company: (1) organizational (or structural or internal) capital as opposed to external, customer-related capital, and (2) human capital.
Knowledge	In this paper, it is defined as a hypothetical construct that describes a change in behavioral repertoire or the ability to describe a functional relation.
Knowledge item	A unit of codified knowledge—also commonly referred to as a knowledge object.
Knowledge management	The guidelines, policies, and practices that an organization uses to create and transfer the right information in order to support the performance of the people in the organization.

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Term	Definition
Knowledge management system	The organized structure, or system an organization uses to accomplish knowledge management.
Knowledge need	An opportunity to support performance through the provision of data and/or information.
Large business	In this paper, it is defined as an organization that employs between 100-999 people or earns annual revenues between $150 million and $1 billion.
Middle-market business	In this paper, it is defined as an organization that employs more than a 1000 people or earns over $1 billion in annual revenues.
Performance gap	In this paper, it is defined as (a) something prescribed by the organization that is not happening now but should be happening, (b) something that is happening now that should not be, or (c) something that is not prescribed by the organization yet and thus, is not happening now but should be.
Performance Support Mechanism (PSM)	A term coined by Triad Performance Technologies, Inc. to mean a type of knowledge item that supports performance; said another way it is an inputs to work as opposed to an output.
Rule-governed behavior	Behavior controlled by rules (verbal descriptions of contingencies).
Small business	In this paper, it is defined as an organization that employs 500 or fewer people or earns less than $150 million in annual revenues.
Structural capital	Proprietary knowledge such as branded methods and tools—also referred to as organizational capital.
Tacit knowledge	In this paper, it is defined as contingency-shaped behavior.
Taxonomy	A hierarchical system of classification that groups knowledge items under the appropriate categories, naming schemes for knowledge items and a key-word strategy.
Work products	A type of knowledge item that is an "output" of work such as deliverables and other interim work products.

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Appendix B

Client Engagement Process Disconnects

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Disconnects

The following are a list of disconnects identified by the Learning & Performance Support Client Engagement Process Design Team during the "Is" analysis. A disconnect is anything that impacts the efficiency or effectiveness of the process.

The following is a list of the main themes emerging from these disconnects.

- It is understood that gaining key accounts is the long-term goal; what's unclear is the acceptable times and conditions under which area offices can and should deviate from that goal.
- There are no clear procedures for selecting the appropriate size and scope of projects that fit Triads human resource and technology capacity.
- There is a lack of consistently applied procedures for defining a project that enables an effective transition from getting work to designing / developing work.
- Technology concerns:
  - √ Infrastructure capable of meeting current and future market demands
  - √ When and how to integrate technology effectively into projects
- Information on Triad staff and freelancers is not easily accessible for project planning and assignments.

Table Headings Key

#: A sequential number for the disconnects that will stay constant so that disconnects can be referenced across documents.

Step: The Should Process Map macro step(s) in which the disconnect should be considered during the design of the process.

Level: (*O= organization*, *P= process*, *J= job/performer*) The foremost level in the organization wherein the disconnect needs to be resolved (recognizing that after initial action is taken, it may become more relevant at other levels of the organization). Disconnects requiring action by the process will be added to the Process Design Open Issues Log.

Disconnect: A description of the disconnect

RASI: *R=* The people, groups, departments who are *responsible* for resolving the disconnect, *A=* or need to *approve* the resolution, *S=* or *support* the design of the solution, *I=* or be *informed* during the design of the solution.

Impact: The impact of the disconnect

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
1.	Find It	1-3	O or P	Revenue goals drive selecting prospects. There are no clear criteria for selecting prospects for newly formed Area Offices (AO) and key-account criteria get set aside in order to generate revenue. Key account criteria are disregarded when there is a need to: • Develop new people (e.g. Athena) • Gain new skill sets for experienced Triad staff (e.g., Optima – pay for performance)	Sales Design Team (R) SIT (A)	• Keep current staff utilization rates up. • Misused opportunity because too scattered and not focused on selected few	Data
2.			P	No tools available for selecting prospects • No specific people designated to do sales in AO	TIPSS (R) Sales Design Team (A)	• Resource allocation across offices	Instruments-KM
3.			O	There is no established limit on number of companies to pursue per AE • No corporate AEs or Sales Team	Sales Design Team (R) Ted & Dave (A)	• Misallocation of resources • Inconsistency across Area Offices	Data

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
4.	Get It	1	O	It is unclear what project sizes we really want to be able to go after. How are we aligning overall Triad business-to-market goals? How are we positioning ourselves in the marketplace and our capacity to deliver?	Sales Design Team (R) SIT (A)	• Planning/aligning forecasting with capacity and revenue • Sales • Ability to reach goals • Quality of life/ employee morale • Recruiting	Data
5.		1	O	Current account plans don't have a set of criteria for qualifying prospects across different AO markets	Sales Design Team (R) Ted & Dave (A)	• Sales	Data
6.	Get It	5	O	It is unclear in a competitive bidding situation, where we want to come out on bottom-line price. Do we want to come out closer to the high end or middle of the pack? Is it dependent on account, strategy, or on geography? • In a competitive bidding situation, when we change our price to get the job, do we change sell rate or hours needed to do the job? We shouldn't change hours.	Sales Design Team (R) Ted & Dave (A)	• Planning/aligning forecasting with capacity and revenue • Sales • Ability to reach goals • Gross Margin	Data

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
7.		5	O	Don't have a robust enough internal technical infrastructure (e.g., Server banks and network). Don't have the back-end support to handle current & future project demand.	IS (R)	• Lost work opportunity • Insecure working environment • Are we a boutique or are we a player?	Instruments-infrastructure
8.		5	O	With new and small AO, insufficient capacity to do large projects is a problem in getting large contracts • Large contracts can be nice if you have enough time to do them (e.g. $1.5 m in 3 years) but can result in resource & capacity strain in short time frames (e.g., 1.5 m in 6 months)	Sales Design Team (R) SIT (A)	• Resource allocation problem	Instruments-infrastructure
9.		5-6	P	There are no tools for follow-up • Sales tracking system • Management system • Marketing database	TIPSS (R) Sales Design Team (A)	• Sales • Revenue generated	Instruments-KM
10.		6	P	Customers ask the same or similar questions, yet we don't strategically use those questions to prepare for presentations. • No boiler-plate presentations available to re-use	PS (R) TIPSS (I) Sales Design Team (A)	• Sales cycle prolonged • Time and cost increases • Wasted time on writing	Instruments-KM

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
11.	Get It	6	P	No capability to determine Triad staff qualifications by: • Project work — Type — Length/size — $ value — # of people involved • Area of expertise (e.g. Content & technology) • Education/years of experience	TIPSS (R) HR (A)	• Increased time to search for information • Missed learning opportunities • Missed sales opportunities	Instruments-KM
12.	(throug h-out)	8 +	P	Different titles & terms across AO • PIM/SOW • Work plans/proposals/concept-shaping documents • Contracts/letters of agreement • Process methodology and terminology referring to the process methodology (e.g., what levels is a phase, activity, task, etc.) so that we can communicate with each other about the process	PS (R)	• Difficult to communicate across area offices • Lose efficiencies when: — Developing new people — Transferring people — Leveraging people across projects or area offices	Instruments-KM
13.		6	O	There is a conflict between nonbillable work, such as writing RFQ's / proposals and developing prototypes, and billable work. (i.e., balancing the two) • Reward system only considers billable utilization rate	SIT (R)	• Less effort into nonbillable work that may be critical to future growth and success in the field • Staff work too hard to try to accomplish both	Data

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
14.		6	P	Proposals are tedious to write and are not boiler-plated into pieces that can be easily extracted and reused • Electronically archived and stored on CD makes it difficult & time consuming to retrieve • No system for easily searching for or finding proposals	PS (R) TIPSS (I)	• Extra time spent reinventing the wheel • Lost opportunity to re-use best-practice examples	Instruments-KM
15.		6	P	Quoting template is based on activities while the proposal is based on deliverables and there is no clear link between activities and deliverables. • Separate deliverables may require separate quotes rather than all deliverables quoted by phase	PS (R) TIPSS (I) SIT (A)	• Accuracy of quotes • Quoting template is cumbersome to use & to translate activities price into deliverable price	Instruments-KM
16.	Get It	5-6	P	Don't cleanly identify pre-sale costs (proposal writing costs/ prototype costs) and re-cover some/all costs in the project. • People new to the role do not have tools to enable them to know how much sales cost should be recovered and when	PS (R)	• Profit margin • Revenue	Instruments-KM

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
17.		7	P	No method for capturing lessons learned across AO when we get and/or don't get awarded projects	PS (R) TIPSS (I)	• Repeat some learning over & over • Spend time on the same part of project again • Lost opportunities to improve the sales process	Instruments-KM
18.		6	P	During quoting or at the beginning of the project it is known that there are not enough resources. There are no clear strategies for gathering required resources. • No way to track staff availability from one AO to another. • No process for logistically getting one person to another AO to work temporarily	PS (R) TIPSS (I)	• Project opportunities lost • Take a project which you can't deliver • Client dissatisfaction • Poor quality • Employees work too hard	Instruments-KM & process

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
19.	Design It	8	P & J	Resource availability while doing a project becomes strained because: • Client schedule slippage • Multiple projects that land at the same time (although quoted separately) • Difficulty managing/prioritizing time • Steps take longer quoted • Emergency projects that come up that weren't planned for (proposals, etc.). • Illnesses • Staff or freelancer turnover or lacking sufficient skill sets	PS (R)	• Client dissatisfaction • Poor quality • Employees work too hard • Cost overrun	Instruments-infrastructure
20.	N/A	N/A	P	No efficient methods for transferring *large files* • specific to new area offices/ area office development (e.g., MNAO)	IS (R) TIPSS (I)	• Inefficient project work	Instruments-process

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
21.	Design It	8	P	Unclear process for hiring technical freelancers. For example: A B AO AO D3 FL D3 FL FL FL FL FL • Who has recruiting burden for technical freelancer? • If D3 doesn't have capacity, is it back to AO to find resources?	D3 (R) TIPSS (I) SIT (A)	• Inefficiencies in staffing projects • Miscommunication	Instruments-process
22.		N/A	P	Available templates & tools is not known in new AO (what, when to use, and how to use).	TIPSS (R)	• Inefficiencies in project work • Increased cost & time	Instruments-KM
23.		8	P	Need fresh set of templates for freelancer contracts. They do not take into account all situations for using freelancers	PS (R)	• Critical information not communicated • Time wasted spent writing new contracts	Instruments-KM

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
24.		8	P	At project definition, not consistently asking about housing of materials produced (e.g., will it be on the web). Failing to discuss how we can meet both short- and long-term needs for product or service delivery. • How is the product going to be used for on-going training once initial "big push" is over? • E.g., With Steelcase it is usually after launching a product, the client hasn't thought about how they will house that training so that it is available for people that they hire after the initial launch training).	PS (R)	• Retrofitting a solution, not done as efficiently as you could have done it. • Change in project scope & cost (PCN) • Lose credibility with client • Profitability/gross	Instruments-process
25.	Design It	8	P	Time for long-term maintenance is not always built into the original budget	PS (R)	• Change in project scope & cost (PCN) • Lose credibility with client • Customer satisfaction	Instruments-process
26.		8	P	Don't have a robust template for defining scope of fixed fee projects • How many graphics, number of reviews, number of prototype iterations • Quoting template doesn't get at scope but just at hours and cost	PS (R) TIPSS (I) SIT (A)	• Client dissatisfaction • Profitability • Client doesn't understand what constitutes a change and the implications	Instruments-KM

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
27.		8	P	Need to include D3 information in Status Report	PS (R)	• Inefficient project management of D3 people & resources	Instruments-process
28.		6.2	P	Technology design specs may be coming later than they should (need to happen at a high-level in 6.2 and get more specific in 9)	PS (R) D3 (I & A)	• Recommend solutions that aren't feasible • Over run on costs • Lose credibility with client	Instruments-process
29.	Get It & Design It	6	P	If quoting before the group design meeting, then after the meeting if there are significant changes, a PCN is required. Whereas efficiencies could be gained by doing Time & Materials through project definition and then quote the fixed price after the group design meeting.	PS (R)	• Time and cost of re-quoting/PCN • Added administrative work	Instruments-process
30.	Design it	10.3	P	Client requirements dictate when technology prototypes are developed and approved • E.g., One client doesn't want to see a design doc, just a prototype and another client wants to see a design doc first and the prototype later	PS (R) D3 (I & A)	• Without design document, it is more difficult to know if prototype will match customer requirements and provide direction for development staff • Lack of standardization makes working between area offices more difficult	Instruments-process

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
31.	Design It	10-11	P	Needs to be a formal audit between the design document and the deliverable developed to ensure content and objectives are covered	PS (R)		Instruments-process
32.	Make It	11	P	No systematic way to do internal reviews	PS (R)	• Causes high-level/or Triad management to do reviews (test script) • Doesn't get worked into the schedule or budget	Instruments-process
33.		8	J	Project manager may not have the experience in managing technology projects and lacks focus on the technology piece- puts a strain on the D3 team.	PS (R)	• Inefficient (collaboration isn't easily accomplished) & ineffective (not paying attention to detail) reviews	Capacity

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
34.		N/A	P	Need a systematic diagnostic process for identifying and fixing tough software bugs and communicating resolutions to other technical staff such as: • Documented resources • User groups • Discussion lists • Technical-support phone numbers Note: Need more clarification of what this is referring to: If these are bugs within a project, this is owned by D3 but if these are bugs within Triad's existing technical environment this is owned by IS.	D3 & IS (R)	• Rework • Time delays • Rework, cost, schedule delays, and client disappointment	Instruments-process
35.		10	P	There are no internal technical specs, technical standards document, or technical style guide that can be used from one project to the next. • Guidelines for development of technical projects used for internal reviews	D3 (R)	• Lost time for project manager, repeated errors and, if not fixed, client satisfaction	Instruments-KM

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
36.		N/A	P	New AO are reinventing the wheel. Best Practices examples would be helpful.	TIPSS (R)	• Inefficiencies in project work • Increased cost • Profit margin	Instruments-KM
37.	N/A	N/A	O	No virtual working environment (e.g., NetMeeting)	IS (R) TIPSS (I)	• Credibility with client, clients expect it • Lack of credibility with clients	Instruments-KM
38.	N/A	N/A	O	Need balance between the standard technology package and having the ability to support and keep up with the rapidly changing technology demands of the field • This is specific to new area offices/ area office development (e.g., MNAO) • Need to have an ability to add/use technical tools/new technology in a moment's notice • Not all AO have production stations and the standard technology package on staff computers may not be sufficient	IS (R)	• Can't complete work when we need to • Ability to attract & retain top talents • Technical staff turnover (unhappy with environment-too button-down)	Instruments-infrastructure

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
39.	Design It	6.2 & 8	P	PCNs can become a way to disappoint first-time clients, especially in a competitive-bid situation. • Some AO spend time up front educating the client • If it is a sales situation , may or may not want to be hard hitting with the implications of PCNs • PCNs could be a result of not covering 1 – 2 points in the PIM / SOW • Not documenting enough requirements up front	PS (R)	• Client satisfaction • Project budget • Gross profit margin	Instruments-process
40.	Design & Make It	N/A	P	Variation in client sign-off at major milestones, no standard Triad protocol • Don't have a standard usability testing process to use with clients and often it just doesn't get done	PS (R) D3 (A) TIPSS (I)	• Cost • Rework • Client satisfaction (potential conflict) • Might blow the budget • Use the client's method, don't do it at all, or it's poor quality • Credibility with client	Data

