USING KNOWLEDGE MANAGEMENT SYSTEMS TO MANAGE KNOWLEDGE RESOURCE RISKS

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ABSTRACT

One of the emerging roles of management accountants in organizations is the design and operation of their organization's knowledge management system (KMS) that ensures the strategic utilization and management of its knowledge resources. Knowledge-based organizations face identifiable general risks but those whose primary product is knowledge, knowledge-products organizations (KPOs), additionally face unique risks. The management accountants' role in the management of knowledge is even more critical in such organizations. We review the literature and survey a small convenient sample of knowledge-products organizations to identify the general risks knowledge-based organizations face and the additional risks unique to KPOs. The general risks of managing knowledge include inappropriate corporate information policies, employee turnover, and lack of data transferability. Additional risks unique to KPOs include the short life span (shelf-life) of knowledge products, the challenging nature of knowledge experts, and the vulnerability of intellectual property. The paper includes recommendations for management accountants in KPOs to develop and maintain competitive advantage through their KMS. These

include developing enterprise-wide knowledge policies, fostering collabo-
ration and documentation, addressing knowledge security, and evaluating
the effectiveness of the KMS.

One of the emerging roles of management accountants in organizations is
the design and operation of their organization's knowledge management
system (KMS) that facilitates the strategic management of its knowledge
resources.[1] This role is even more critical in organizations whose primary
product is knowledge, the knowledge-products organizations (KPOs). Sev-
eral authors have extensively discussed the value of KMS to a variety of
organizations (e.g., Sveiby, 1994; Davenport & Prusak, 1998; Santosus &
Surmacz, 2001), and the use of KMSs to add value to organizations through
the strategic utilization, development, and maintenance of knowledge (e.g.,
Hansen, Nohria, & Tierney, 1999; Smith, 2004; Bryan, 2004).[2] However,
there is little in the management accounting or KMS literature that ad-
dresses the unique aspects that KPOs must consider in the design and op-
eration of their KMS. In addition to identifiable general risks that any
knowledge-based organization faces, KPOs confront a unique set of risks
that affect their KMS. Using a survey of a small convenient sample of
KPOs, we explore both types of risks and how they are managed. This paper
identifies the general risks knowledge-based organizations face in knowledge
production, explores the unique risks that KPOs additionally confront and
how they manage such risks, and offers recommendations in the design of
KMS to improve the management of these risks.

This paper is organized in six parts. Part I briefly defines knowledge and
distinguishes it from information. Part II describes knowledge management,
explores the characteristics of organizations whose primary focus is pro-
ducing knowledge products (KPOs), and provides an overview of the gen-
eral business model of KPOs and their role in the current information
marketplace. Part III consists of a description of a small convenient sample
of KPOs used in our survey. Part IV identifies knowledge-related risks in
general as well as unique knowledge risks specific to KPO, reviews how
these risks apply to our small sample of KPOs, and explores how KMSs can
be used by these organizations to manage and mitigate these risks. Part V
includes recommendations that management accountants must consider in
the selection of an appropriate KMS that is dependent on the nature of the
competitive marketplace. Part VI provides a summary and conclusions in-
cluding the critical role that management accountants can play in the
knowledge management field.

PART I: INFORMATION VERSUS KNOWLEDGE

The differences between *information* and *knowledge* are often blurred as both organization theorists and marketing managers frequently, but erroneously, treat them as synonyms. The Operational Research Society (2004) has a brief webpage describing some of these errors.[3] Their examples include company logos and literature that wrap information and knowledge together as interchangeable. The distinction is critical, because each requires different management techniques (Wilson, 2002).

A key characteristic of information is that it contains a fact-based message involving data in a specific context that is relevant to the audience. Knowledge, on the other hand, is characterized by ideas, thoughts, and beliefs intended to convey a subjective message (No Doubt Research, 2003). Pyle (2003) sharpens the distinction by stating that ''information is how you know [what happened]; and knowledge is what to do about it'' (p. 97). According to Ackoff (1989), knowledge is derived from the internalization of information. Davenport and Prusak (1998) assert that knowledge implies experience of the communicator, practical utility toward problem solving, complexity vis-à-vis the problem at hand, and evolution from prior knowledge. All these writers agree that information begets knowledge.

Knowledge Dimensions

Knowledge can be classified in different useful ways according to several dimensions. For example, knowledge can be explicit or tacit, content-based or expertise-based, and common or distinctive.

Explicit knowledge is tangible and documented. In the words of Fairchild (2002), it is ''what is left when people go home'' (p. 243). *Tacit* knowledge, in contrast, is undocumented and often characterized as the experience and intrinsic knowledge of employees. *Content* knowledge, or know-what, is concerned with the theoretical concepts underlying knowledge. The knowledge that steel frames provide a suitable structure for hurricane-prone houses is an example of content knowledge. Brown and Duguid (1998) note that content knowledge is frequently held in explicit form, which eases the ability to share with others. *Expertise*-based knowledge, or know-how, is having the capacity to carry out a task.[4] An example of expertise knowledge is the capability to construct a steel-framed house. *Common* knowledge, according to Bryan (2004), ''by definition, hardly needs trading'' (p. 105) as it forms the root of basic, practical judgment. Common knowledge is

derived from universally familiar and well-documented past experiences. On the other hand, *distinctive* knowledge stems from the expertise of the few. It is the source of organizational competitive advantage (Bryan, 2004) and forms the basis of knowledge products.

PART II: THE KNOWLEDGE-PRODUCTS ORGANIZATION (KPO)

Before we discuss the specific issues of knowledge risks, we first address what knowledge management is and is not, and the role of management accounting in knowledge management.

Knowledge Management and Management Accounting

For our purposes, we adopt the definition of knowledge management as provided by Carl Frappaolo (1998) of the Delphi Group, which states that "knowledge management is leveraging collective wisdom to increase responsiveness and innovation" (p. 2).

At its root, knowledge management seeks to apply structured managerial processes to the various and somewhat abstract knowledge assets of the firm (Newman, 1999). Newman explains that a well-designed KMS first identifies knowledge assets and then ensures their maximum contribution to the business through both content management and information processing. According to Prusak (2001), one of the first steps in implementing a KMS is to identify: (a) what do we know, (b) who knows it, and (c) what we should know that we do not know (p. 1002). Through a knowledge management system, an organization can identify and document the answers to these questions.

A core tenet of knowledge management is the selective conversion of tacit knowledge into explicit knowledge. This promotes the collective education of the organization and prepares for employee attrition. Tacit knowledge departs with the employees holding that knowledge, while explicit knowledge stays behind in the organization. Another key principle of knowledge management is collaboration, stressing the benefits from inter-departmental and intra-departmental cooperation through communication and sharing (Kirsner, 2001). Such an environment ensures that other units within the same organization benefit from each other's success and learn from their respective failures.

In summary, effective knowledge management offers the following:

(a) It supports the development and implementation of strategy in those organizations where knowledge resources are central to the organization's mission.
(b) It provides a means for management to make better-informed decisions related to its most valuable resources.
(c) It offers ways to measure knowledge and the contributions of knowledge assets to predetermined goals.