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
41.	Deliver It	11-12	P	Need an internal audit of items to hand over to client at the close of the project for Triad to use to help deliver the solution • Not clear who owns maintenance/final copy? Should be specified in project definition • Archiving is inconsistent and files are not quickly retrieved when needed for area offices not located in FH	PS (R)	• Excessive follow-up (time) • Client dissatisfaction (late to client) • Duplicate process between AO which upsets the IS dept.	Instruments-process
42.		11-12	P	No standard timing and no trigger for sending customer satisfaction survey	PS (R) TIPSS (I)	• Some surveys don't get sent/ lost opportunity for evaluation and feedback	Instruments-process
43.		11-12	P	Inconsistent in holding debriefs meetings. Lessons learned are not captured and there is no methodology that integrates those lessons into the process or performance support mechanisms, etc.	PS (R) TIPSS (I & A)	• Make the same mistakes over and over • No performance feedback • Potential client dissatisfaction if you're neglecting issues	Instruments-KM & process

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
44.	N/A	N/A	O & P	How does Triad remain competitive on sell rate? Are high skills people doing too much lower-level skilled work? • Binder management (who buys, creates tabs, spines & covers, etc.) • Administrative • Graphics production (e.g., Cropping screens) • Which CA model does an AO use?	SIT (R)	• Increased cost to client • Inefficient use of time • Cost • Not being competitive	Data & Instruments-process
45.	Deliver It	12	P	Sporadic & inconsistent use of evaluation on projects. Inconsistent practices evaluating within Triad.	PS (R)	• Hurts ability to market and sell services (no value proposition to BR while selling the next project) • Lose client credibility • Lose T&D industry credibility	Instruments-process
46.	Invoice it	18	P	No way for Accounting to track the Freelancer invoices when they are sent directly to AO project manager	PS (R) Bruce (A)	• Dissatisfied freelancers when money is late (can be delayed up to a month or more) • Increased cycle time for freelancer invoice approval	Instruments-process

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#	Phase	Steps	Level	Disconnect	RASI	Business Impact	BEM
47.	Design It	8	P	TRAC has no ability to cross reference projects by area offices and no ability to track transfer costs for Project Managers	TIPSS (R)	• Difficult to accurately track AO profitability • Extra work, cost • Inconsistent practices • Difficult to make good decisions about resource allocation	Instruments-KM
48.		8	P	It's unclear how Project Managers should use TRAC to track project budget & profitability (TRAC won't give you a profit margin but will give you a break down of costs)	TIPSS (R)	• Difficult to manage profitability of project managers	Data
49.	Invoice It	18	P	Freelancers are submitting invoices at the first of the following month instead of at the end of the current month. This puts the expenses in a different month than the revenue is recognized.	PS (R)	• Margin for error (e.g., Double billing client) • Rework & extra work by Finance (increase processing time up to 1 week) • Freelancer contract may be impacted • Cash flow • Missed or lost client credibility	Instruments-process
50.		20	P	Monies received approximately every 42 days	PS (R)	• Restricts cash flow	Instruments-process

Appendix C

PSM Types and Descriptions

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PSM Types and Descriptions

PSM Type	Appropriate Use (Use when you need to...)	Description (criteria)	Standard Application for Creation
Biography	• Provide someone's work and education history/experience.	• In Triad formats, either narrative or with bullets	• MS Word
Checklist	• Provide a prompt to verify completed activities or achieved standards/criteria	• Lists activities to be completed or standards to be achieved • If activities differ by role, roles and responsibilities are clear	• MS Word
Decision Aid Or Decision matrix	• Guide someone through making a subjective decision	• Provides for pertinent if-then scenarios • Is not an objective calculation (in that case, use a worksheet)	• MS Word
Flowchart	• Depict a procedure graphically that includes decisions and roles are not important	• Depicts activities graphically • Represents chronology or sequence in a top-down format	• Visio
Form	• Collect information or data	• Provides fields to be completed by a user • Specifies who should fill out which fields and any hand-offs • In Triad's Form template • Uses electronic fields with online help text where possible • Provides hyperlinks to other documents referenced on the form	• MS Word
Graphic	• Provide art work such as graphics and logos	• Provide the path for users to be able to insert the graphic via "Picture Insert From File"	• Any
Guidelines	• Communicate expectations and best practices	• Communicates best or recommended practices that employees are encouraged to follow • A higher-level of scrutiny by the KMS steering team • Not step-by-step	• MS Word

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PSM Type	Appropriate Use (Use when you need to...)	Description (criteria)	Standard Application for Creation
Job aid	• Provide a performer with auditory or visual signals that offer directions for carrying out increments of a task when it is not important to do the task by memory	• Provides instructions for using the job aid • Provides standards or criteria for the work product • Can include characteristics of other PSMs all rolled into one PSM (such as a checklist, a process map, etc.) • Its value is to help the user to complete a given task or create a work product	• Any
List	• Provide information	• Information that shares a common characteristic	• Any
Method Sheet	• Explain a work product, benefits of the output and the procedure for creating the work product	• Client-deliverable quality in look and feel • One-page • Aligns with marketing identity; written–style is consistent with marketing materials	• In Design (or other Triad standard desktop publishing software)
Policy	• Communicate a corporate rule	• In Triad's policy template • Provides hyperlinks to forms relating to the policy • A higher-level of scrutiny by the KMS steering team	• MS Word
Procedure	• Explain or provide step by step instructions for creating a specific work product	• Communicates steps to be completed in order to accomplish some specified outcome • Steps are at the task-level of detail • Sequential	• Any
Process/ Process Map	• Show cross-functional or cross-role responsibilities and decisions graphically because it's not clear whose supposed to do what	• Depicts activities and outputs graphically • Represents chronology or sequence in a left-right format • Can represent activities over time • Depicts activities by role or function • A higher-level of scrutiny by the KMS steering team	• Visio
Sample	• See or show an	• Real-life work product	• Any

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PSM Type	Appropriate Use (Use when you need to...)	Description (criteria)	Standard Application for Creation
	example of a tangible work product		
Script	• Provide specific language to be used, written or verbally, in a given situation	• Written from a user's perspective, with his or her responses to the situation • Context-specific • A higher-level of scrutiny by the KMS steering team	• Any
Sheet or Document	• Provide information that is not in a list format	• Information that shares a common characteristic	• Any
Template	• Provide a base with which people will create a work product that has a standard look, feel and content areas.	• Is a base document that can be built upon or altered • Formatted in Triad styles and/or with Triad logos • Is consistent with Triad go-to-market strategies and brand image • Takes advantage of the functionality of the specific software	• Any
Tool	• Provide a mechanism to assist either one user or multiple users in interacting with a given work product	• Self-contained system • A combination of other PSMs • Its value goes beyond the user and creating a given work product or is created for use by multiple people interacting with one work product • Takes advantage of the functionality of the available electronic applications and automation	• Any
Worksheet	• Guide someone through identifying an objective outcome or output	• Provides fields to be completed in order to get a given output or outcome	• Any
Workbook	• Guide someone through identifying multiple objective outcomes or outputs	• A collection of worksheets	• MS Excel

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Appendix D

Design Tool

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Knowledge Management System Design Meetings

Meeting Notes

Design Teams

Client Engagement Process (meeting on 12/18/01)

Attended: Lisa Toenniges, Shawn Merritt, Dave Bonello, Susan Fisher, Karyn Patterson and Jaci Smeltzer

Employee Resources (meeting on 12/21/01)

Attended: Lisa Toenniges, Dave Bonello, Terry Dancer, Nancie Long, Erin Fulk, Susan Fisher and Jaci Smeltzer

Decisions

- All documents should be loaded into CP with Triad's new styles and logo, etc.

The Client Engagement Process category rules:

- Knowledge items (KIs) are static and unchanging
- There will be a subcategory for each accomplishment and one for Project Management and Communications

Next Steps

- Jaci to create a project plan, to be reviewed and approved by Lisa, and share with design teams (the project plan will assign a timeline to all of the following action steps.
- Jaci to draft the macro process flows for getting KIs into the system, distributed and used. Then send drafts to the design teams for review.
  Sub-processes:
  - Identify and acquire
  - Organize and store
  - Maintain
  - Distribute and use

  Outputs of designing the above-specified processes should include the following:
  - KI intake form (pending the design of the identify and acquire process)
  - Criteria for each type of knowledge object (or KI; and synonymous with Performance Support Mechanism or PSM)
  - Naming convention rules
  - Owners (both content and process owners)
- Jaci to coordinate loading identified KIs into Changepoint according to the taxonomy agreed upon.
- Jaci to coordinate writing directions for copying text from a .pdf (determine where it should be stored later).
- Jaci and Susan work together to create a template for Triad policies and forms with new styles and a common look and feel.
- Design teams to review material sent for their input and approval.

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The Taxonomy

The table below reflects the KIs that have been identified for loading into Changepoint's Knowledge Base. Some content owners have been identified in parentheses. Additional content and process owners will be identified during the process design effort.

Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	**Exist outside of databank, load as is**	**In databank, load as is and fix later**	**In databank fix first, then load**
Client Engagement Process	A1: Account and Buying-Center Search Conducted		❑ Marketing Brochure in a .pdf file		
	A2: Account Qualified		❑ Method Sheets in a .pdf file: ○ Learning Strategy Development ○ E-Learning Strategy Development ○ Business-Linked Curriculum Architecture Design ○ Impact Mapping ○ TrainSmart ○ TADPOLE ○ Business-Linked Individual Development Planning ○ Success Case Evaluation		

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	A3: Business Opportunity Determined			❑ Account plan template ❑ Account planning agenda ❑ Account profile template	
	A4: Solution Proposed		❑ Web Infrastructure Questionnaire (A4) ❑ GRAO's process mapping process ❑ TADPOLE process and tools	❑ Pricing guidelines ❑ Proposal planning sheet ❑ Quoting template	
	A5: Project Communicated and Contracted			❑ Editorial Services contract ❑ Fixed price contract ❑ T&M contract ❑ Email account contract ❑ Freelancer procedures ❑ Software loan contract	
	A6: Project Planning Conducted		❑ Workplan template	❑ Print Deliverables job aid ❑ Pre-SOW agenda template ❑ Pre-SOW guidelines ❑ SOW agenda template ❑ Schedule guidelines	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	A7: Research and Analysis Conducted		❑ Sample Interview protocols ❑ Impact mapping template ❑ Design Specifications template		
	A8: Project Designs Prepared	❑ Design prototype approval memo ❑ Design document review memo	❑ Interface Gallery ❑ Functional prototype approval memo	❑ Group design meeting agenda template ❑ Decisions, Decisions Choosing a Delivery Method presentation ❑ Sample memo to accompany a design document first draft	
	A9: Deliverables Developed	❑ Draft Checklist	❑ Web Publishing Guidelines ❑ Graphics matrix ❑ Code libraries ❑ Sample interactions ❑ Web Publishing Guidelines	❑ Sample memo to accompany final deliverables ❑ Sample memo to accompany first draft of deliverables ❑ Sample memo to accompany a pilot draft ❑ Sample memo to accompany a video script first draft	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	**Exist outside of databank, load as is**	**In databank, load as is and fix later**	**In databank fix first, then load**
	A10: Implementation and Evaluation Plans Executed			❑ Print deliverables reproduction specifications template ❑ Non-print deliverables reproduction specifications template	
	A11: Project Closed	❑ CSI directions/ process		❑ Project close checklist ❑ Archiving process ❑ Project debrief agenda template	
	PM: Project Management and Communications		❑ Client sign-off forms ❑ Team charter template ❑ D3 Programmer's intake form ❑ D3 Graphics Intake form ❑ HILS Grammar Rules ❑ Client Sign-off forms	❑ PCN form ❑ Status log template ❑ RASI guidelines ❑ RASI template ❑ Editorial Style Guide ❑ Budget discussion worksheet ❑ Sample status log ❑ Editorial work request ❑ Project status dashboard	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	CEP: Client Engagement Process map		❑ Client Engagement Process map		

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	**Exist outside of databank, load as is**	**In databank, load as is and fix later**	**In databank fix first, then load**
Employee Resources	Org. Structure		❑ FH Office layout (Dave) ❑ GR Office layout (Dave) ❑ Org chart (to replace staff list) (Erin)	❑ Phone extensions (Erin) ❑ Who Ya Gonna Call list (Erin)	
	POP (Partnering on Performance)			❑ POP Overview (Erin) ❑ Position descriptions (Erin) ❑ Competency models (Erin) ❑ 360-degree feedback (Erin) instrument ❑ Individual Development Planning (IDP) process (Erin) ❑ IDP template (Erin) ❑ Competency assessment (Erin) ❑ Development opportunities (Erin) ❑ Binder materials (Erin)	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	Policies and Procedures	❑ IS Policies to include (Dave): ○ Network password policy ❑ Time off policy (Erin)	❑ Remote-office policy (Nancie)	❑ Time reporting (Erin) ❑ Exceptional Performance Award policy (Erin) ❑ Cellular phone/calling cards policy (Erin) ❑ Professional affiliation policy (Erin) ❑ Copyright statement (Erin) ❑ New employee referral bonus (Erin) ❑ Employee handbook (Erin) ❑ Exit procedure and checklist (Erin) ❑ Triad housekeeping guidelines (Erin) ❑ Compensation policy (Nancie) ❑ Help desk procedures (Dave) ❑ Part-time policy (Erin)	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	Benefits			❑ Triad holiday schedule (Erin) ❑ Business travel and entertainment (rename to Expense Reporting Policy and incorporate Staff lunch meetings policy, Employee gifts policy) (Nancie) ❑ Summary of benefits (Erin) ❑ Link to www.bcbsm.com (Erin) ❑ Link to www.dentemax.com (Erin) ❑ Link to www.unum.com (Erin) ❑ Link to 401k website (Erin) ❑ Benefits changes (404) (Erin)	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	Forms			❑ Travel request form (Nancie) ❑ Travel advance form (Nancie) ❑ Referral bonus form (Erin) ❑ Check request form (Nancie) ❑ Time-off request (Erin) ❑ Exceptional Performance Award form (Erin) ❑ Salary adjustment form (Erin) ❑ Performance improvement plan form (Erin) ❑ Resume/Pre-screen form (Erin)	

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	**Exist outside of databank, load as is**	**In databank, load as is and fix later**	**In databank fix first, then load**
	Recruiting and Selection	❑ Recruiting and selection process maps (Erin, Jaci to help facilitate the design)	❑ Technology quiz (Dave)	❑ Pre-screen activities (integrate with D3 prescreening activities, not in databank) (Erin, Dave to give input) ❑ Post-interview rejection call guidelines (Erin)	❑ Sample Approach to Interviewing (combination of Lisa's and Shawn's approaches) (Lisa) ❑ Combine and revise Professional reference check questions and Pre-employment phone reference check script
Corporate Information	About Triad	❑ List of publications with links to actual articles) ❑ List of awards with links to more information	❑ Annual business plan ❑ Mission statement ❑ Guiding Principles and values		

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	Corporate Performance		❑ Income and balance statement ❑ Operating Expenses ❑ Accounts receivable report ❑ Accounts payable report ❑ Monthly net sales by account report ❑ Invoice list ❑ Sales vs. goal ❑ Cumulative Gross Profit ❑ Sales forecast to actual tracking ❑ Cash flow ❑ Annual statement ❑ PFP reports (several) ❑ CSI report ❑ D3 CSI report ❑ Employee culture survey results		

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Category	Sub-category	Knowledge Objects			
		Don't exist, need to be created	Exist outside of databank, load as is	In databank, load as is and fix later	In databank fix first, then load
	News		❑ Current D3 e-Letter and list with links to archived issues (Dave) ❑ Current Touchpoint and list with links to archived issues ❑ Current PDG News and list with links to archived issues (Shawn) ❑ List of archived Performance Point issues with links to actual issues in .pdf ❑ Current "Ted's state of the business communication" and list with links to archived memos ❑ List of all press releases with links to the actual press releases		
Account Information	Prospects	❑ Company profile template (to attach to actual company records)			
	Leads				
	Customers				
People	Internal	❑ Employee birthdays (Erin) ❑ Employee Anniversaries (Erin)	❑ Bios (to attach to resource profile)		
	Freelancers				