Clearly, KM is an interdisciplinary function in which the role of the management accountant is critical, particularly in strategy implementation, in tactical decision-making, and in the measurement of knowledge resources. Strategic management accounting tools such as the balanced scorecard can potentially inform organizational strategy development and implementation, support effective knowledge management (Fairchild, 2002), and facilitate the strategic deployment of intangible (knowledge) assets (Kaplan & Norton, 2004). The management accountant's measurement skills can benefit the organization in developing relevant qualitative, quantitative, and financial measures.

It is important to note what knowledge management is *not*. KM is not an answer to a specific question; it is not an ad-hoc "just in case" system; it is not a means of defining goals; and it is not a technology. KM clearly can benefit from the use of technology, but is not defined by that technology. Many companies already use technological applications such as email, customer relationship management (CRM) applications, or intranets as tools to manage their knowledge. Often, KM suggests various hardware and software systems as vehicles for knowledge creation, storage, retrieval, and analysis.

KMS as an Effective Tool

The archetypal KMS is the instrument by which the organization implements its knowledge management strategy; one is only useful in the presence of the other. Alavi and Leidner (1999) describe KMS as designed to move managerial activities beyond the scope of data and information systems, and focus "on creating, gathering, organizing, and disseminating an organization's knowledge" (p. 3).

KMSs should not be expected to solve critical business problems related to poor planning, lack of a solid business plan, or ineffective human relations. Malhotra, the founding chairman and chief knowledge architect of

the BRINT Institute, explains that knowledge provides advantages to its owner only when acted upon (BMEE, 2003). The return on knowledge management investment stems from eradicating quality and control problems, finding efficiencies, securing knowledge assets, and most importantly responding appropriately to changes in the competitive environment.

Knowledge management strategies can be measured by the results of KMSs put in place (Alavi & Leidner, 1999). This means a KMS should "do something useful" (Davenport, De Long, & Beers, 1997, p. 2) to be effective. Davenport, Jarvenpaa, and Beers (1995) outline measurable KMS dimensions as: (1) the procedural conversion of implicit knowledge into tacit; (2) the improvement of knowledge to add value to the customer; (3) collaboration with the customer; (4) promotion of knowledge sharing as part of the work process; and (5) enhancement of production efficiencies. The benefits of effective KMS include substantial positive effects on profits, increases in the amount of useful knowledge a firm creates, and positive feedback and acceptance by the KMS users (Davenport et al., 1997).

The Emergence of KPOs

In a manufacturing-based economy, a company's research and development (R&D) department is the primary source producing as well as consuming the organization's knowledge assets. Because in-house knowledge systems reduce reliance on external sources, firms can protect their innovations and closely monitor product development. However, two trends in the US economy that have accelerated in the past three decades explain the explosion in the number and scope of KPOs. First, companies now compete in increasing arrays of dissimilar products, which widens the necessary focus of their expertise. Second, companies have grown more global in scope. Both of these trends have increased the need for external research resources.

The importance of knowledge resources is evidenced by statements made by a number of authors. Logan and Stokes (2004), for example, assert that "the culture of an organization is not just its social and business practices but also its organizational knowledge" (p. 226). Economists, organizational theorists, management consultants, and professional accounting organizations (CMA Canada, 2000) agree that knowledge and knowledge assets are the sine qua non of the modern economy. Looking into his crystal ball, Drucker (1994) expected knowledge workers and knowledge resources to dominate the coming society. Carlucci and Schiuma (2004) cite Wiig's affirmation that pins a firm's sustainability to how it manages and applies its

knowledge assets. Malhotra (BMEE, 2003) suggests that intellectual capital deserves recognition on the corporate balance sheet and in the national accounts similar to the gross national product (GDP). Intangible knowledge assets are swiftly replacing tangible capital as the source of a company's distinction and basis for advantage in a competitive marketplace (Logan & Stokes, 2004). A comparison of market capitalizations for new versus old economy stocks particularly reinforces this idea.[5]

Recent surveys by the Industrial Research Institute of leading US companies document a current trend toward flat R&D budgets and higher targets of sales yield for R&D expenses (Grucza, Bianco, & Ayers, 2005). The National Science Board (2004) concludes that volatility in the economy and technology-based markets is forcing firms to "leverage the value of their R&D spending through alliances and collaborations" (Chap. 4, p. 23) in contrast to a single-source strategy. Going forward, US firms expect to increase alliances with knowledge producers, license technology from others, and increase overall efficacy of limited R&D dollars (Grucza et al., 2005).

The NSB (2004) research also indicates an increase in outsourcing R&D work. For example, the funding of external, contracted R&D for US firms grew by 12.2% per annum from 1993 through 2001, compared to only 8.5% during the same time period for in-house R&D funding. Since 1993, contract R&D expenditure growth outpaced internal spending six out of eight years (see Fig. 1). These observed trends clearly support the contention that firms will need to look to partnerships and alliances to enhance the bang for their R&D buck. It should be noted, however, that figures for 2001 point to the discretionary nature of R&D spending in times of recession. Firms that contract to perform research and development for other organizations appear highly vulnerable to macroeconomic cycles.

The Knowledge-Products Organization (KPO)

Advances in communication and computing technology are rapidly transforming the collection, synthesis, and dissemination of information needed for business decision support. Furthermore, the growth of US business and the increase in global competition have spawned a unique industry tailored toward distinctive knowledge creation. As a result, new organizations are moving to meet this accelerating demand for expertise. In doing so, they construct an entire business model around knowledge flow and use their specialized industry acumen to form a KPO.
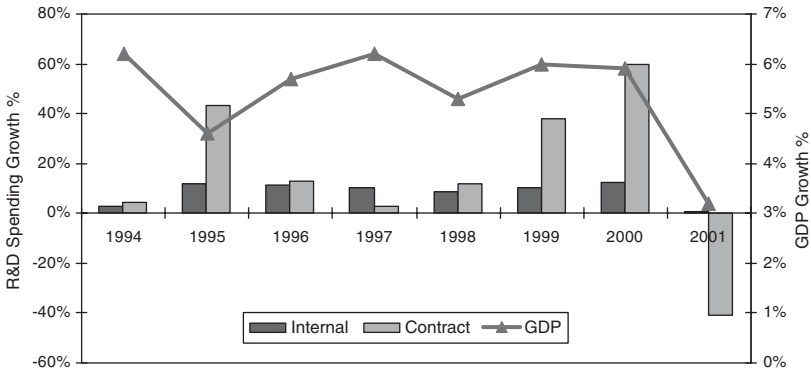
Fig. 1. Industrial R&D Expenditure Growth: Internal versus External Spending.
Notes: Data are company and other non-Federal funds for industrial R&D performance in the United States within the Company and Contracted to External Organizations. Starting with the 1999 Survey, Estimates are Based on North American Industry Classification System. In Prior Years, Estimates were Based on the Standard Industrial Classification System. *Sources:* National Science Foundation, Division of Science Resources Statistics, and Survey of Industrial Research and Development, annual series, http://www.nsf.gov/sbe/srs/indus/start.htm; Bureau of Economic Analysis.