Appendix E

Triad Knowledge Management Process

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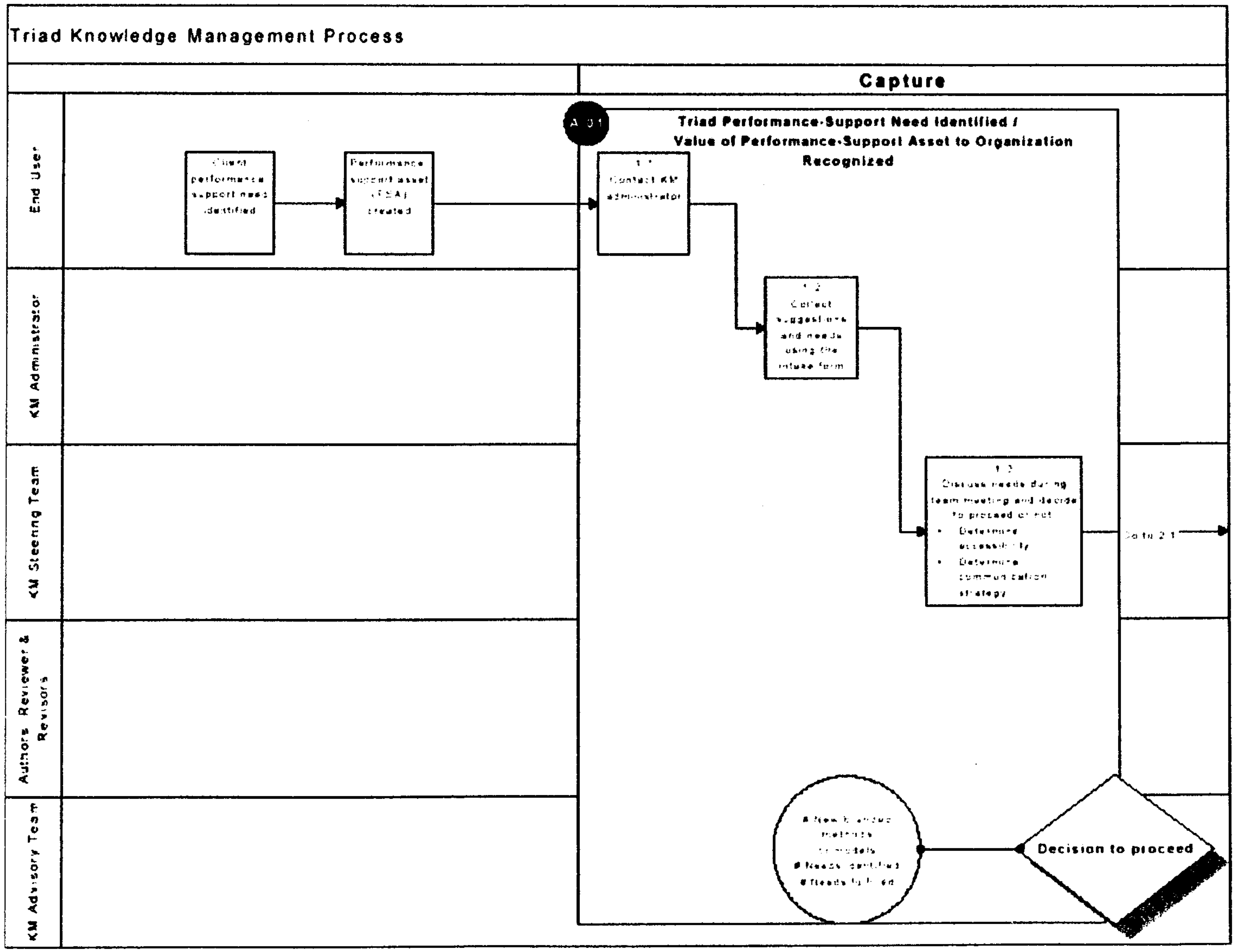

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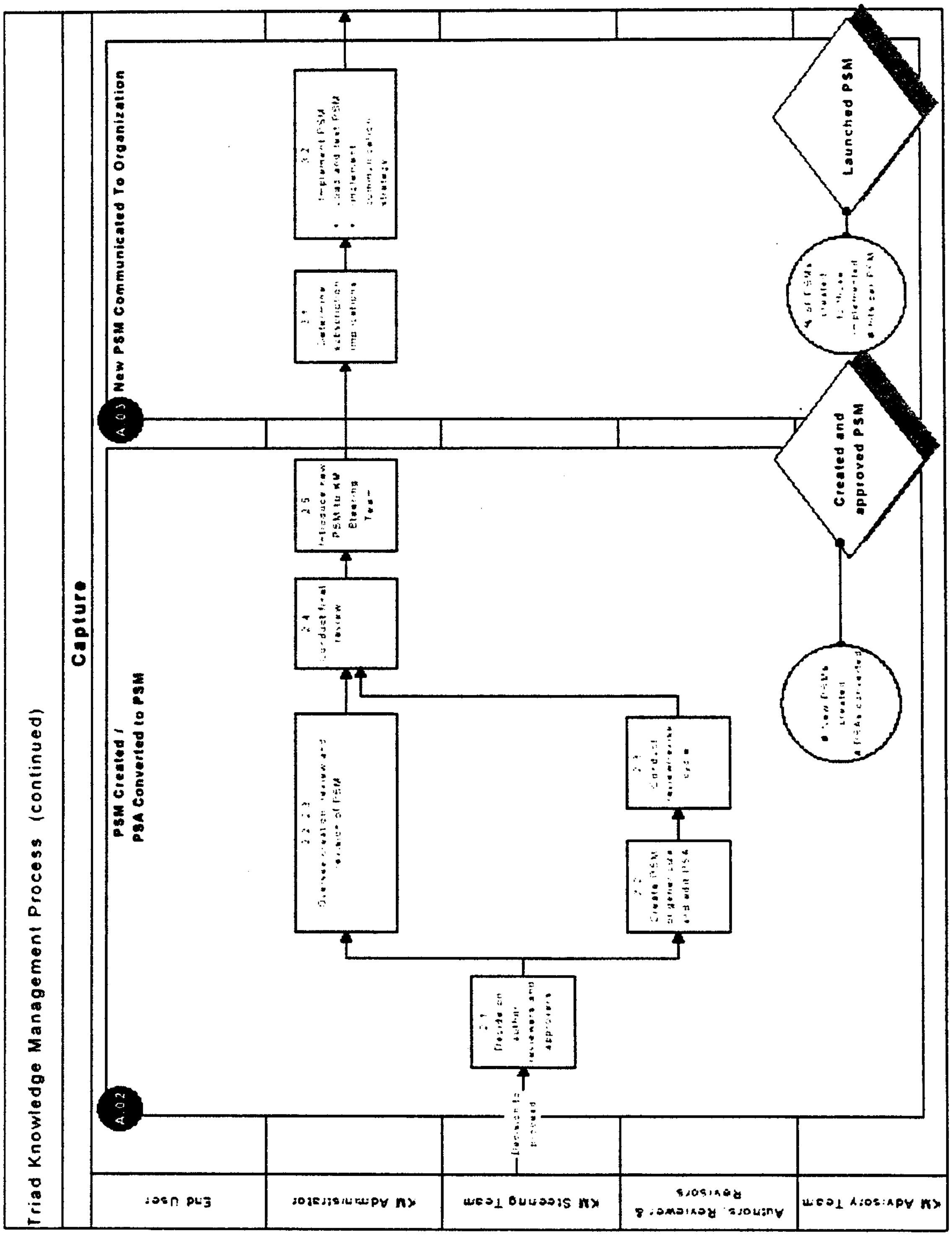

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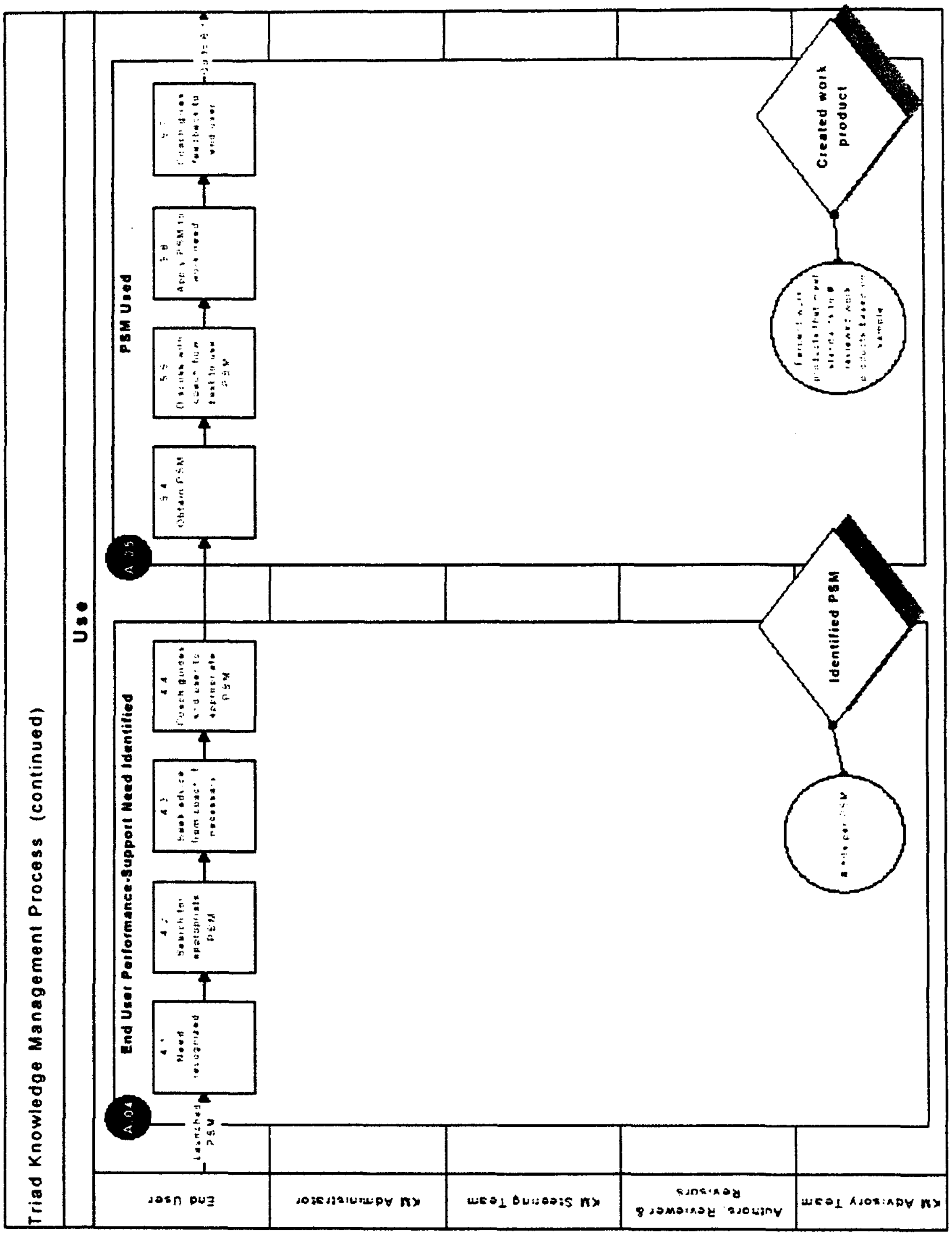

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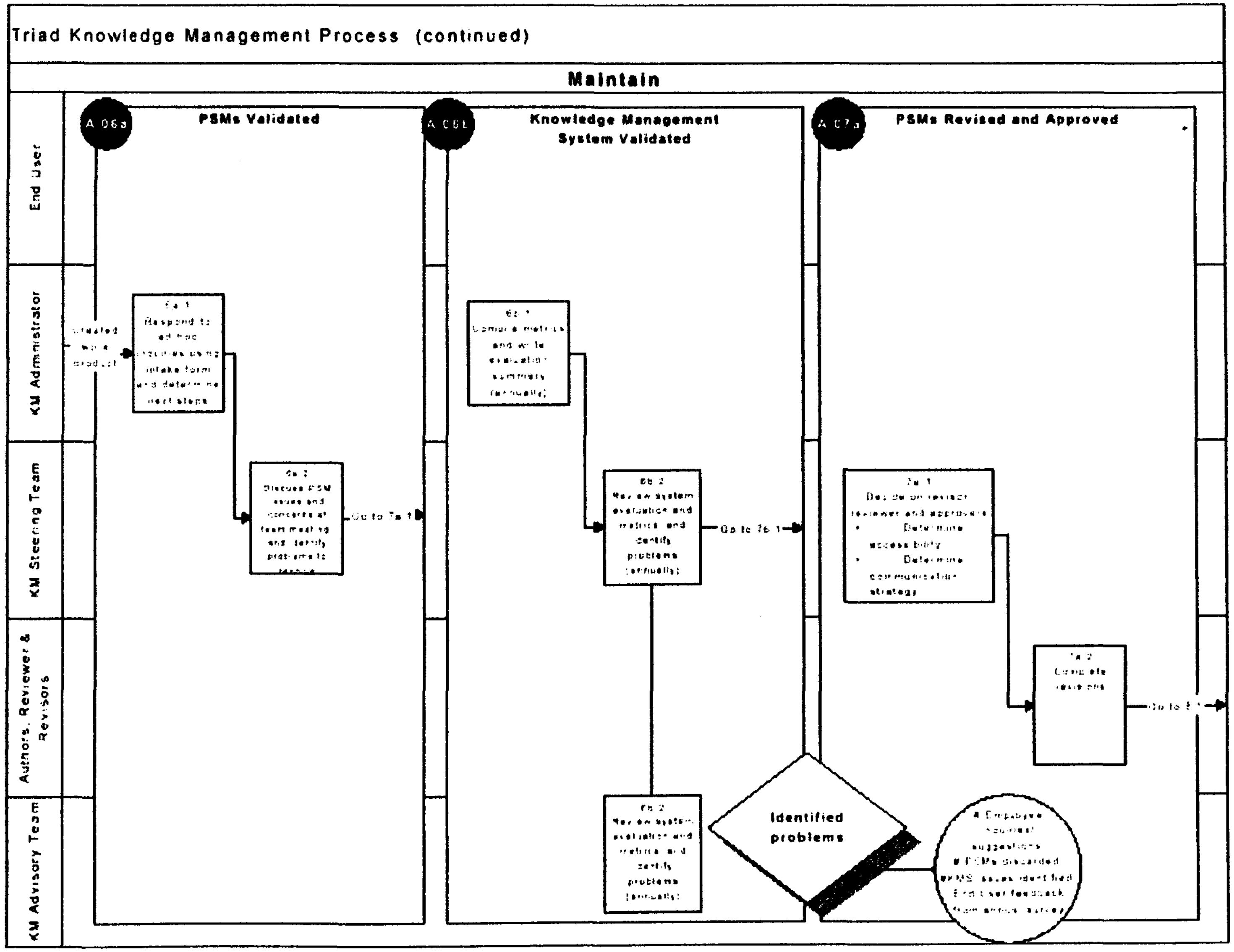