According to Dietz and Elton (2004) of McKinsey & Co, partnering with these new KPOs can be lucrative for a firm. They claim that "[t]he most common organizational shortfall is a failure to recognize that in-licensing (the licensing or purchase of [Intellectual Property] and related assets from external organizations) can boost a company's performance and growth as much as homegrown R&D" (para. 4). They suggest that companies who actively "in-license", that is, outsource intellectual property, enjoy innovation, improvement, and expansion, which increases their competitive advantage. As noted above, the Industrial Research Institute's (2005) research indicates that organizations are beginning to understand the value of purchasing knowledge products. Sveiby (1994) describes knowledge organizations as a sub-component of the service sector, identified by their small size, creativity and high education, among other factors. Their product is "solving problems that are hard to solve in a standardized manner" (Chap. 1, para. 4). According to Sveiby, the business model of such a firm revolves around "attracting the personnel, attracting the customers, and then matching the capacity and the chemistry of the personnel and the customer" (Chap. 1, para. 6).

The knowledge products organization is one that sells internally created knowledge packaged as products with reliance on subject-matter expertise. KPOs tend to focus on *distinctive*, rather than common, knowledge products. The product may be specific to a subset of an industry such as financial market prediction, or broad such as process improvement. Knowledge-producing organizations rely upon a mix of expertise and content knowledge, depending on the requirements of the marketplace. Delivery of tacit knowledge may require personal interaction as with a consulting firm; while explicit knowledge is imparted in the style of periodicals, manuals, or electronic media. In short, the KPO is a for-hire R&D unit of the pre-knowledge economy with the flexibility and technological tools of the New Economy.

KPO Structure

The organizational structure of the KPO maps very closely to other industries. In this way, the selling and financing of knowledge is minimally different from a typical service, retail or manufacturing firm. The sales force must be well informed of product capabilities and market demand; the finance team must ensure that the books are properly maintained and that the firm is capable of increasing shareholder value in view of the absence of significant tangible assets. In fact, knowledge production may follow a work flow similar to a typical manufacturing firm.

The manufacturing model consists of several phases, including "product design and documentation, material selection, planning, production, quality assurance, management, and marketing of goods" (Rehg & Kraebber, 2001, p. 2). Like a manufacturer, the KPO must gather marketing intelligence on the competitive product space. In designing a product, marketing research identifies strengths, weaknesses, opportunities, and threats (Brooksbank, 1994). Unlike the manufacturing firm whose raw materials are typically derived from outside resources, the KPO's production materials can be found from within the organization (e.g., experience of the knowledge workers, data warehouses, and project documentation), as well as from exogenous sources (e.g., collaborative relationships with clients, secondary data providers, and user communities). The means of production for both types of firms involves combining the raw materials with the expertise knowledge of the workers.[6]

To monitor the quality of production, each may use control measures, including statistical metrics, service calls, and reviews of work in-process. While a material good can be "stress tested" to determine failure rates and measure tolerances, the KPO may use comparative analysis with

benchmarking and ''best practices'' as determinants of quality control. The knowledge product, like the final material good, must be delivered to the end user in a manner that is convenient and efficient. Because explicit knowledge requires no specific medium and tacit knowledge is intangible, knowledge products can be transmitted through electronic channels, printed documents, and personal communication.

Post-sale support ensures that the product functions as intended, and fosters the relationship between producer and customer. Each type of firm must deal with related technical problems such as integration with existing systems. For the KPO, this means technical and data support, production of ''white papers'' and other accessory knowledge products, and resolving inevitable discrepancies with other sources of knowledge. Fig. 2 shows a model of this production process, highlighting the stages described above and pointing out the similar and different approaches to each stage of the production cycle.

Developing and constructing quality knowledge products on a given topic requires the KPO to retain one or more subject matter experts (SMEs) to oversee alignment of company practices with changes in the industry landscape. For example, a technology research firm would have experienced IT managers or developers on staff who ensure that the knowledge created by the firm stays abreast of advances in the field. A KPO may send its SMEs to industry conferences and client sites, or have them participate in user groups. The firm relies heavily upon this SME position for mid-term and long-term strategic guidance. SMEs may also be in the position of, or report to, the chief information officer (CIO) or the recently developed position of chief knowledge officer (CKO). According to Thurow (2004), the CKO is one ''who provides honest, unbiased intelligence about the world around a company and where the company stands in that world'' (p. 91).

Taxonomy and Examples

A general taxonomy of the prototypical KPO is shown in Fig. 3, using the various knowledge dimensions previously discussed. In reality, firms may actually straddle multiple classifications.

Examples of KPOs include:

Management consultants: for-profit firms, serving management in client organizations in support of project oversight, process engineering, and general expert advice in organizational strategy. Hargadon (1998) calls these KPOs ''knowledge brokers'' (p. 210).
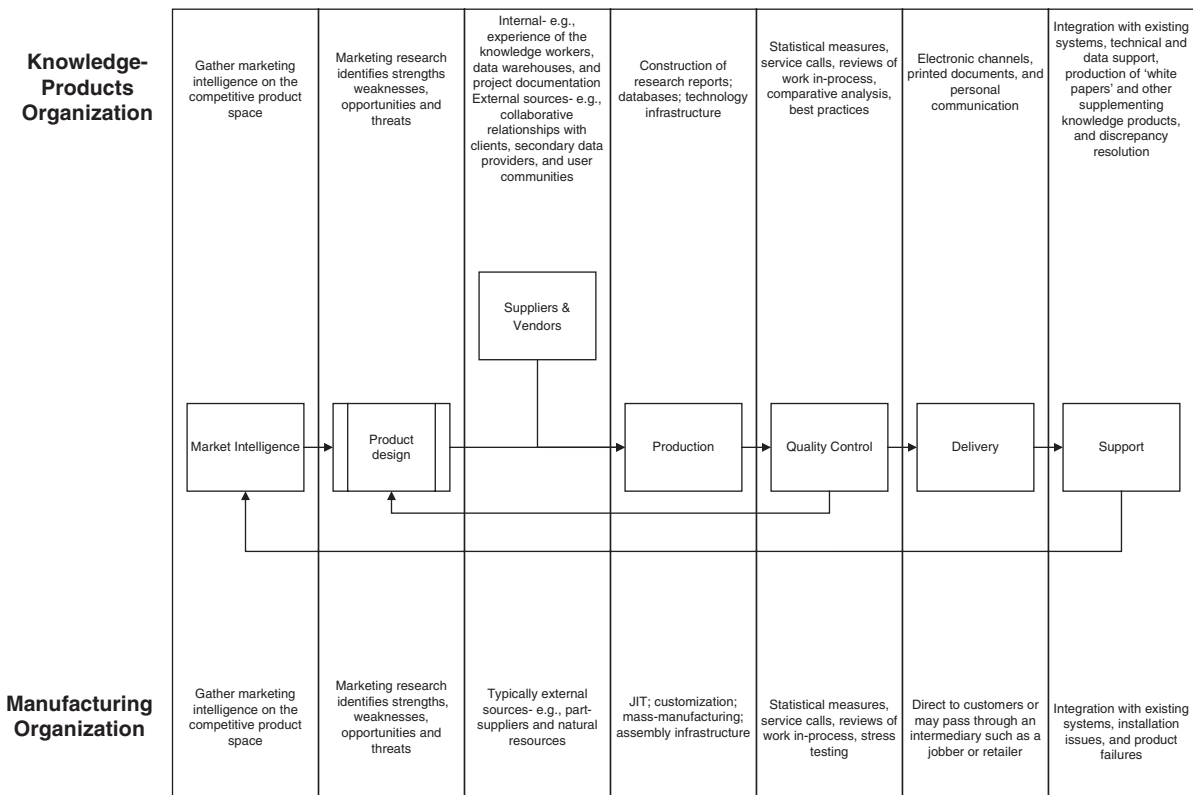
	Market Intelligence	Product design	Suppliers & Vendors / Production	Production	Quality Control	Delivery	Support
Knowledge-Products Organization	Gather marketing intelligence on the competitive product space	Marketing research identifies strengths weaknesses, opportunities and threats	Internal- e.g., experience of the knowledge workers, data warehouses, and project documentation External sources- e.g., collaborative relationships with clients, secondary data providers, and user communities	Construction of research reports; databases; technology infrastructure	Statistical measures, service calls, reviews of work in-process, comparative analysis, best practices	Electronic channels, printed documents, and personal communication	Integration with existing systems, technical and data support, production of 'white papers' and other supplementing knowledge products, and discrepancy resolution
Manufacturing Organization	Gather marketing intelligence on the competitive product space	Marketing research identifies strengths, weaknesses, opportunities and threats	Typically external sources- e.g., part-suppliers and natural resources	JIT; customization; mass-manufacturing; assembly infrastructure	Statistical measures, service calls, reviews of work in-process, stress testing	Direct to customers or may pass through an intermediary such as a jobber or retailer	Integration with existing systems, installation issues, and product failures

Fig. 2.   Manufacturing Firm versus KPO.

Profit Status	Client	Delivery Timing	Product Form	Knowledge Concept	Product Content Examples
For Profit Not For Profit	Educational Business Consumer Government	Cyclical Ad Hoc	Tacit Explicit	Expertise Content	Financial Knowledge Consumer Knowledge Political Knowledge Industry Knowledge Product Knowledge
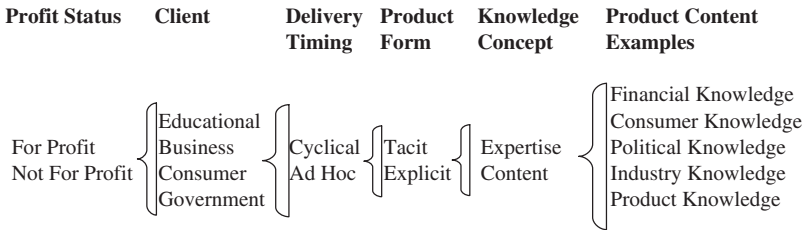
Fig. 3.   General Knowledge-Producer Taxonomy.

Real estate brokers: for-profit firms serving businesses and/or individuals with ad hoc knowledge of real estate markets.

Educational institutions: typically not-for-profit, researching any number of subjects for internal consumption as well as furthering external and private interests. While most research is project-oriented, cyclical knowledge products include such services as the distinctive knowledge that accompanies the University of Michigan's monthly Survey of Consumers.[7]

Investment banks: for-profit organizations serving the needs of institutional clients and individual investors with both ad hoc and cyclical knowledge products oriented toward finance and investment.

Information Providers and Software Developers

Many organizations create informational products that do not meet the requirement of distinctive knowledge. While their contributions to the economy and society are remarkable, their aim is to collect and reproduce information, leaving application or interpretation to the consumer. These include search engines (e.g., Yahoo!, Google), fact-finding agencies (e.g., US Census Bureau, Bureau of Labor Statistics), and reproducers of publicly available information (e.g., libraries). The litmus test of a KPO is that it sells "expertise" as opposed to "facts".

We suggest that software is a medium for managing knowledge but it is not knowledge. In the absence of artificial intelligence, knowledge remains a product of human interaction with information. Software development companies facilitate the ability of others to produce knowledge, but are not themselves KPOs. However, developments in neural networks, "thick" modeling, data-mining, and other forms of information systems that attempt to create artificial intelligence are rapidly approaching knowledge production and are frequently the de facto tools of a KPO.

Whether an organization is or is not a KPO, does the difference really matter? As described in Part IV, the subjectivity of knowledge creates a unique set of risks beyond those of information-based companies. Before we discuss these risks, we describe our small sample survey in the next section.

PART III: SURVEY OF KNOWLEDGE-PRODUCTS ORGANIZATIONS

In order to develop an understanding of KPOs and their knowledge resource risks we conducted a survey of a small convenient sample of six KPO companies.[8] The purpose of conducting the survey is to explore the risks KPOs face and how they manage these risks. Since our survey is primarily qualitative,[9] the small sample is sufficiently informative.[10] The six respondents consist of US companies; a consulting firm focused on quantitative real estate research, a firm specializing in real estate research, a large publicly held financial services firm, a firm specializing in industry sales knowledge and market expertise providing its services to Fortune 500 companies, a financial research firm, and a firm with expertise in general industry compliance.[11]

The survey consists of questions related to knowledge products, competition, and KMS; the survey questions appear in the appendix. Interestingly, three of the six respondents see their products as information-based, and the other three respondents see their products as knowledge-based. This probably reflects the confusion alluded to earlier of using information and knowledge as synonyms. We maintain that the nature of KPOs is different from information-products organizations due to the unique risks they confront and the different requirements of their KMS. The majority of respondents show that they create standard rather than customized products. Two respondents indicate that their products are mature rather than innovative, and three indicate that their knowledge employees apply more tacit, personal knowledge rather than explicit, written instructions in problem solving. All respondents are able to identify at least a few direct competitors, and two respondents cite a recent increase in competition.

Of the six respondents, the most common preferred medium for knowledge dissemination is website and email (four respondents). Only one indicates that the preferred medium for knowledge dissemination is networked databases, and one prefers printed documents. Two respondents state they use their CRM and web activity auditing systems as their formal KMS.

Three respondents employ various forms of repositories and libraries to store their information and knowledge assets. Only one firm cites no formal KMS.

Three of the organizations use personal relationships to bring in knowledge resources from outside the firm. Two organizations rely on surveys as their source of information for knowledge products, while one firm relies solely on secondary data sources.

Three respondents use no formal collaborative tools to share knowledge between employees; one of these respondents explains that the lack of such tools is due to the firm's small size. A fourth firm relies on instant messaging, email, and electronic documentation to share and collaborate around the organization. The fifth respondent uses formal enterprise content and KMSs. None of the six firms has a formal chief information/knowledge officer (CIO/CKO) position, nor plans to create one, although the financial research firm does have a director of operations who performs a similar function.

Each of the respondents identifies some area in need of improvement in managing their internal knowledge and their knowledge products. The most common deficiencies are the lack of coordination of their knowledge assets (four respondents) and knowledge retrieval inefficiencies (three respondents). Two firms note that their employees are reluctant to use the in-place KMS; one of the two indicates that the systems are "too cumbersome" and inflexible to meet the needs of disparate business units. Redundancy and over departmentalization are additional shortcomings noted by another respondent. Each of the six respondents ties the firm's competitive advantage to its industry expertise or to its customer service.

Responses to the survey indicate that KPOs consistently credit their version of KMSs with increased efficiencies in select areas such as project management (our current systems allow us to keep on top of projects, manage client workloads, and understand pressing client concerns), error reduction (the ability to see how others have managed/worked issues … there has been a cutback in repeated mistakes as a result), and better communication (keeps [knowledge workers] on the same page when you can upload new instructions to the system and have everyone view at the same time).