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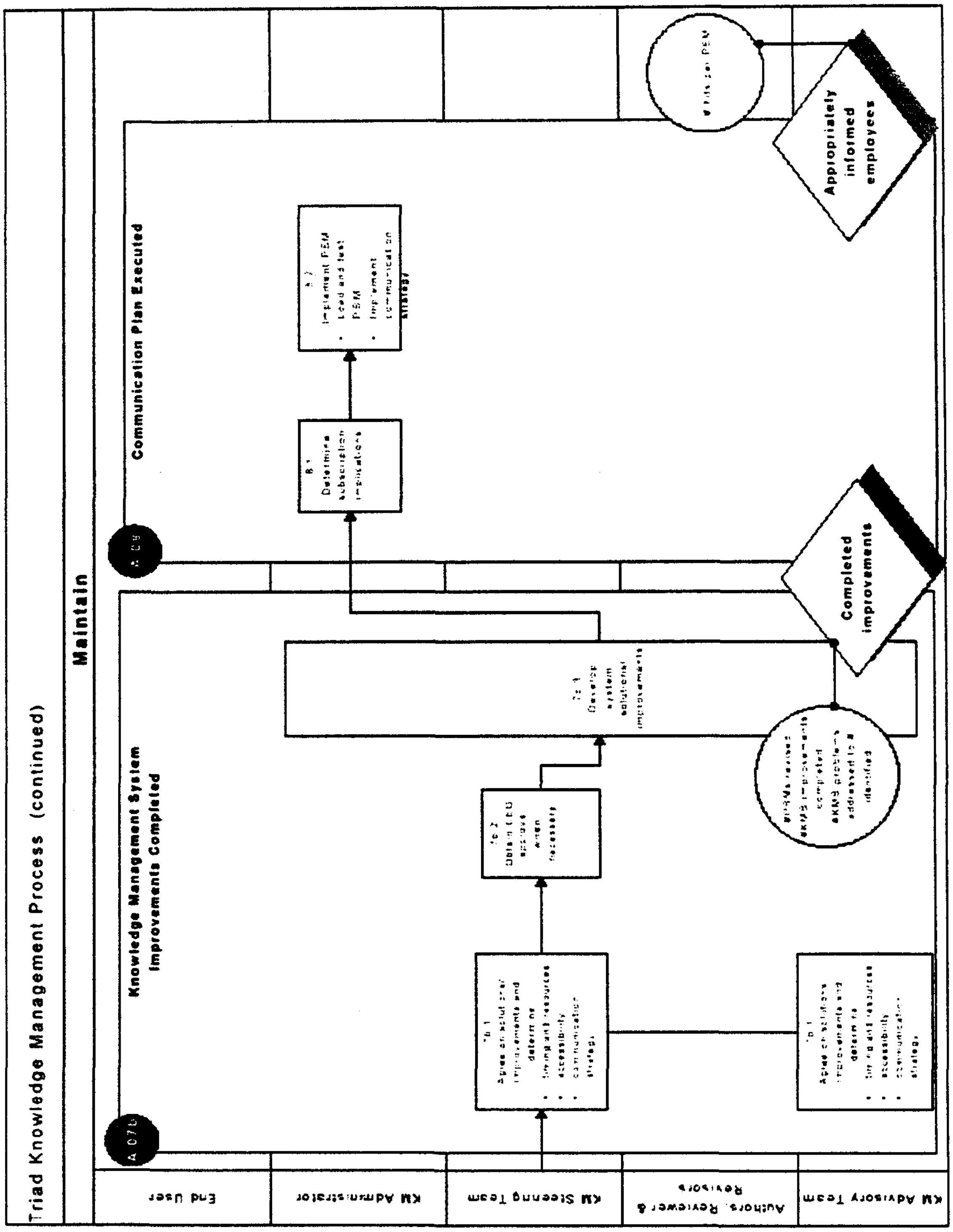

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Appendix F

KMS Training Materials

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15. Knowledge Management

Overview

This section will enable you to:

- Provide an overview of Triad's knowledge management system (KMS)
- Recognize the taxonomy used to organize Triad's corporate knowledge
- Navigate in knowledge management
- Search for knowledge items
- Use knowledge items
- Add knowledge items
- Edit knowledge items
- Delete knowledge items
- Manage subscriptions
- Set subscriptions
- Describe the different types of PSMs

About Knowledge Management

Triad's Knowledge Management Philosophy

- Triad has decided to lean in its approach to knowledge management with, what is known in the industry as, a personalization philosophy as compared to a codification philosophy. In truth, there is always a mix of both personalization and codification but if you apply the 80/20 rule, we lean towards personalization. This means that Triad is not attempting to separate its knowledge management technology from basic interaction with people.
- Triad's position is that people can add a lot of context and meaning to information that cannot be easily codified.

Triad's Taxonomy

- A good KMS is organized in such a way that information can be easily found by users. In the knowledge management industry, this organizing structure is referred to as a taxonomy.
- Changepoint allows for two levels of organization. The first level is a category and the second level is a sub category.
- Triad designed its taxonomy around the client engagement process, our organizational structure and the way we configured Changepoint for our organization.
- Refer to Triad's taxonomy later in this section to understand the way in which our knowledge is organized.

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Knowledge Items

- Triad distinguishes between knowledge items that are inputs into work meant to support individual performance (that is, performance support mechanisms or PSMs) and outputs or products of work (that is, work products).
- Both PSMs and work products are included in Triad's knowledge management system (KMS).

Knowledge Items (also known as Knowledge objects in the	
PSMs (inputs)	Work Products (outputs)

System Administration

Triad has created the following three roles to manage its KMS:

- KM Administrator
- KM Steering Team
- KM Advisory Team

1. The KM administrator is responsible for maintaining the KMS. This includes ensuring knowledge items remain relevant, usable, and accurate; providing an annual system evaluation; and being a member of the KM steering team.
2. The KM steering team is responsible for steering the KMS, or guiding its growth and improvement. This includes approving of its scope, design, development and use, and overseeing an annual system evaluation process.
3. The KM advisory team is responsible for providing user input into the on-going design and development of the KMS. This includes providing ad hoc input and participating in an annual system evaluation process.

Business Process

- Triad's Knowledge Management Process specifies the accomplishments and steps necessary to capture, use and maintain its corporate knowledge.
- All Triad people are encouraged to share their knowledge, ideas and work products so that Triad can leverage that knowledge across the organization. This can be done by contacting the KM administrator.
- The business process depicts the process to be followed for adding, changing and removing knowledge items to the KMS.

Infrastructure

- Triad is using Changepoint as its knowledge repository—the technical system in which knowledge items will be physically stored.
- Currently, Triad is using Changepoint as the system by which knowledge items will be accessed. Plans to provide a more user-friendly interface are being considered for the future improvement of the system.

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Roles and Responsibilities

Task	When	Who
Search knowledge items	Ongoing	• All
Use knowledge items	Ongoing	• All
Add knowledge items	As needed	• Finance • KM administrator
Edit knowledge items	As needed	• Finance • KM administrator
Delete knowledge items	As needed	• Finance • KM administrator
Manage knowledge subscriptions	As desired	• All
Create knowledge subscriptions	As needed`	• KM administrator
Edit knowledge subscriptions	As needed`	• KM administrator
Delete knowledge subscriptions	As needed`	• KM administrator
Make suggestions	Ongoing	• All

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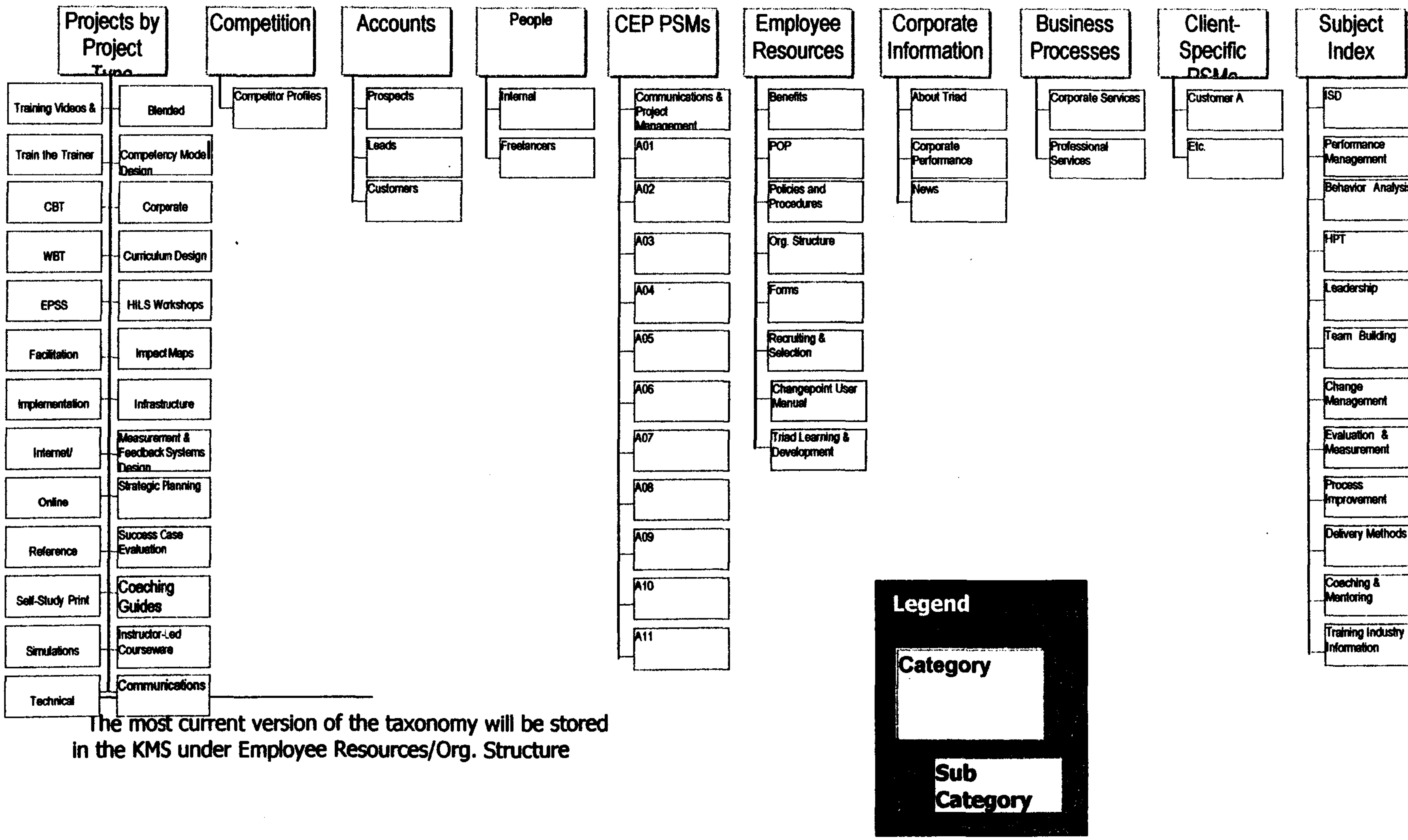
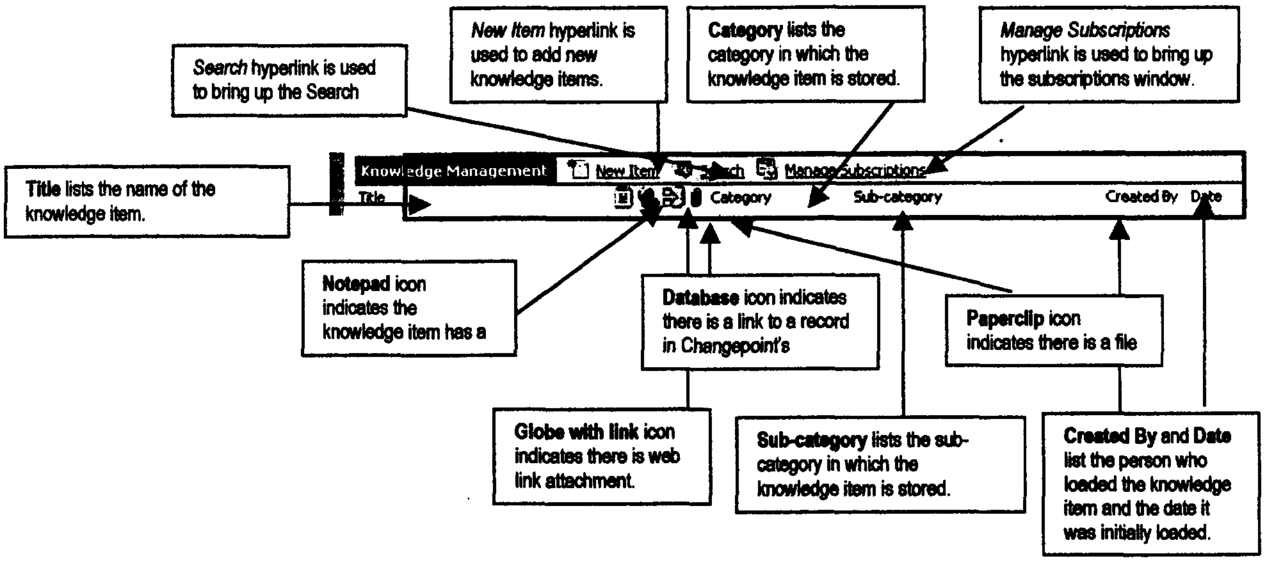
Triad's Taxonomy[1]



The most current version of the taxonomy will be stored in the KMS under Employee Resources/Org. Structure

Navigate in Knowledge Management

Changepoint uses some unique symbolic conventions in its knowledge management functionality. The following graphic points these out and describes them.



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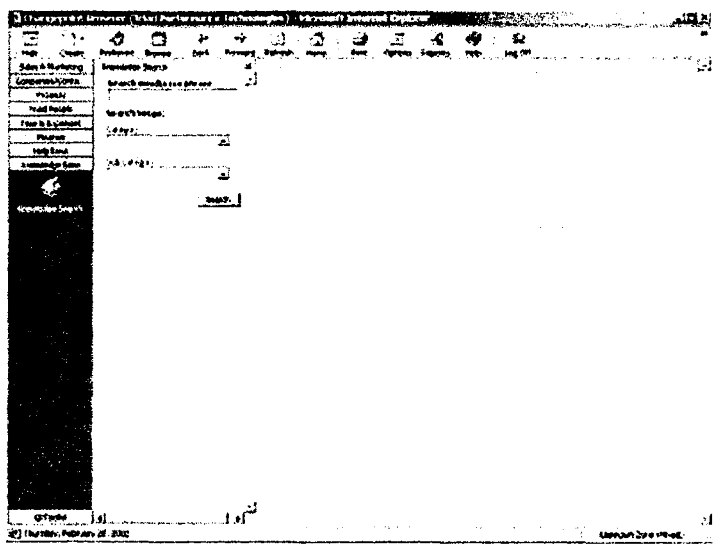
Search for Knowledge Items

You can search for knowledge items in either of the following two ways:

- Search word(s) or phrase
  Searching by key words or title words
- Search scope
  Drilling down on Triad's taxonomy

To search for a knowledge item, use the following steps:

1. Click the *Search* hyperlink in the **Knowledge Management** section of your home page; or in the action bar, click KNOWLEDGE BASE and then click the **Knowledge Search** icon.
   The KNOWLEDGE SEARCH window will appear.



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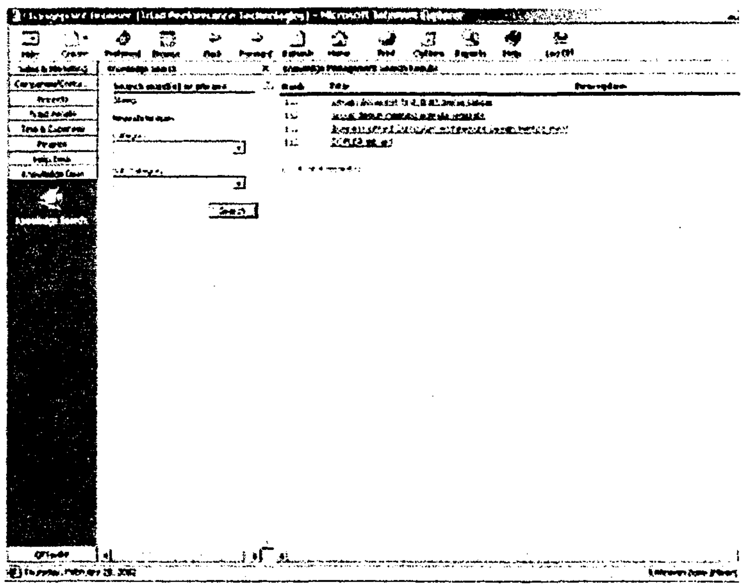
Search By Key Word or Phrase

2. Enter the key word or phrase in the **Search word(s) or phrase** text box.

   An asterisk (*) acts as a wildcard. By placing an asterisk at the end of the keyword, it will search for any form of that word.

3. Click **Search.**

   The KNOWLEDGE MANAGEMENT SEARCH RESULTS display view will appear.



Search Scope

If you use key words in addition to searching the scope, it will narrow your scope to search for those key words in the category and/or subcategory that you specify.