The most frequently stated benefits of KMSs are project management (three respondents), followed by centralization of knowledge assets (two respondents). Faster creation and easier updates of knowledge products are identified as benefits by one respondent, while creating valuable documentation for new employees is identified as another benefit by a different respondent.

Respondents to our survey appear to gauge success of their KMS in only one or two areas simultaneously. In order to carry out their knowledge management strategies, KPOs in our sample tend to employ a mix of third-party solutions (e.g., CRM software; document management) in conjunction with homegrown or ad hoc solutions to managing their knowledge resources (e.g., intranets, proprietary documentation, tacit knowledge sharing).

The chief operating officer of the real estate research firm in our sample disapproves of a formal, enterprise KMS, stating "I don't like intranets!" This executive prefers to be surrounded with handpicked managers who are the subject of the executive's great confidence to achieve the research firm's objectives. While this informal approach to knowledge management may reinforce corporate information policies from the perspective of this executive, it does not consider what might happen when these managers leave the firm.

PART IV: KNOWLEDGE-RELATED RISKS

All firms, whether KPOs or not, and regardless of their business model, face a varied set of knowledge-related risks. They face several obstacles or barriers to effective knowledge management, which have been addressed in the recent literature. Most critical to the knowledge organizations are the following impediments.

Weak or Missing Corporate Information Policies

This barrier identifies a systemic issue that could afflict several different business units within the firm. Without enterprise-wide information policies, the company becomes a set of conflicting data fiefdoms building knowledge-based systems to their own specifications and rules (Loshin, 2001). Examples of damaging information policies include the recent mismanagement of sensitive information from Bank of America, Reed Elsevier and Choicepoint (Goldfarb, 2005).

Four firms that responded to our survey described multiple independent systems for managing and sharing knowledge, and decentralized content management. This highlights a potential deficiency in KM in the KPO. KPOs' knowledge management may benefit more from a systemic approach in their KMS. The financial services firm in our sample concedes that weaving together disparate tools focused on individual problems creates "a lot of redundant systems that are not in synch with one another". Without

an enterprise-wide policy covering security, use and definition of information resources, an organization runs the risk of failing to meet strategic business objectives. Surprisingly, none of the respondents indicates that their firm has a dedicated knowledge manager such as a CKO.[12] This reflects a potentially serious void, and underscores the opportunity that management accountants have in spearheading an interdisciplinary systemic approach to managing knowledge resources and products.

Employee Turnover

Every firm experiences the risk of employee attrition. Knowledge organizations, because they build products from the wisdom and experience of their employees, are especially vulnerable to this risk. Consider the collective knowledge of baby-boomer employees walking out relatively en masse once retirement age hits. Some turnover can be healthy, in the range of 5–20% leading to growth and corporate stimulation (Sveiby, 1994); but above and below this threshold, the company could be either leaking knowledge assets or risking complacency.

Three survey respondents point to the advantage of having documented knowledge in their KMS as a means to support the training of employees and to recall lessons learned from previous projects. With heavy reliance on tacit knowledge, the industry-sales expert firm appears to be an excellent candidate for a formal collaborative system to improve efficient knowledge production and ensure codification of critical knowledge assets. The vulnerability to leaking knowledge is greater when the number of "knowledge" employees is relatively small. According to an executive respondent from the real estate research provider, departing employees have caused disruptions in general operations and knowledge creation from time to time.

Lack of Data Transferability

Loshin (2001) suggests that data created by one party will often fail to meet the quality needs of another. That is, data has a theoretical maximum quality that fits the needs of the creator but falls short for others. This is perhaps one of the most serious challenges faced by any organization, because the other party could be a paying client. Loshin explains that poor communication between the creator and the user of an information asset causes this disconnect, as different business units within a company have the ability to create duplicate, yet exclusive information and management systems. We believe this to apply equally to knowledge assets.

Four respondents noted a problem with lack of coordination between knowledge assets. If divisions are unable to integrate or coordinate their knowledge assets internally, it could indicate difficulties in adjusting to shifting customer demands.

On the other hand, one firm appears to have dealt successfully with this issue. A principal with the real estate consulting firm made the following statement: "we do a good job of communicating and sharing information with vendors and clients and always attempt to anticipate the information/knowledge requirements for ourselves and clients". As an example, this firm interviews a sample of their clients' to fully understand the scope of their clients' consulting projects. Furthermore, a respondent from the industry compliance expert organization noted that their firm "guides" customers on how to make successful business decisions using the firm's knowledge products. This KPO also actively solicits customer feedback concerning product quality. This approach suggests a solution to lack of data transferability problem,[13] and to the problem of the short shelf-life of knowledge (see the next section). Delighting the customer and providing useful innovations require such collaboration with the end user.

In addition to the above general barriers to effective knowledge management, we identify three other critical knowledge management challenges that are unique to KPOs.

The Short Life Span of Knowledge Products

As the speed of conducting business increases, managers must accelerate their decision-making process. In order to remain relevant, knowledge access and dissemination must exceed this pace. But knowledge has a finite shelf-life. Senior managers of knowledge producing firms must contend with these shrinking life spans when developing product strategy.

Communication and collaboration with customers of KPOs can help manage this risk. Two firms in our survey highlight their dedicated collaborative efforts with external customers as their success measures. We believe that this is an appropriate strategy to manage the problem of product shelf-life.

The Challenging Nature of Knowledge Experts

For any manufacturer, a primary business challenge is obtaining raw materials, converting them into a finished product, and then duplicating this process at increasingly lower costs. The raw material for knowledge

production comes from the collective experience, insight, and interaction of the KPO's employees, especially subject mater experts (SMEs). This resource cannot be instantly grown or mined, as it is generated over time. The greatest opportunity for knowledge creation results from engaging a sizable and diverse SME base. But at the same time, the disparate nature of geographic locations, skill sets, cultures and backgrounds of a diverse population presents the greatest challenges for collaborative techniques that are so essential for generating knowledge (Bryan, 2004).

According to an interview with the respondent from the real estate research provider, the lack of formal communication channels causes the details of many significant projects to be overlooked to the detriment of their knowledge products. The same problem is identified by the respondent from the large financial services company in our sample, which recognizes the need to improve communication between departments in order to learn from each other's successes and mistakes. However, the size of a KPO may affect its requirements for collaboration. For example, an officer at the industry sales knowledge and market expertise firm suggests that the organization is too small to require formal collaborative tools. However, the same respondent concedes that the firm has neither a tool to review knowledge-in-process nor a central repository for idea sharing among employees.

The Vulnerability of Intellectual Property

Business processes, designs, and equipment are swiftly duplicated – or worse improved – by competitors, often with little legal recourse. Brown and Duguid (1998) conclude that expertise knowledge, or know-how, is an advantage comparatively easy to safeguard, versus content knowledge, or know-what, which is vulnerable to infringement. To remain competitive, KPOs must have the content knowledge to design appropriate products, but additionally the complementary expertise knowledge to properly execute. Simply relying upon great ideas leaves the KPO open to duplication by competitors. Customers and investors will seek out the firm that can provide an elegant solution, not necessarily the one with the most bells and whistles.[14]

Only one of the respondents, the real estate consulting firm, described its products as both innovative and customized. Another respondent, the industry sales expert company, considered its products as innovative, yet standardized (pre-formatted, canned). These two companies are the only respondents that listed expertise and experience as sources of competitive

advantage. We suspect that the competitive advantage of the other four KPO firms is especially vulnerable because it is primarily derived from determinants other than the effective mix of expertise and content knowledge.

Other Risk Considerations

Two additional risks related to KPOs that are not included in the above discussion appear relevant. These are KPOs outgrowing their customers, and bias in knowledge products. In his analysis of the KPO, Sveiby (1994) notes an interesting phenomenon where a firm's knowledge employees ''outgrow the KPO's customers'' (Chap. 16, item 3). Specifically, the firm's knowledge capacity develops or matures faster than market demand. The result is that resources are squandered on overly sophisticated knowledge products. Knowledge and information bias result when factual information is distorted by the communicator, the receiver, or both. Knowledge products are especially vulnerable to personal bias. Consumers of knowledge products will consider this bias heavily in their purchase decisions (Eiser, 2004).

Because knowledge and knowledge-related assets are the primary income-producing resources of the KPO, poor knowledge management practices expose KPOs to these risks. In the next section, we offer recommendations for effective KMS, which are particularly applicable to KPOs.

PART V: RECOMMENDATIONS FOR EFFECTIVE KMS IN KNOWLEDGE-PRODUCING ORGANIZATIONS

This section includes recommendations related to the development of a competitive advantage by KPOs through the KMS and to the selection and implementation of an effective KMS. The management accountant in a KPO can use these recommendations in spearheading an interdisciplinary systemic approach to managing knowledge resources and knowledge products.

Developing a KMS Competitive Advantage

To develop competitive advantage via the KMS, this sub-section offers four recommendations: (a) developing enterprise-wide knowledge policies; (b) fostering collaboration and documentation; (c) addressing knowledge security; and (d) evaluating the effectiveness of KMS.

Developing Enterprise-Wide Knowledge Policies

As with any corporate-level control system, effective deployment requires buy-in from senior executives, that is, finding champions who can empower SMEs to take ownership of products and processes (Poon & Wagner, 2001). Policies governing the entire knowledge product lifecycle are required to guarantee success and impart the importance of knowledge to employees. A strong corporate knowledge and information policy sets common strategies and goals to ensure minimum standards. The policies should include details on privacy, integrity, security, and storage.

Fostering Collaboration and Documentation

Researchers have shown the positive effect of collaboration on knowledge management (Qureshi & Zigurs, 2001; Qureshi, Hlupic, de Vreede, & Briggs, 2002), on operations (Myhr & Spekman, 2002), and on obtaining competitive advantage (Monczka, Trent, & Callahan, 1993). In a study of knowledge management's role within the learning organization, Lu and Tsai (2004) stress that heightened levels of competition between firms require coordination of knowledge assets between functional teams and departments. Bryan (2004) suggests that creating and exchanging knowledge generates not only significant value but also significant challenges for an organization.

Furthermore, successful collaboration produces robust documentation as a requisite by-product. The conversion of tacit into explicit knowledge contributes to the prosperity and survival of the KPO, regardless of whether the knowledge is expertise- or content-based. Neither collaboration nor documentation will retain employees, but they could alleviate knowledge asset attrition and enhance data quality. Benefits include increased efficiencies for new hires and innovative problem solving throughout the company (Logan & Stokes, 2004).

However, care should be taken to avoid codifying all the tacit knowledge of the SMEs. As Pfeffer and Veiga (1999) warn, a firm runs the risk of destroying its knowledge assets when experts are forced to explain complex concepts and judgments to novices. Because so much of their expertise is wrapped up in experience, replicating these competencies in a system designed to assist the inexperienced will cripple the decision-making process, and paradoxically force out the wisdom that was intended to be captured. One of the primary goals of the KPO is to bring a number of employees up to the competency level of SMEs by allowing the experts to share their tacit knowledge through collaboration. Like apprentices working along side a master artisan, collaboration with a SME imparts knowledge, understanding,

and wisdom on non-expert colleagues. In this way, knowledge assets of the firm become diversified, and the risks from attrition are mitigated.

Collaboration can be internal or external. Internal collaboration occurs within the organization, for example between business units and team members. External collaboration is between the organization and its clients and suppliers. External collaboration requires active solicitation of feedback via surveys, panels and focus groups, and cooperation with all sources of knowledge from outside the firm. External collaboration may also include reactive feedback systems for customer complaints. KMS can automate both sides of the external collaboration effort, and assist with cursory analysis to spot trends and prevent critical failures. This analysis should feed directly into the production process so that customer and supplier feedback is integrated with new product development and existing product enhancement (see Fig. 4). KPOs employing these types of active and reactive communication systems with their clients and suppliers will enjoy a competitive advantage over those who forgo external collaboration.

Collaboration within the firm is achieved through an array of increasingly formalized channels (Sherman, 2004). These include standardized processes at the lowest level, up to project management and organizational matrix structures at the highest levels of integration. Knowledge management, as a strategy for internal collaboration, can significantly reduce the risks of uncertainty surrounding these resource requirements, as well as risks related to
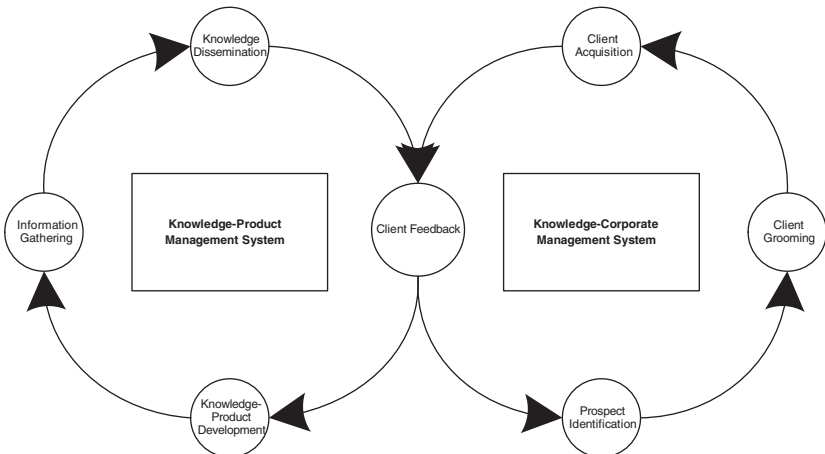

Fig. 4. Collaborative Workflow to Exploit External Knowledge Sources.

competition, market demand, and organizational capability. KM does this by enabling managers to review what resources are available to the firm, how the firm's marketplace is currently served by competing organizations, and what opportunities are there for enhancing the firm's knowledge products.

Though not a knowledge product, Sherman (2004) highlights the development of the Boeing 777 aircraft as an example of successful product development using collaborative technological tools and structural models of integration. Sherman contends that these collaborative tools allowed Boeing to share designs between permanent and ad hoc teams within the company as well as with suppliers, customers, and client support. The result was the first ''paperless'' airplane design, and one that tremendously advanced modern avionics. Bills (2005) discusses how electronic imaging software is improving internal collaboration between disparate units as well as providing customers with timely, accurate, and meaningful service.