2. Select the category by which you want to search in the **Category** drop-down menu.
3. Select the sub-category by which you want to search in the **Sub Category** drop-down menu.
4. Click **Search.**

   The KNOWLEDGE MANAGEMENT SEARCH RESULTS display view will appear.

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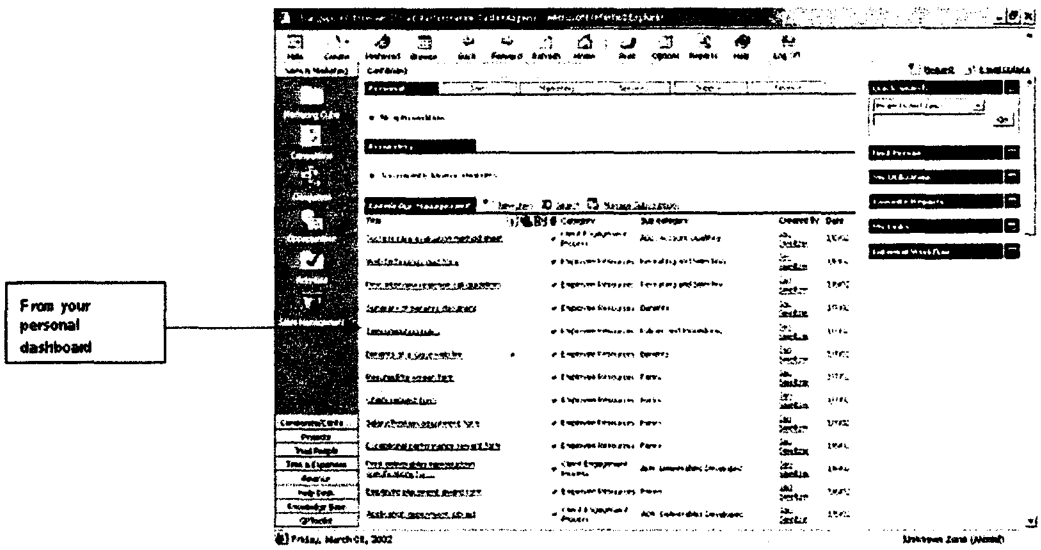
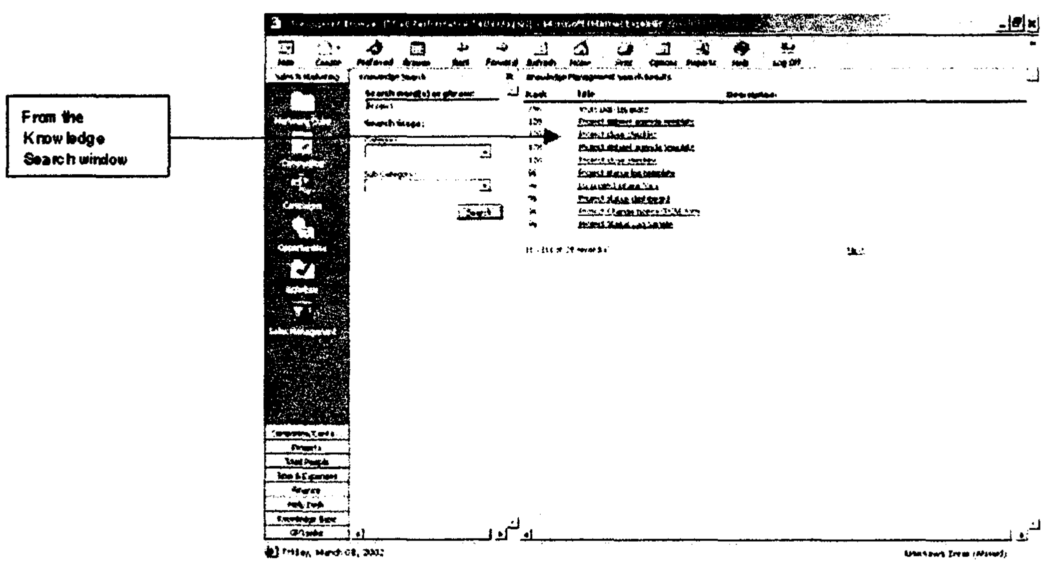
Use Knowledge Items

Once you have found a particular knowledge item, you will want to open it and use it. The following instructions explain how to do that.

1. Click the hyperlink of the knowledge item you wish to use.





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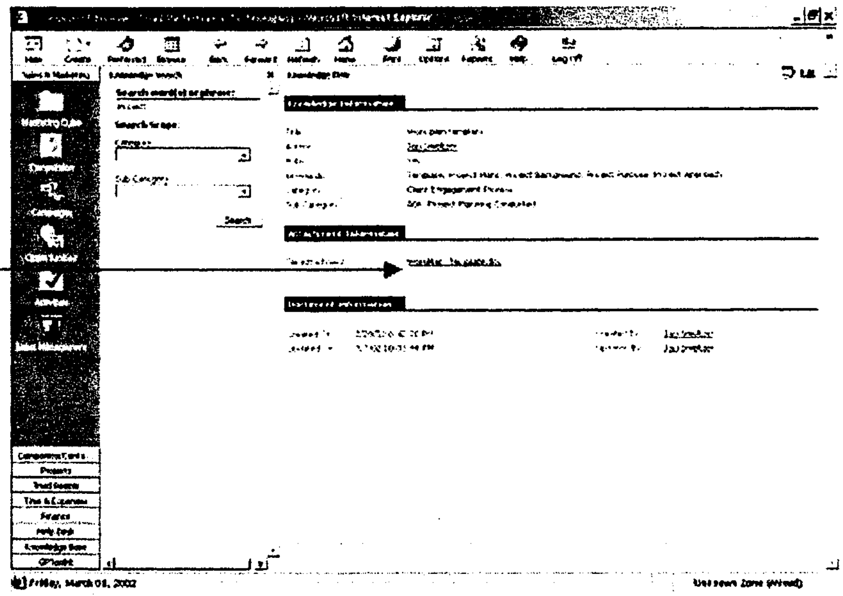
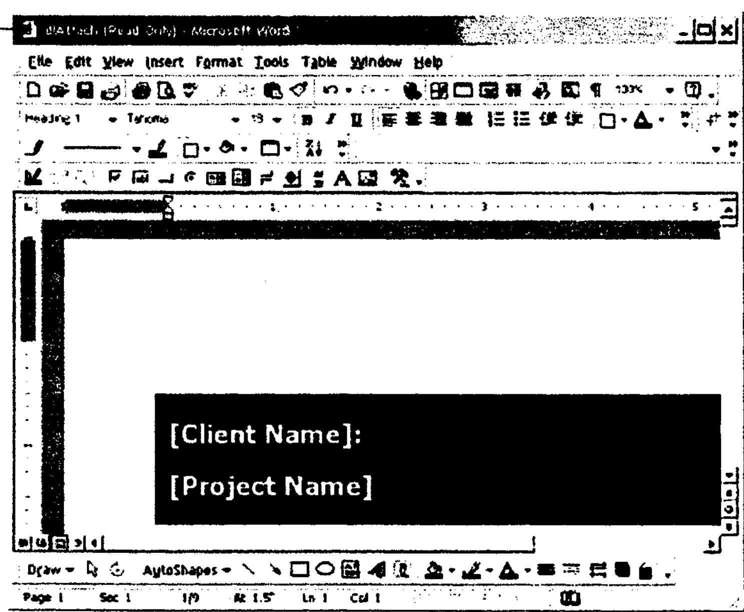
The KNOWLEDGE ITEM profile will appear.



2. In the **Attachment Information** section, click the **File Attachment** hyperlink.

   The file will open as read-only in its application window (for example, in MS Word).

Documents open as Read-Only



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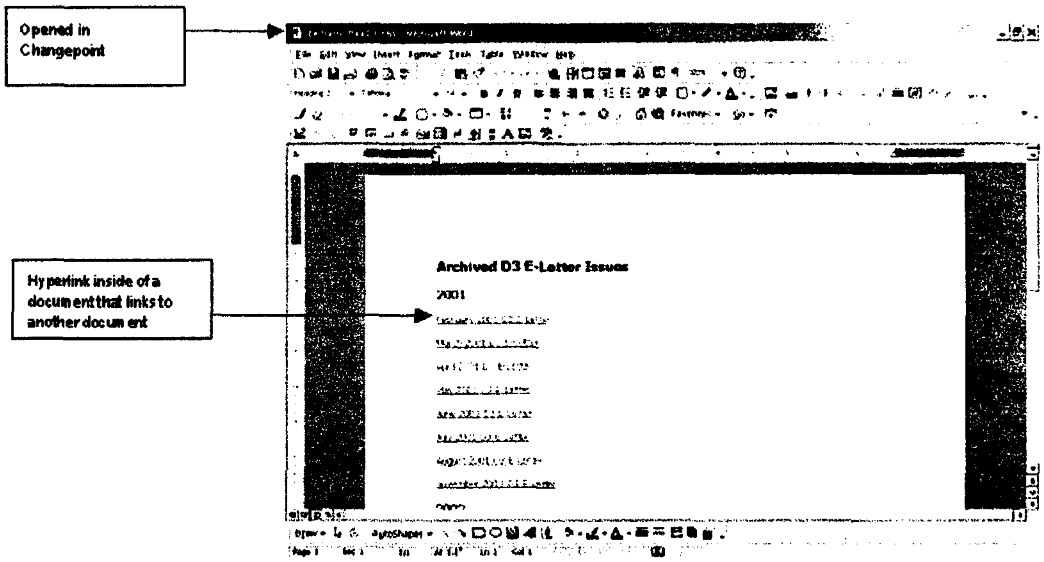
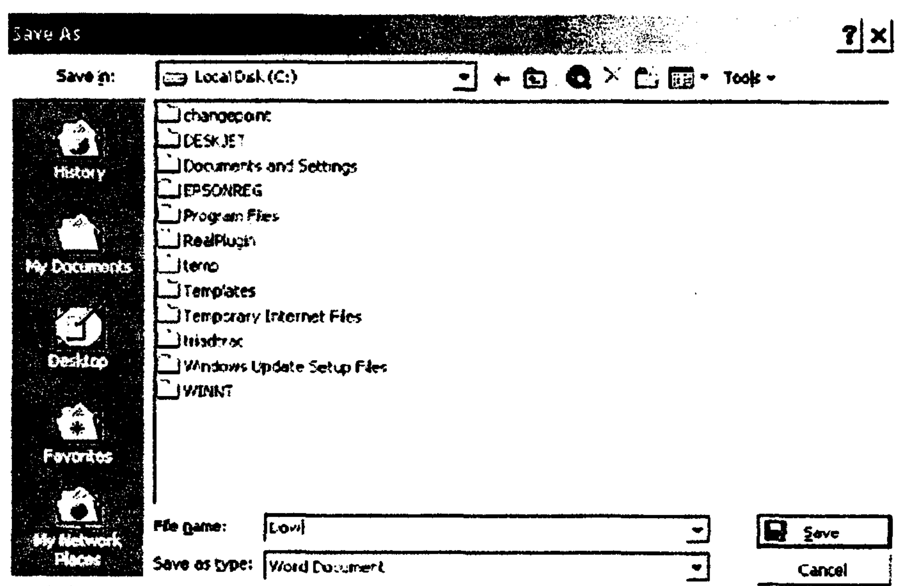
There are several PSMs that have hyperlinks in the document to other relevant documents or web sites.

Hyperlinks only work when the document is opened inside of Changepoint and not saved to a folder.



Save Files From Changepoint

When you go to save a file, you must do a 'Save As'. Then you can use the document as you normally would.



Save the file as you normally would to the folder you wish.

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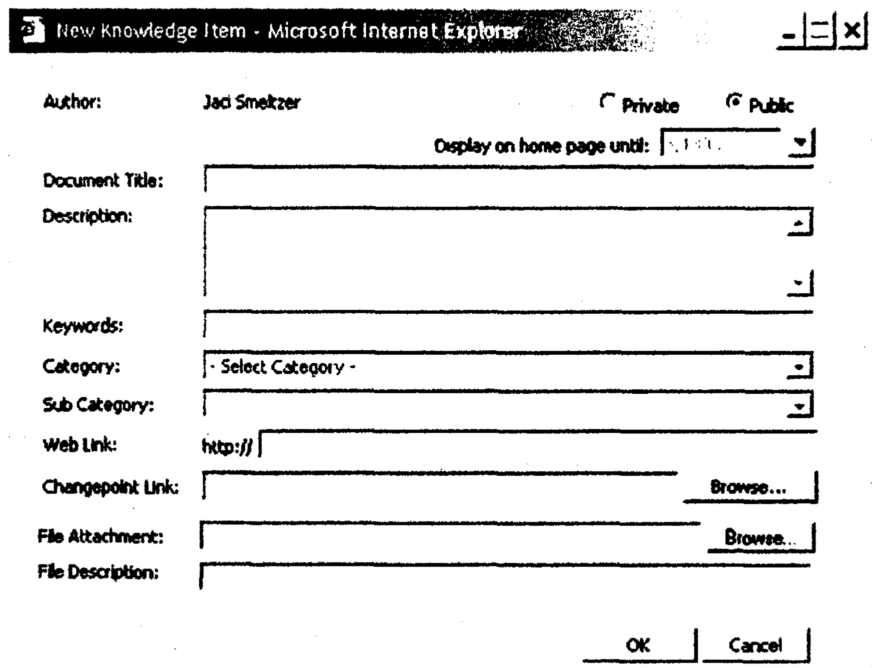
Add Knowledge Items

1. From your Personal dashboard, select the *New Item* hyperlink from the **Knowledge Management** section.

   The NEW KNOWLEDGE ITEM dialog box will appear.



2. Enter the title of the knowledge item in the **Document Title** field.

   Use sentence case except for acronyms and other formal titles; in which case you should use all caps or title case.

   Always add the type of PSM to the end of the document name. For example, 'Work plan template' or 'Design document sample.'

   *Refer to **PSM Types and Descriptions** later in this section for more guidance on naming knowledge items.*

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3. Enter a description of what the knowledge item is in the **Description** field.

   If it is a performance support mechanism (PSM), you might want to describe how the PSM is to be used (for example, "to guide you through creating a standard work plan for a client project").

   If it is a work product, you might want to describe the project-specific characteristics of the document (for example, "it is a design document for a blended solution including 2 WBTs, 1 instructor-led course and an EPSS").

3. Enter keywords for the knowledge item in the **Keywords** field and separate the words with a semicolon.

   *Always include the PSM type as a keyword. Refer to **PSM Types and Descriptions** later in this section for more information.*

   Key words can be entered as phrases (for example, Start-of-Work).

   Enter keywords and phrases in uppercase.

4. Select the category to which the item belongs in Triad's taxonomy from the **Category** drop-down menu.

   Refer to **Triad's Taxonomy** *earlier in this section of the User Manual for more information on Triad's taxonomy.*

5. Select the sub category to which the item belongs in Triad's taxonomy from the **Sub Category** drop-down menu.

   Refer to **Triad's Taxonomy** *earlier in this section of the User Manual for more information on Triad's taxonomy.*

Attach a Link to a Web Page*

   **If you are not attaching a web link, go to the next topic.*

6. Enter the web address in the **Web Link** field.

   Please note that **http://** *is already provided for you.*

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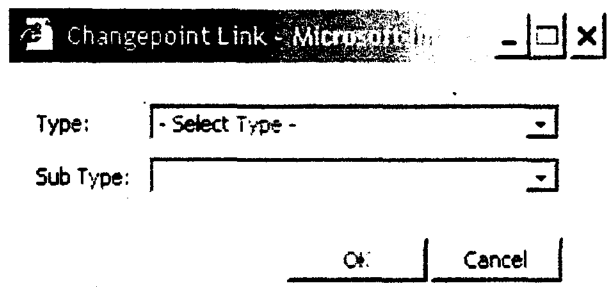
Attach to a Record in Changepoint*

**If you are not attaching the knowledge item to a specific record in Changepoint, go to the next topic.*

Certain knowledge items will be attached to specific records in Changepoint; however, PSMs will not be. Refer to the table below for more information.