Addressing Knowledge Security
An effective KMS will help protect the underlying knowledge assets from misuse and theft. The enterprise-wide knowledge policies should include provisions for those who can access the knowledge assets and information resources, and who can modify work in-process. In practice, this includes requiring credentials to log into sensitive networks and databases, acceptable use policies, auditing systems to record data access, physical access restrictions such as safe rooms for critical hardware, back-up systems for networks and power supplies, and a well-stated and enforced policy on what constitutes access violations and associated penalties. The organization may require non-compete and non-disclosure agreements from both its employees and customers as other forms of security.

Most KPOs' long-term assets such as customer or prospect lists, data warehouses, knowledge work-in-progress, research notes, product distribution, and communication channels are rooted in IT-based systems. Although a generally accepted method to determine the return on investment (ROI) for knowledge assets and information technology has not emerged, it is clear that losing one of these knowledge assets, even temporarily, can be very costly. If able to quantify the revenue lost when a knowledge asset becomes unavailable, the knowledge manager will be better able to identify and justify the organization's security needs (Wilson, 2003). A KMS may catalog hardware inventory, incorporate network intrusion detection systems, and generally provide knowledge managers with a flexible framework to review changes to and contributions from investments in knowledge. The

KMS need not use a specific technology, but the system should allow managers to make informed decisions about all their knowledge resources.

In manufacturing, employees must have proper training on acceptable use of materials, quality of outputs, and safety. While knowledge assets do not generally present any immediate physical danger, recent legislation such as the Gramm–Leach–Bliley Act (1999) is holding companies liable for violations of customer privacy and contact regulations. The KPO must secure its knowledge assets from maleficent or accidental alteration and ensure compliance with evolving privacy mandates. A violation of either could jeopardize financial stability.

Evaluating the Effectiveness of KMS

Measuring the quality of a KMS is a difficult task (Davenport, Jarvenpaa, & Beers, 1995). According to Guida and Mauri (1993), assessing the extrinsic quality of a KMS requires a review of cost/benefit, an evaluation of the effect of the system on the organization, and measurement of acceptance by the end user. As discussed earlier in Part II, Davenport et al. (1995) identify five tactics that can be used to evaluate the effectiveness of the KMS: (a) converting implicit knowledge into tacit; (b) improving knowledge to add customer value; (c) collaborating with the customer; (d) promoting knowledge sharing; and (e) enhancing production efficiencies.

KMS Selection and Implementation

According to Hansen et al. (1999), firms address three questions that shape knowledge management strategy.

(1) "Do you offer standardized or customized products?"
(2) "Do you have a mature or innovative product?"
(3) "Do your people rely on explicit or tacit knowledge to solve problems?" (p. 13).

The answers to these questions will determine whether the KPO is following a *codification* or a *personalization* strategy. The codification strategy depersonalizes knowledge and converts it from tacit to explicit (people to documents), for future retrieval and reuse. Companies use this strategy when multiple clients require the same type of solution, when employees are skilled as implementers rather than inventors, and when revenues are relatively stable forcing the organization to a cost management strategy. Hansen et al. (1999) describe the personalization strategy as a person-to-person collaboration, where knowledge is shared via a network of individuals.

Hansen et al. (1999) advocate this strategy when clients' needs are heterogeneous, when the level of depth and breadth of knowledge does not lend itself to transcription, and when many employees are already SMEs.

Smith (2004) uses these two strategies to contrast the documented approaches of Boston Consulting Group and Ernst & Young to internal knowledge management. Ernst & Young, a professional services firm, prefers to recycle their previous work from codified sources where possible in order to decrease costly resources associated with starting a project from scratch. In contrast, Boston Consulting's approach to KMS seeks to develop personal connections between the firm's knowledge employees utilizing the relationships built from personal contact.

In a complementary approach to designing KMSs, Ofek, and Sarvary (2001) determined that professional service organizations (e.g., consulting, accounting, and advertising firms) should choose a KMS designed *either* to decrease costs of knowledge production and dissemination *or* increase service quality. The former approach of improving operational efficiencies typically includes automation of knowledge documentation and retrieval. Increasing service quality, on the other hand, taps into external resources of knowledge and product enhancement. According to Ofek and Sarvary (2001), the selected strategy is determined by the relative strength of the need to find long-term efficiencies in the production process (operational cost reduction), or to exploit a growing customer base (increasing subscribership through quality).

Ofek and Sarvary (2001) propose that KPOs in a monopolistic environment will choose to increase supply-side returns to scale in order to reduce costs. This is because clients have no substitute firm to choose from. In contrast, most KPOs in a competitive industry should select a KMS that increases the demand-side returns to scale in order to attract new clients. According to Ofek and Sarvary, the rationale behind increasing service quality in a combative marketplace is twofold: first, there is a bandwagon psychological factor whereby customers gravitate to a company that already has a significant, reputable client base; and second, adding new clients provides a store of rich, experience-based knowledge for future assignments.

Hansen et al. (1999) recommend choosing one dominant strategy instead of trying to straddle different approaches. They contend that "a company's knowledge management strategy should reflect its competitive strategy: how it creates value for customers, how that value supports an economic model, and how the company's people deliver on the value and the economics" (p. 108). Thus, the options for a KPO are to choose a personalization or a codification strategy; and decrease costs or increase service quality (see Fig. 5).
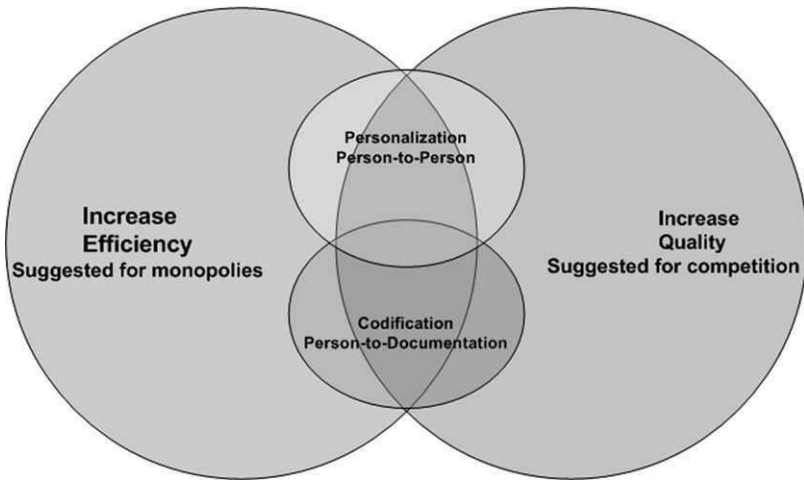
Fig. 5. Knowledge Management System Strategies: Exclusive and Complementary Options for Managing the Knowledge Production Process.

Many respondents to our survey have primarily concentrated on achieving operational efficiencies, which contradicts the competitive nature of their markets. In a competitive environment, increasing service and product quality generates greater return on investment than trying to reduce production costs (Ofek & Sarvary, 2001). Quality can be enhanced by increasing collaboration, more rigorous hiring practices, and improving distribution or changes in product scope to fit client needs. When deciding between a strategy of knowledge codification or personalization, the KPO must consider its market strategy and whether it serves clients best through de novo solutions or adaptation of prior work.