7. Click the **Browse** button to the right of the **Changepoint Link** field.

   The CHANGEPOINT LINK dialog box will appear.



Type and Sub Type Descriptions

The following table describes the various documents that will be attached to a specific record in Changepoint.

Item	Type	Sub Type
Employee Biographies	Triad Person	Name of employee
Company profiles	Company	Name of company
Links to project folders on the archive server	Engagement	Name of engagement

8. Select the type of record to which you want to attach the knowledge item in the **Type** drop-down menu.
9. Select the sub type of record to which you want to attach the knowledge item in the **Sub Type** drop-down menu.

   If attaching a file, skip the next step and go to the next topic.
10. Click **OK**.

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Attach a File*

**If you are not attaching a file, go to the step #14 below.*

Do not attach documents that have template extensions (such as .tmp or .xlt) because they will open as the original template instead of as a document based on that template.

Excel 97 is not compatible with Changepoint's knowledge management functionality. Therefore, excel files should be converted to an Acrobat PDF file format if possible or a word document can be created with a hyperlink to the excel document.

When the company upgrades to Excel 2000, it is compatible and these work-arounds will not be needed.

11. Click the **Browse** button to the right of the **File Attachment** field.

    Browse through the folder structure to find the document you wish to attach.

12. Click **Open**.

    The path to the document should appear in the **File Attachment** *field.*

13. For documents that are frequently updated, enter the date of the last update in the **File Description** field.

    For example, the phone list is so frequently updated that it would be helpful to list the last date it was updated in this field.

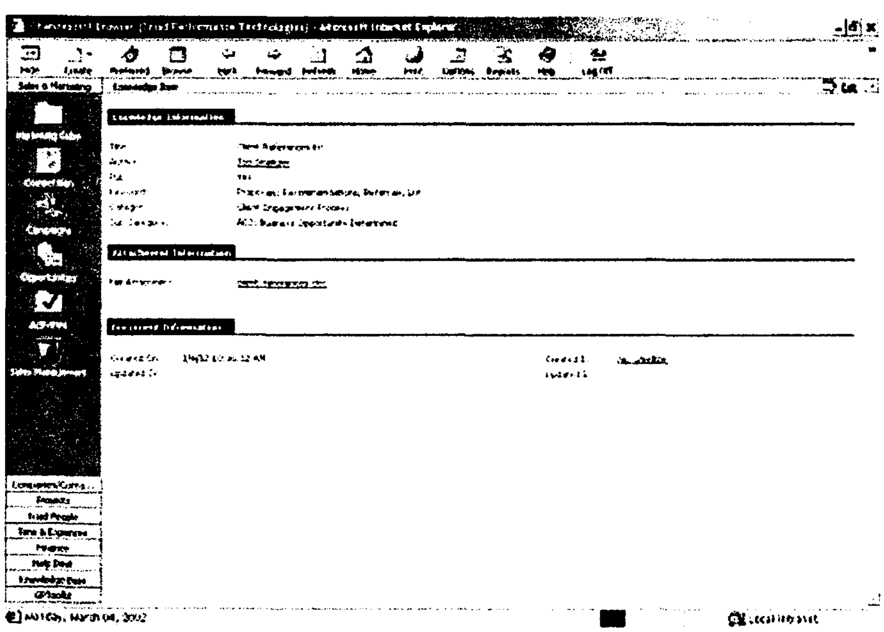
14. Click **OK**.

Edit Knowledge Items

You will edit knowledge items in order to change key words, reload a file that has been updated or revised, and to delete a knowledge item.

1. Search for and click the hyperlink of the knowledge item you wish to edit.

   The knowledge item will appear in display view.



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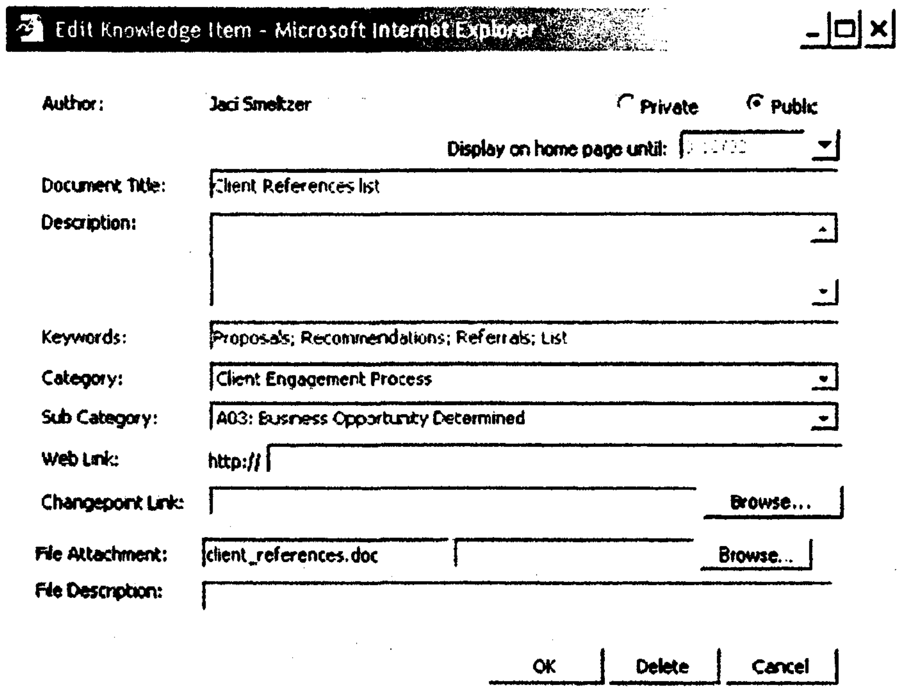
2. Click the *Edit* hyperlink in the workflow bar.
   The EDIT KNOWLEDGE Item dialog box will appear.



3. Make the changes that you wish to make.
4. Click **OK.**

Delete Knowledge Items

1. Search for and click the hyperlink of the knowledge item you wish to delete.
   The knowledge item will appear in display view.
2. Click the *Edit* hyperlink in the workflow bar.
3. Click **Delete.**
4. Click **OK.**

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Manage Knowledge Subscriptions

When new knowledge items are added, they will display as hyperlinks on everyone's Personal dashboard in the **Knowledge Management** section for 14 days by default. This prompts users that a new knowledge item has been added. After the two-week period, the item is no longer displayed as a hyperlink on Personal dashboards but can still be accessed by searching for it.

In addition, when knowledge items are updated or revised, the KM steering team may decide, as part of a communication strategy, to redisplay the item on Personal dashboards for a given period to prompt users that the item has been updated or revised.

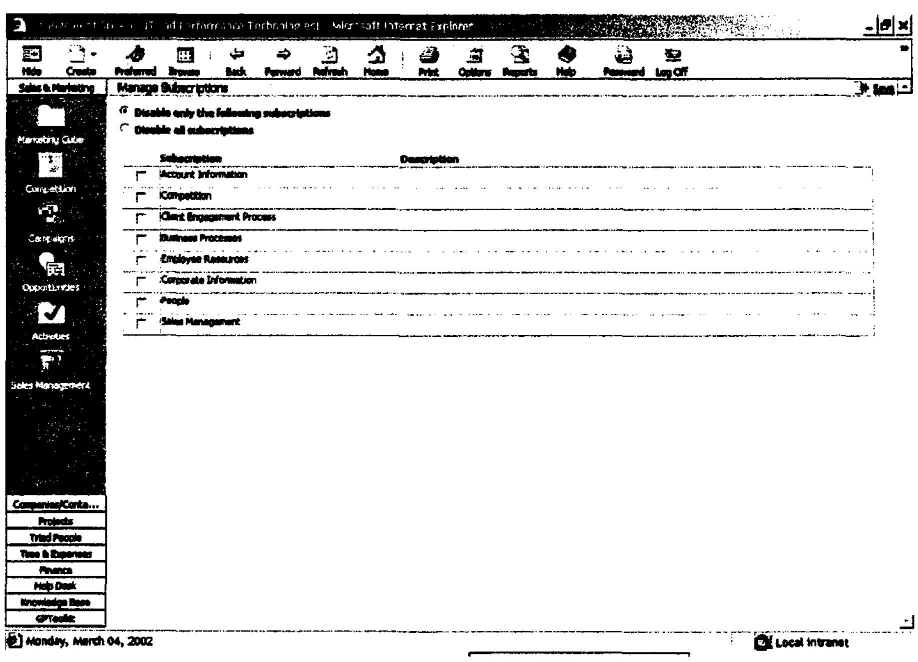
However, users can control which items they see and have access to on their Personal dashboard by managing their own knowledge management subscriptions. There is a subscription for each category in Triad's taxonomy that contains all of the knowledge items in that category.

Note that when you disable that particular subscription it also restricts your ability to search knowledge items that may be in the categories of the subscriptions you restricted; therefore Triad recommends that you not use this functionality.

To disable a subscription, use the following instructions.

15. Click the *Manage Subscriptions* hyperlink on your Personal dashboard in the **Knowledge Management** section.

    The MANAGE SUBSCRIPTIONS display view will appear.



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16. To disable all subscriptions so that nothing ever appears on your Personal dashboard, select the **Disable all subscriptions** radio button.
17. To disable only certain subscriptions, check the check boxes for the categories that you want to disable to the left of the Subscription column.
18. Click the **Save** hyperlink in the workflow bar.

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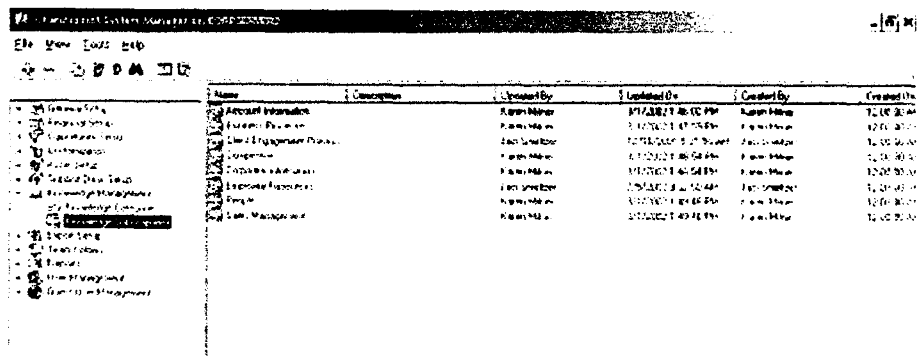
Create Knowledge Subscriptions

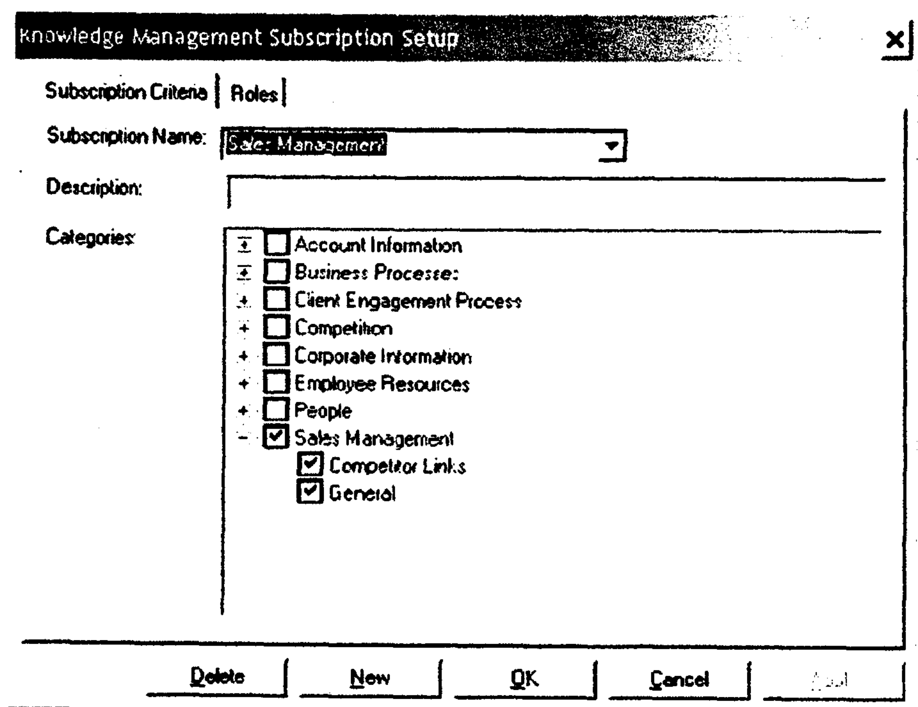
Subscriptions are set up in Changepoint's System Manager application.

1. From within System Manager, expand the KNOWLEDGE MANAGEMENT treeview.
2. Select **Knowledge Subscriptions.**

   The subscriptions will appear in display view.



3. Double-click any subscription to open the KNOWLEDGE MANAGEMENT SUBSCRIPTION SETUP dialog box.



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4. Click **New**.

   The **Subscription Name** *field will become blank.*
5. Enter the name of the new subscription you wish to create in the **Subscription Name** field.
6. Check the checkboxes next to the categories of knowledge items that you wish the subscription to include.

   You can expand the list and select only sub categories if desired. However, currently Triad has decided to have a subscription for each category that includes all subcategories therein.

   Please note that you can only restrict access to knowledge items at the role level, not at the resource level.
7. Click the Roles tab and check the checkboxes next to each role that should have access to the subscription.

   At this time, all roles should be allowed access to all subscriptions—there are none that have restricted access.
8. Click **Apply** to continue adding another subscription or click **OK** to end.

Edit Knowledge Subscriptions

From the KNOWLEDGE SUBSCRIPTION display view; use the following instructions to edit a knowledge item.

1. Double-click on the subscription you wish to delete.

   The KNOWLEDGE MANAGEMENT SUBSCRIPTION SETUP dialog box will appear.
2. Select the subscription you wish to edit in the **Subscription Name** drop-down menu.
3. Make the changes you wish to make.
4. Click **Apply** to continue editing another subscription or click **OK** to end.

Delete Knowledge Subscriptions

From the KNOWLEDGE SUBSCRIPTION display view, use the following instructions to delete a knowledge item.

1. Double-click on the subscription you wish to delete.

   The KNOWLEDGE MANAGEMENT SUBSCRIPTION SETUP dialog box will appear.
2. Click **Delete**.

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PSM Types and Descriptions

PSM Type	Appropriate Use (Use when you need to...)	Description (criteria)	Standard Application for Creation
Biography	• Provide someone's work and education history/experience.	• In Triad formats, either narrative or with bullets	• MS Word
Checklist	• Provide a prompt to verify completed activities or achieved standards/criteria	• Lists activities to be completed or standards to be achieved • If activities differ by role, roles and responsibilities are clear	• MS Word
Decision Aid Or Decision matrix	• Guide someone through making a subjective decision	• Provides for pertinent if-then scenarios • Is not an objective calculation (in that case, use a worksheet)	• MS Word
Flowchart	• Depict a procedure graphically that includes decisions and roles are not important	• Depicts activities graphically • Represents chronology or sequence in a top-down format	• Visio
Form	• Collect information or data	• Provides fields to be completed by a user • Specifies who should fill out which fields and any hand-offs • In Triad's Form template • Uses electronic fields with online help text where possible • Provides hyperlinks to other documents referenced on the form	• MS Word
Graphic	• Provide art work such as graphics and logos	• Provide the path for users to be able to insert the graphic via "Picture Insert From File"	• Any
Guidelines	• Communicate expectations and best practices	• Communicates best or recommended practices that employees are encouraged to follow • A higher-level of scrutiny by the KMS steering team • Not step-by-step	• MS Word

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PSM Type	Appropriate Use (Use when you need to...)	Description (criteria)	Standard Application for Creation
Job aid	• Provide a performer with auditory or visual signals that offer directions for carrying out increments of a task when it is not important to do the task by memory	• Provides instructions for using the job aid • Provides standards or criteria for the work product • Can include characteristics of other PSMs all rolled into one PSM (such as a checklist, a process map, etc.) • Its value is to help the user to complete a given task or create a work product	• Any
List	• Provide information	• Information that shares a common characteristic	• Any
Method Sheet	• Explain a work product, benefits of the output and the procedure for creating the work product	• Client-deliverable quality in look and feel • One-page • Aligns with marketing identity; written–style is consistent with marketing materials	• In Design (or other Triad standard desktop publishing software)
Policy	• Communicate a corporate rule	• In Triad's policy template • Provides hyperlinks to forms relating to the policy • A higher-level of scrutiny by the KMS steering team	• MS Word
Procedure	• Explain or provide step by step instructions for creating a specific work product	• Communicates steps to be completed in order to accomplish some specified outcome • Steps are at the task-level of detail • Sequential	• Any
Process/ Process Map	• Show cross-functional or cross-role responsibilities and decisions graphically because it's not clear whose supposed to do what	• Depicts activities and outputs graphically • Represents chronology or sequence in a left-right format • Can represent activities over time • Depicts activities by role or function • A higher-level of scrutiny by the KMS steering team	• Visio

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PSM Type	Appropriate Use (Use when you need to...)	Description (criteria)	Standard Application for Creation
Sample	• See or show an example of a tangible work product	• Real-life work product	• Any
Script	• Provide specific language to be used, written or verbally, in a given situation	• Written from a user's perspective, with his or her responses to the situation • Context-specific • A higher-level of scrutiny by the KMS steering team	• Any
Sheet or Document	• Provide information that is not in a list format	• Information that shares a common characteristic	• Any
Template	• Provide a base with which people will create a work product that has a standard look, feel and content areas.	• Is a base document that can be built upon or altered • Formatted in Triad styles and/or with Triad logos • Is consistent with Triad go-to-market strategies and brand image • Takes advantage of the functionality of the specific software	• Any
Tool	• Provide a mechanism to assist either one user or multiple users in interacting with a given work product	• Self-contained system • A combination of other PSMs • Its value goes beyond the user and creating a given work product or is created for use by multiple people interacting with one work product • Takes advantage of the functionality of the available electronic applications and automation	• Any
Worksheet	• Guide someone through identifying an objective outcome or output	• Provides fields to be completed in order to get a given output or outcome	• Any
Workbook	• Guide someone through identifying multiple objective outcomes or outputs	• A collection of worksheets	• MS Excel

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Appendix G

KMS Launch E-Mail to
Triad Employees

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From: [redacted], Lisa
Sent: Monday, March 11, 2002 11:09 AM
To: All Triad Employees
Subject: We're Launching our Knowledge Management System!

As Ted mentioned in his voicemail broadcast, we're thrilled to be launching our Triad Knowledge Management System (KMS)! This email will let you know how to get started, and you'll receive a new section for your Changepoint Manual (in your mail slot) with the detailed information.

What is the goal of Triad's KMS?

To provide a robust system of performance support for Triad people in an online environment that can be accessed as work is being done and is scaleable to evolve as Triad grows; thus, creating operational efficiencies and developing industry-leading innovative processes, methods and tools for Triad. (Note the linkage to our mission statement.)

What are the objectives?

1. To leverage intellectual capital across the organization.
2. To identify performance-support needs and intellectual assets.
3. To store and organize knowledge items that support performance (Performance Support Mechanisms or PSMs, and work products) in such a way employees can easily find them.
4. To set clear expectations for work products so that individual performance meets Triad's standards.
5. To provide knowledge items that enable employees to get up to speed and become proficient in their job roles quickly.
6. To overtly create a line-of-site between PSMs and our core business process and business goals.
7. To foster a culture where employees develop new, and share, ideas for improved PSMs that benefit the organization.

In general, how does the KMS work?

We are using Changepoint as our knowledge repository and you will access all of the knowledge items using Changepoint. We've already loaded over 160 PSMs! There are a number of new PSMs (for example, a work plan template) and we freshened up many others with our new logo, styles and any appropriate text changes (for example, start-of-work meeting agenda template). You'll also be able to access things like the Triad Business Plan, past issues of Performance Point and TouchPoint, and all of our employee resources (like the organizational chart, the birthday and anniversary lists, and POP materials). We've even standardized our policies and forms. The forms can now be completed electronically and include online help, and you can link directly from our policies to any relevant forms.

How do I get started?

Since everyone is so busy, we decided to treat this as self-study rather than a "live" event. Below is a plan you will want to follow. It is a mix of reading (from the Changepoint Manual), making a few adjustments to your settings, and playing around with the system. Your initial pass to get familiar with everything can be completed in about 30 minutes.

- Read pages 15-1 through 15-5.
- Configure your computer settings by following the directions on pages 15-6 through 15-8.
- Get into Changepoint. For those of you who typically get into Changepoint via www.intriad.net, you will notice a new look and feel to the screen. Just click on the Changepoint icon. And later go back and try out the links to other Triad websites and common Internet search engines!

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- To begin searching and using PSMs, follow the directions on pages 15-10 through 15-14.
- You can ignore pages 15-15 through 15-20.
- Read pages 15-21 through 15-22 and 15-26 through 15-30. You can ignore pages 15-23 through 15-25.
- At some point, you will want to check out page 15-9.

Start using the PSMs! And report the time you spend doing your self-study activities to Employee Development.

What is happening to the Triad Databank?

Take a look! The only portion we are keeping is the Freelancer Data. Everything else is now in Changepoint or has been archived.

What about actual interim and final project deliverables?

The plan for down-the-road is to attach certain "work products" to Engagements as part of the project close process. We're not quite ready to do this yet, as we have to complete our server *reconfiguration and common folder structure tactic, revise our archiving process, and make sure* we are able to reliably back up Changepoint with its new volume of data. Stay tuned!

What if I have an idea for a new PSM or a suggestion to improve an existing PSM?

Jaci will be our Knowledge Management Administrator and the central hub for all questions, concerns and suggestions. If you have an idea for a new PSM or suggestion to improve an existing PSM, simply contact Jaci and tell her about your idea. And, if you have already created something really cool for a client project that we should be leveraging across the company, let Jaci know. She'll figure out how to make it generic or perhaps rope you into helping!

In Closing...

Thanks to all who completed Jaci's pre-implementation survey!

And a big thank you to Jaci, Dave, Susan F. Matt, Carol, Karyn, Erin, Shawn, Joe, Nancie, Terry and Michelle...we've now completed Business Tactics 2.1-2.4.

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Appendix H

KMS Intake Form

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☐ Done?

KMS Intake Form

The KM administrator will use this form to process requests for new PSMs and suggestions made to improve, or requests to revise, current PSMs in Triad's knowledge management system. The KM administrator will use this form to obtain additional information from the end user and the KMS steering team. Once completed, this form should be kept for one year so that annual metrics can be compiled and the evaluation process can be completed.

This form has 1 page(s).

1. **End user name:** **Date Contacted:**
2. **Need** ☐ **Revision/update** ☐ **Suggestion** ☐ **Technical Error/Problem** ☐
3. **Type of PSM**

☐ Checklist	☐ List	☐ Script
☐ Decision Aid	☐ Method Sheet	☐ Template
☐ Flowchart	☐ Policy	☐ Tool
☐ Form	☐ Procedure	☐ Workbook
☐ Guidelines	☐ Process/Process Map	☐ Worksheet
☐ Job aid	☐ Sample	☐ Other (please specify)

4. **Name of existing or new PSM or PSA:** ____________________
5. **Hyperlinks in document:** ☐ **Yes** ☐ **No**
6. **Summary of request:** ____________________
7. **Requires KM Steering Team Review:** ☐ **Yes** ☐ **No** **Date Reviewed:**
8. **Author or Revisor:** ____________________
9. **Reviewers and Approvers** ____________________
10. **Approved?** ☐ Yes ☐ No **Date Approved:**
11. **Communication Strategy:** ____________________
12. **Summary action taken:** ____________________
13. **# of PSAs converted?** ______ **# of PSMs created?** ______ **# of PSMs revised?** ______
    # of PSMs discarded: ______
14. **Date Implemented:** ______ **Date Verified:** ______
15. **Loop closed with caller who had need or suggestion?** ☐ Yes ☐ No
16. **Communication strategy executed?** ☐ **Yes** ☐ **No** **Date:** ______
17. **Additional Notes**

____

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Appendix I

Work Plan Template

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[Formal Client Name]:

[Project Name]

Project Work Plan

Submitted by

TRIAD
people • performance • results

[Date Submitted]

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Table of Contents

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[Project Name]:
Work Plan

This work plan documents Triad's understanding of the project purpose, background, evidence of success, deliverables, approach, schedule, team, and pricing and invoicing schedule for this project.

Project Purpose

[Click here; type the project's purpose which should summarize the solution. See example below:]

[The purpose of this project is to develop a 1.25- to 1.5-hour seat-time Web-based learning (WBL) program. This learning program will provide product development employees with the factual and conceptual framework for understanding environmental issues, why they are important, and how the decisions they make in the product development process can influence Steelcase's environmental stewardship.

This is intended as the first course in a curriculum and is aimed at providing a "knowledge" level of competence. Further courses to develop "understanding" and "skill" will be required.]

Project Background

[Click here; type the project background which should summarize the need or pain points.]

Evidence of Success

In order for this project to be considered successful, the project must be *effective*, and executed *on time* and *within budget*. In addition, the following conditions are critical:

- [Click here; bullet-list evidence of success, which should be measurable outcomes.]

Deliverables

The pricing provided is based on the following tangible outputs, which will be created as a result of this project:

[These are examples of standard deliverables; add, delete and revise as necessary.]

Deliverable	Description	Specifications
1. Design Document	A detailed document that builds on the design specification and includes such information as content outline, timing and flow, and instructional strategies (including practice opportunities).	• [Insert approx. number of pages] • [PowerPoint 97 or Word 97]
2. Design Specification	A document that summarizes the research phase and includes preliminary design information such as target audience, learning objectives and constraints.	• Approximately 2-3 pages

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Deliverable	Description	Specifications
3. Evaluation Plan	Defines the evaluation strategy including goals, objectives, methods, instruments, report audience and report format.	•
4. Evaluation Report [note Success Case Evaluation report later in this list]	A report, which includes the following: • Executive summary • Introduction • Background and methodology • Key findings • Recommendations	• [Insert approx. number of pages] • [Will there be both an MS Word report and a PowerPoint presentation or just one or the other?]
5. Evaluation Tools	• Level One Evaluation: An instrument designed to measure participants' reaction to the learning event. • Level Two Evaluation: An instrument designed to measure the extent to which participants increased knowledge or skill as a result of the learning event. • Level Three Evaluation: An instrument designed to measure the extent to which participants applied what they learned on the job. • Level Four Evaluation: An instrument designed to measure the extent to which the participants' learning impacted bottom-line business results. • Interview Protocols: A set of interviewing scripts that will be used during the success case interviews. • Likert-scale survey: [revise to describe the specific survey] A survey containing 5-8 questions with a scale measuring the degree to which people agree or disagree with a statement, usually on a 3-, 5-, or 7-point scale. • Data analysis tool used to organize and sort data	• [Insert number of surveys, interviews, describe web-enabled tools, etc.]

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Deliverable	Description	Specifications
6. Facilitator Guide	This guide will assist and guide the facilitator in conducting the [enter name] [seminar, course, workshop, etc.] A small section will be included at the front of the guide which explains the following: • Timing and flow • Materials needed to conduct the [seminar, course, workshop, etc.] • Suggested room arrangements • Use of visual materials • Key learning objectives This guide will provide an outline of the content to be presented, discussions to be facilitated, and/or activities to be led.	• [Insert approx. number of pages] • [PowerPoint or Word]
7. Handouts	Materials used to support course content or lecture. For example, exercise instructions, scenarios or questions for activities such as role-plays, games and group problem solving; a narrative that describes a case study and provides relevant data; and simulation materials and data.	• [Insert approximate number of handouts] • [Insert types of handouts—for example, 1 set of flashcards and 1 page of exercise instructions in MS Word]
8. Implementation Plan	The curriculum delivery strategy that specifies what, where, how, and by whom for each course.	• [Insert approx. number of pages]
9. Job Aids	A job aid can be defined as a storage place, other than memory, for information that is used in performing a task. A job aid provides the performer with auditory or visual signals that offer directions for carrying out increments of a task. The specific job aids that will be delivered on this project are listed to the right.	• [Insert specific items and indicate whether laminated, and other special features]
10. Participant Guide	This guide will include such things as: • Bulleted summaries of key workshop information • Space for notes • Activities Copies of the overhead transparencies will be included in the Participant Guide as appropriate. This guide could be bound using a [x-inch binder, GBC binding, etc.].	• [Insert approx. number of pages] • [PowerPoint or Word]

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Deliverable	Description	Specifications
11. Pilot Materials	Reproduction of the following: • Facilitator Guide • Participant Guide • Binders • Covers/spines • Posters • CDs • Etc. This includes copying, collating, binding.	• [Insert quantity of binders, pages, CDs, etc.]
12. Presentation Visuals	Supporting visuals will project images that highlight key concepts and graphics.	• [Insert approx. number of slides] • To be used as [transparencies in an overhead projector or in a computer-delivered slide-show] • [PowerPoint or Word]
13. Quick Reference Guide	[Enter description]	• [Insert approx. number of pages] • [PowerPoint or Word]
14. Reproduction Specifications	Detailed directions for reproduction that includes information such as quantity, binding, graphics etc.	• [Insert approx. number of pages]
15. Research Report	A report that communicates research and performance analysis findings, recommendations and project considerations.	• [Insert approx. number of pages]

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Deliverable	Description	Specifications
16. Success Case Evaluation Report	This report documents the results of Triad's Success Case Evaluation method—the purpose of which is to discover those instances, if any could be found, where the application of learnings from the learning intervention led to the achievement of one or more valuable business outcomes. The goal is not to quantitatively assess and analyze the full range of coaching intervention participants and impact, nor is it to draw inferences about the "average" trainee. Instead, this methodology seeks to determine if business results were impacted, why and by whom, and if not, why not. This report includes the following sections: • Executive summary • Introduction • Background and methodology • Impact profiles • Key findings • Recommendations	• [Insert approx. number of pages] • [Insert number of impact profiles]
17. Video Script	The script will equate to [enter number] minutes of video and will be developed in a two-column format. The left column describes the action taking place (for example, voice-over footage or on-camera interview) and the right column contains the spoken text.	• [Insert approx. number pages of script]
18. Video Tape	The video will use [enter number] actor(s) depicting [enter number] of characters for on-screen and voice-over narration. The video will include [enter number] of settings. The creative treatment will include graphics to enhance the communication through text and visual data displays (for example, pie charts and bar graphs).	• [Insert approx. number of minutes] • Produced in [Beta SP] format

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Deliverable	Description	Specifications
19. Web-Based Training Module	[Enter description]	• [Insert approx. number of modules] • [Insert number of custom interactions] • [Insert approx. number of screens per lesson] • [Insert level of interactivity: low/medium/high] • [Insert number of grahics] • [Insert number of minutes of audio] • [Insert number of minutes of video] • [With which LMS, if any, is it compatible?] • [With which browser is it compatible?]
20. Work Plan	Detailed documentation of Triad's understanding of the purpose, approach and schedule, and success indicators for the project along with a description of the project team's roles and responsibilities.	• Approximately 10-12 pages

Project Approach

This section describes the steps involved in each of the project phases required to accomplish the desired results and deliverables of this project.

[Click here and describe the approach; delete if unnecessary.]

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Project Schedule

It is the mutual responsibility of all project team members to adhere to the schedule or negotiate schedule changes before the start of affected tasks.

Note: Because of the multiple components in this project, schedule dates may overlap.

Step, Task or Milestone	Start Date	End Date	Responsible
Insert more rows as necessary			

Project Team

The project team consists of members from both [Client Name] and Triad. The team member roles and primary responsibilities are described below.

Triad

[Click here; list names and provide a brief description of their role and primary responsibilities.]

[Client Name]

[Click here; list names and provide a brief description of their role and primary responsibilities.]