PART VI: CONCLUSION

We have attempted to identify knowledge risks, particularly as they affect KPOs. The survey we conducted indicates that the KPOs in our sample do not generally appear to have a systemic approach to managing their knowledge resources and are thus prone to many of these risks. The role of a CKO or equivalent does not seem to have developed in our small sample. If this is a reflection of a general trend, then this void provides a unique opportunity to management accountants in general, but especially management

accountants in KPOs to spearhead an interdisciplinary systemic approach in their KMS to effectively manage knowledge resources and products.

Companies can no longer look inward to find new products and new markets, but must seek expertise through partnerships, alliances, and knowledge retailers. Research shows that the growing trend of partnering with a KPO stimulates innovation and can potentially increase shareholder value. It has been recognized for more than a decade that the raison d'etre of the emerging knowledge marketplace is to manage the human intellect. According to Quinn, Anderson, and Finklestein (1996):

> In the postindustrial era, the success of a corporation lies more in its intellectual and systems capabilities than in its physical assets. The capacity to manage human intellect- and to convert it into useful products and services- is fast becoming the critical executive skill of the age (p. 71).

The success of KPOs vying for contracts that add value to customer organizations will be determined by the KPO's respective abilities to resolve key knowledge-related risks. Each KPO must survey its shortcomings, and design a KMS that continuously promotes collaboration, quality, and knowledge creation unique to the competitive landscape and knowledge product scope.

To survive, the knowledge company must prove itself an expert in data collection, knowledge synthesis, and dissemination. The successful KPO will manage its knowledge assets to protect them against both attrition and unauthorized access, while exploiting collaborative opportunities. Firms that isolate their knowledge assets should consider moving toward the development of a triadic model whereby knowledge is shared within functional teams, across complementary teams inside the firm, and with external sources such as customers and suppliers. KPO industry leaders will use KMSsto manage the various knowledge domains while simultaneously avoiding the knowledge-related risks discussed in this paper. We believe that the skills, expertise, and knowledge of management accountants can help organizations generally, and KPOs specifically to develop, utilize, and maintain a more comprehensive and systemic approach to knowledge management.

NOTES

1. The role of management accountants in knowledge management is evolving. For example, see Bhimani, Alnoor, 2003 (Editor), Management Accounting in the Digital Economy, Oxford, and CMA Canada, 2000.

2. It is important to note that the technical dimension of KMSs should be subordinated to the strategic management of knowledge.

3. See http://www.theorsociety.com/about/topic/projects/notorious/2_1_knowledge_info.htm.

4. Acuña, Lopez, Juristo, and Moreno (1999) use the terms *strategic knowledge* and *tactical knowledge*, respectively to describe what we call *content knowledge* and *expertise knowledge*. Brown and Duguid (1998) use the terms *know-what* and *know-how* to describe a similar dimension. We prefer to use *content* and *expertise* knowledge as we feel these terms better describe the dichotomy between mastery and capability.

5. Events such as the late 1990s dot-com meltdown also underscore the importance of knowledge management.

6. For an in-depth discussion of how organizational knowledge is created, see Nonaka (1994).

7. One may argue that the Consumer Surveys are actually *common* knowledge, since they aggregate a population of individual perceptions without additional discourse. In our opinion the University of Michigan uses its experience and expertise to interpret these survey results, producing distinctive knowledge in the form of additional analysis and commentary concerning the role of consumers in the US economy. See the research reports found at http://www.sca.isr.umich.edu/documents-menu.php?class=s for examples of such distinctive knowledge.

8. Over a period of five months, we contacted 40 individuals from 35 different KPOs and obtained six responses. Even though the respondent sample was small, the information we gathered was useful in exploring the risks and issues related to KMS of KPOs. The survey was qualitative in nature, as we did not intend it for purposes of hypotheses testing.

9. It is important to note that this is a qualitative survey and is not intended for hypothesis testing; rather it is intended to gather information to understand the KPO risks and how they are managed. This is the same objective that is common in case studies.

10. Many of the firms that did not participate in the survey declined to contribute, citing policies against participating in outside surveys.

11. We also received knowledge management-related documentation from a global multi-industry consulting firm which declined to complete the survey. Additionally, we conducted in-depth interviews with the chief operating officer and vice president of technology at the real estate research firm that participated in the survey.

12. One respondent, a US financial research firm, indicated it has a director of operations who is responsible for maintaining best practices.

13. Although Loshin (2001) describes this problem as it relates to data and information assets, we believe that it is equally applicable to knowledge, which is derived from data.

14. This may explain why Google (GOOG), a firm with negligible tangible assets, can buy the largest US automaker, DaimlerChrysler AG (DCX), with enough capital left over to pick up Ford (F), and General Motors (GM), as of October 21, 2005.

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APPENDIX. SURVEY QUESTIONNAIRE

Company Name	Participant Name	Participant Title

General Description of Company

The above General Description will be used to publicly characterize your firm in the final research publication. Please feel free to make changes as necessary to protect your identity. Your Name, Title and Company Name will not be publicly visible, and are used for internal record keeping only. Section 1 Knowledge Product-related Questions

1. Do you consider Knowledge or Information to be your company's primary product? What does the difference (knowledge vs. information) mean to you (or your business)?

Check One: ☐ **Knowledge**   ☐ **Information**

Comments:

2. Does your company offer a standard or a customized product? (Scale of 1-5)

1=Standardized, pre-formatted,   5= Customized, each project/client
canned research   is unique

Check One: ☐   ☐   ☐   ☐   ☐
              1   **2**   **3**   **4**   **5**

Comments:

3. Does your firm have a mature or innovative product? (Scale of 1-5)

1= Mature, industry-standard   5= Innovative, proprietary and
research   not-reproduced

Check One: ☐   ☐   ☐   ☐   ☐
              1   **2**   **3**   **4**   **5**

Comments:
Section 2 Competition

4.   What companies (or types of companies) would you consider to be your firm's competitors? If you benchmark, please explain by name or description.

5.   What defines your competitive advantage vis-à-vis your competitors?

Section 3 Knowledge Management Systems

6.   What formal or informal Knowledge Management systems do you have in place to manage, create, protect, and exploit your knowledge assets? Do you believe these systems help give your firm advantage over competitors?

7.   What are your general methods for gathering the information components that feed your knowledge product? E.g. telephonic surveys, relationships with data sources, panel of experts.

8.   What is your preferred medium for knowledge dissemination? E.g. Internet, personal consulting, networked databases, etc.

☐ **Web site** ☐ **Face-to-face contact** ☐ **Networked databases** ☐ **Email**
☐ **Other**

If "Other", please explain:

9. Do your employees use explicit or tacit knowledge to solve problems? (Scale of 1-5)

1= Explicit, written   5= Tacit, personal knowledge
instructions   & experience

Check One: ☐   ☐   ☐   ☐   ☐
             1   **2**   **3**   **4**   **5**

Comments:

10.	Does your firm employ formal collaborative tools to share knowledge between employees? If so, what are they?

11.	Do you have a formal Information or Knowledge Officer? If so, what are his/her primary duties? If not, would you consider creating such a position?

12.	What shortcomings have you identified in your Knowledge Management systems?

13.	What benefits have you identified from your Knowledge Management systems?