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Contact List

Name and Address	Telephone Number	Mobile Number	Fax	E-mail Address
[Client Name] [Client Address] [Client Main Phone Number]				
[client team member]				
[client team member]				
Triad 30101 Northwestern Hwy. Suite 201 Farmington Hills, MI 48334 (248) 737-3300		2 Burton Centre, 2040 Raybrook SE, Suite 207 Grand Rapids, MI 49546 (616) 956-6850		
[Triad team member]	[ext. #]			
[Triad team member]	[ext. #]			
[Triad team member]	[ext. #]			
[Triad team member]	[ext. #]			

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Pricing

[This section should be on a separate page so that the client can easily give it to Purchasing or remove it when sharing the work plan with other team members.]

This is assumed to be a [fixed-price or time and materials] project and the pricing reflects the deliverables and approach as described in this work plan. However, Triad is pleased to discuss alternatives and is willing to support this initiative to whatever degree [Client Name] requires.

[Use this section, in blue font, for a fixed-price project. Delete if it is a time and materials project. Change the font to black when completed. To automatically sum the rows in the table, right-click on the Grand Total Amount field and choose Update Field.]

Fees and Invoicing Schedule

Deliverables/Milestone	Estimated Invoicing Date	Amount
Insert additional rows before the Grand Total row.		

Grand Total $ 0

[Use the next two sections, in green font, for a **time and materials** project. Delete if it is a fixed-price project. Change the font to black when completed. To automatically sum the rows in the Invoicing Schedule table, right-click on the Estimated Total Amount field and choose Update Field.]

Roles and Rates

Triad's professional fees are presented in the table below.

Role	Hourly Rate
Insert additional rows if necessary.	

Invoicing Schedule

Approximate monthly invoice amounts are presented in the table below.

Invoicing Date	Estimated Amount
Insert additional rows before the Estimated Total row.	

Estimated Total $ 0

Upon request, Triad can provide the most up-to-date budget data on Wednesdays, which includes data through the previous Saturday.

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Assumptions

Triad's pricing and schedule are based on the following list of assumptions. If these assumptions are not correct or change in the course of the project, it may affect pricing and/or schedule. In such cases, notify the project manager as soon as possible.

[Following is an exhaustive list of assumptions that may apply to your project. Delete those that are not applicable. Ensure that assumptions documented in this project work plan align with those used in the quote template.]

- Triad's quote is based on the approach, deliverables (and their respective specifications) and schedule described in this document. Changes to approach, deliverables and schedule could result in a change in price.
- [Client Name] will appoint a [Client Name] project manager who is empowered with the technical and fiscal authority to coordinate logistical efforts with Triad; consolidate, arbitrate, and resolve differences of review comments from different SMEs; and interface with the Triad project manager on day-to-day activities.
- Triad's quote assumes [Number] minutes of seat time of instruction.
- Triad's quote assumes [Number] screens of instructional material.
- Triad's quote assumes [Number]% of interactivity using standard templates—multiple choice, fill-in-the-blank, true/false.
- Triad's quote assumes [Number] interface designs.
- Triad's quote assumes [Number] support graphics.
- Triad's quote assumes [Number] minutes of audio.
- Triad's quote assumes [Number] minutes of video.
- All materials will be in English for this project.
- When possible, all print documents will be developed in the Microsoft Suite 7.0. High production print output may require use of other applications.
- The proposed solution will be authored using [software] [version]. The delivery platform will be [delivery platform].
- Triad assumes [Number]% of the content is existing and that existing content is accurate and complete.
- Triad will use existing graphics, audio or video as appropriate.
- [Client Name] will write the content for the [deliverable(s)].
- There will be [Number] of drafts: [first, second, pilot and final (alter as needed)].
- There will be [Number] reviews of materials: one between first and second draft, and one between second and final draft. Revisions to materials are estimated at approximately [Number]% following first draft and [Number]% for subsequent drafts.
- There will be up to [Number] reviewers for each review. [Client Name] will consolidate reviewers' comments and submit them to Triad for incorporation into the materials.
- [Number] representatives of [Client Name] will participate in the usability test of deliverables.

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- Triad's quote assumes [Number] Triad team members will attend the [length] pilot/usability testing.
- Turnaround time for each review will be [duration] business days.
- Resources (people and documents) will be available in a timely fashion. Project participants will be available for, and attend all meetings.
- Reviews will be done online using Triad's Review Tool. [Client Representative] will act as a representative for [Client Name] and will verify that the comments from any other reviewers at [Client Name] are valid and represent changes that should be made.
- Triad will maintain project status logs on a weekly basis.
- Triad will conduct weekly client project meetings.
- Triad's *Web Infrastructure Questionnaire* was completed accurately by a qualified representative of [Client Name]. Differences from the *Web Infrastructure Questionnaire* which are disclosed later in the project may require additional cost in the form of additional time and/or materials.
- Learner tracking and bookmarking is accomplished using [Client Name]'s established custom or off-the-shelf Learning Management System.
- Neither learner tracking nor bookmarking are required for this training.
- [Client Name] will provide appropriate support for integration with [Client Name]'s Learning Management System.
- Price includes final delivery of electronic files and one printed master copy of deliverables specified in this work plan.
- Price does not include any work associated with packaging of the materials (e.g. binder/housing design/production). Triad assumes [Client Name] will handle packaging design through another supplier.
- [Number] master CD-ROMs will be provided to [Client Name]. Duplication of additional CD-ROMs can be quoted upon request.
- Price does not include audio production or time of any Triad project team member to attend audio recording and edit sessions. Triad can provide a quote for audio production support upon completion of audio scripts when final script specifications and audio production plans are finalized.
- Price does not include video production or time of any Triad project team member to attend video shoots and edits. Triad can provide a quote for video production support upon completion of video scripts when final script specifications and video production plans are finalized.
- Price assumes [Client Name] will be responsible for the logistics of conducting the courses, including inviting and registering participants, and scheduling and arranging the facilities, equipment and refreshments.
- Price assumes [Client Name] will be responsible for delivering the courses, including selecting and scheduling the facilitators.
- All work products resulting from this project will be the property of [Client Name]. Triad will retain no ownership or rights to the content or products.
- All materials supplied to Triad will be treated as specified by [Client Name].

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- Triad will invoice monthly for time and materials utilized according to the rate structure provided in this document.
- Triad will invoice according to the invoice schedule provided in this document.
- Triad reserves the right to invoice [Client Name] for work completed, in the event that [Client Name] delays the project for a period of [Number] weeks or more.
- Travel expenses are not included in the pricing. If travel is required to complete the project, expenses incurred by Triad will be invoiced at cost according to [Client Name] guidelines.
- If requested changes for this project exceed the budget or schedule reflected in this project quote, Triad will discuss requested changes with the [Client Name] project manager. If requested changes are required to complete the project, Triad will issue a Project Change Notice (PCN) to the [Client Name] project manager to update the project plan and budget.
- Triad will conduct any course maintenance on a time and materials basis.

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Agreement

[It is a best practice to sign off on a work plan and adhere to it as a contractual, legal document.]

Your signature below indicates that you have read the contents of this work plan and agree to the contents herewith and that you are signing this document as a legitimate agent of the corporation you represent.

[Client Name] Representative Signature	Date
Triad Representative Signature	Date

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Appendix J

Work Product Data Sheet

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Work Product Data Sheet

Element	Possible Pts.	Work-Product Subject Number						
Client								
Date								
Date last revised								
Cover page	**1**							
Project name designated	**1**							
Client name designated	**1**							
Triad logo on cover page	**1**							
TOC	**1**							
Correct footer, Triad logo	**1**							
Correct footer, Date	**1**							
Correct footer, Page number	**1**							
Correct header, Project name	**1**							
Project purpose	**5**							
Project background	**5**							
Evidence of Success	**5**							
Deliverables	**5**							
Table in Deliverables sections	**5**							
Project Approach	**5**							
Project Schedule	**5**							
Project Team	**5**							
Contact List	**5**							
Right pricing section/Quote	**5**							
Assumptions	**5**							
Agreement, Triad signature place	**5**							
Agreement, Client signature place	**5**							
Total	**74**							

Appendix K

KMS Pre-Implementation Survey

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Knowledge Management System Pre-Implementation Survey

The intent of this survey is two-fold. We want to get an assessment of the impact Changepoint and the Client Engagement Process has had, if any, on doing work at Triad. We also want to obtain a baseline by which we will identify and measure the improvements made in managing information and the extent of performance support given to Triad people in doing their work. A follow-up survey will be given to you following the implementation of Triad's knowledge management system (KMS) in order for you to assess the degree of change and/or improvement. Your participation in this survey and honest feedback will be greatly appreciated.

Please check below in which department you work.

- ❑ Consulting Sales and Service
- ❑ D3
- ❑ Practice Development Group
- ❑ Corporate Services

1. How many hours on an average week do you spend looking for information (such as a sample of a particular deliverable or a template)?

   ________Hours per week

2. How much time each year did you spend in 2001 looking for, or sharing, industry information (such as ASTD's state of the industry report) or competitive information for clients (such as dollars spent on training per head)? Please specify in hours.

   ________Hours in 2001

3. How many calls do you get on average per week from internal employees seeking information or advice from you and how much time do you spend on those calls?

   ________Number of Calls ________Average amount of time per call

4. Based on the amount and complexity of information within your department, how long would you estimate that it would take a new employee to become fully competent on using the tools available and creating satisfactory deliverables based on their role? If you are not a people manager, please answer this from a personal perspective. If you are a people manager, please answer from a training perspective. Please specify in hours.

1-40 hrs.	40-80 hrs.	80-120 hrs.	120-160 hrs.	160-200 hrs.	200+ hrs.
(1 week or less)	(1-2 weeks)	(2-3 weeks)	(3-4 weeks)	(4-5 weeks)	(More than 5 weeks)

5. Are there people in your department taking on tasks that should be handled in other departments? If yes, please identify what kind of tasks and why you think this is happening.

6. What are the major "pain points" for you in accessing information and/or disseminating information with respect to your particular job roles?

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7. If you are a project or account manager, how much *more* time do you spend up front managing projects with Changepoint compared to without it? Please specify in hours per project.

0	0-2	2-3	3-4	4-5	5+
Hours	Hours	Hours	Hours	Hours	Hours

8. If you are a project or account manager, please rate the improvement in the accuracy of, reliability of, and access to, project data with Changepoint compared to TRAC.

1	2	3	4	5
no improvement	slight improvement	50% improvement	75% improvement	100% improvement

9. If you are a project or account manager, how much time on average per month, do you spend on the monthly invoicing cycle? Please specify in hours per month.

0-1	1-2	2-3	3-4	4-5	5+
Hours	Hours	Hours	Hours	Hours	Hours

10. Please rate the improvement in the forecasting process (that is, that the forecast is fed by project data in real time and if project data are accurate, the forecast will be accurate)?

1	2	3	4	5
no improvement	slight improvement	50% improvement	75% improvement	100% improvement

11. In the last year, how much of your time is spent on re-work because a work product or deliverable had wrong or missing types of information (not due to inaccuracies, typos, etc)? For example, how much time have you spent re-doing a work plan because the account manager wanted you to add or remove a section? If you are a manager, please indicate an average time estimate for those products you have asked people to redo. Please specify in hours per year.

________Hours per year

12. How much potential do you think there is to improve Triad customer service (for example, the quality of our deliverables or our responsiveness) just from improving the quality of information sharing and dissemination within Triad?

1	2	3	4	5
None	A little bit of potential	Some potential	A lot of potential	Great potential

13. Based on your understanding of what a knowledge management system is, which of the following are expectations you have for how the system will benefit you?

- Improve quality of deliverables
- Decrease the amount of time I spend looking for something

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- Provide content or content ideas for various work products (e.g., work plans, proposals, design documents)
- Provide clear expectations around standards for work products
- Decrease the amount of time I spend writing something (such as, from scratch as opposed to based on a template or a sample)
- Decrease the amount of time I spend explaining to someone else what I expect of them
- Decrease the amount of time I spend coaching someone on how to do something
- Provide samples of work products
- Provide easy access to past work products and deliverables
- Brainstorm more of these with Lisa

14. Based on your understanding of what a knowledge management system is and where Triad is as an organization, how much timesavings do you expect to realize per month from using a knowledge management system?

    ________Hours per month

15. Do you believe our competitors are better at knowledge management than we are? In other words, are we way below where others are in leveraging corporate knowledge, about the same or ahead of the game?

    ________Way below ________About the same ________Ahead of the game

16. Please rate how you feel about how encouraged you are to share your work products with others in the organization?

1	2	3
not encouraged at all	somewhat encouraged	Very encouraged

17. Please pick the statement that best describes how you feel about sharing your work products with others in the organization? Check all that apply.

    - My work is my work— I'm not thrilled with the idea of others getting a short cut
    - If someone asked, I'd share but I don't have time to go out of my way
    - I'd feel good if others thought my work was worthy of reusing
    - If it can help Triad, then I'm all for it

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Appendix L

KMS Post-Implementation Survey

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KMS Post-Implementation Survey

I will be using Triad's own Success Case Evaluation method to assess the impact our Knowledge Management System (KMS or "the system") has had on Triad's business. Therefore, I may call you to ask some follow-up questions.

Your participation in this survey and honest feedback will be greatly appreciated. Please complete the survey and email it to Jaci Smeltzer by August 28th.

Please check below in which department you work.

☐ Consulting Sales and Service ☐ Practice Development Group
☐ D3 ☐ Corporate Services

1. Estimate how much time do you estimate the system has saved you on average per week?
   ☐ 0-30 minutes ☐ 30-60 minutes ☐ 1-2 hours ☐ 2-3 hours
   ☐ 3-4 hours ☐ 4-5 hours Other: Please specify:
2. Since the system implementation, how many hours on average per week do you spend looking for information (such as a sample of a policy or a template)? Please specify in hours per week.
   ☐ Less than 1 hour ☐ 1-2 hours ☐ 3-4 hours ☐ 4-5 hours
   ☐ 5 hours or greater Other: Please specify:
3. Based on the amount and complexity of information within your department, do you expect to realize a difference in how long it takes for new employees to become fully competent on the content since the system implementation?
   ☐ Yes ☐ No
4. Please rate the improvement in ease of finding information you need.
   ☐ No improvement ☐ slight improvement ☐ 50%improvement ☐ 75% improvement
   ☐ 100% improvement
5. Have you used the system to impact Triad's business goals?
   ☐ Yes ☐ No
6. Previously, did you frequently use Triad's databank to find templates, policies and other information?
   ☐ Yes ☐ No
7. Do you frequently use the current KMS to find templates, policies and other information?
   ☐ Yes ☐ No

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8. For each of the areas below, indicate the extent to which you think this system has influenced you or your department.

Area	No influence	Slight improvement	50% improvement	75% improvement	100% improvement
Productivity	☐	☐	☐	☐	☐
Efficiency	☐	☐	☐	☐	☐
Quality and/or accuracy	☐	☐	☐	☐	☐
Response time	☐	☐	☐	☐	☐
Development time	☐	☐	☐	☐	☐
Cost control	☐	☐	☐	☐	☐
Customer service	☐	☐	☐	☐	☐
Customer satisfaction	☐	☐	☐	☐	☐
Employee satisfaction	☐	☐	☐	☐	☐
Performance expectations	☐	☐	☐	☐	☐

9. Which of the following expectations do you believe Triad delivered on with the system? Check all that apply.
   - ☐ Provide samples of work products
   - ☐ Provide easy access to past work products and deliverables
   - ☐ Decrease the amount of time I spend creating or writing a document
   - ☐ Decrease the amount of time I spend explaining to someone else what I expect of them
   - ☐ Decrease the amount of time I spend coaching someone on how to do something
   - ☐ Decrease the amount of time I spend looking for information
   - ☐ Provide content or content ideas for various work products (e.g., work plans, proposals, design documents)
   - ☐ Provide clear expectations around standards for work products
   - ☐ Reliably provide accurate information
   - ☐ Improve the quality of deliverables

10. Please provide any other comments in the following space.

TRIAD [date]

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