Knowledge Management: Evaluating the Organizational Requirements and Culture for an Emerging Technology.

Chris Parton1,2, Samuel J Wang, MD, PhD1, and Blackford Middleton, MD, MPH, MSc1,3

1Partners HealthCare System, Boston, MA
2University of Alabama at Birmingham Health Informatics Program, Birmingham, AL
3Brigham & Womens Hospital, Harvard University, Boston MA

Abstract
The purpose of this paper is to explore the application of knowledge management concepts to an information systems (IS) knowledge base, as opposed to a clinical one. The field of Medical Informatics is committed to helping others manage medical information and knowledge through the application of information technology. At Partners HealthCare, a wide variety of clinical information management systems have been built and implemented in complex environments, creating an extensive applied informatics knowledge base. How should healthcare IS departments manage this intellectual capital? That’s the question that Partners HealthCare is asking its senior and middle IS managers. This paper reports on an internal survey addressing Knowledge Management (KM) requirements, the potential application of this technology in our organization, and discusses where we are today and where to go from here.

The Evolving IS Knowledge Base
Few would argue that healthcare is one of the most information intensive industries. The sheer volume and types of data, evolving data codes and structure, controlled medical terminology, and evolution of medicine itself, present challenges that are, in many ways, unique to healthcare. For all of these reasons, healthcare IS departments face complexities that are also unique to the industry. Continuing advancements in technology and genomics will further differentiate the complexities of health related information from that of other industries. In addition, the continued organizational upheaval in modern healthcare delivery systems call for a high degree of flexibility and interoperability between information systems and healthcare organizations. The before mentioned complexities, combined with a limited pool of IS resources, both human and financial, call for the creation of new strategies to ensure that health related IS departments continue to offer effective support of patient care. These facts lead one to conclude that the current methods of managing healthcare IS knowledge may not be sufficient. While there are, at any given time, many technology related trends, one in particular, Knowledge Management (KM), warrants close evaluation for its potential application in healthcare IS.

What is Knowledge Management?
The purpose of this paper is to explore the application of knowledge management concepts to an IS knowledge base. The field of Knowledge Management is itself evolving rapidly. A review of relevant literature supports this fact. Differentiating marketing-related Knowledge Management publications from research-based ones is, alone, a daunting task. Before discussing the Knowledge Management needs of health related IS departments, it is important to define Knowledge Management.

Identifying that Knowledge Management is necessary is vastly different than knowing which KM strategy best meets the needs of a particular organization. Hansen et al. [1] identify two distinct strategies for managing knowledge. The first, called the codification strategy, entails the codification of knowledge for storage in databases. The codification strategy uses a “people-to-documents approach” where information “is extracted from the person who developed it, made independent of that person, and reused for various purposes” [1]. The codification strategy focuses on explicit knowledge. The second strategy, called the personalization strategy, is KM that focuses on connecting the right people in the right situations. With the personalization strategy, technology is utilized to facilitate the communication of knowledge, by cataloging and reporting who knows what. This approach is well-suited to managing tacit knowledge. When it comes time to select a strategy, Hansen et al. report the experience that those who “pursued an assemble-to-order product or service strategy emphasized codification and reuse of knowledge. Those that pursued highly customized service offerings, or a product innovation strategy, invested mainly in person-to-person knowledge sharing.” Finally, the authors stress the selection of one strategy over the other, using both in
roughly an 80/20 fashion. Failing to do so, the authors found, can undermine the intent. [1]

An integral part of strategy selection is knowing what types of knowledge the organization is trying to manage. There are (most commonly) two distinct types of knowledge – explicit knowledge that can be accurately and completely recorded in writing (documents) and tacit knowledge that is possessed in the minds of experts (the knowledge of experience). Malone [2] offers several definitions of knowledge management. The first states that “knowledge management can be defined as the identification, optimization, and active management of intellectual assets, either in the form of explicit knowledge held in artifacts or as tacit knowledge possessed by individuals or communities”. The second definition states that “knowledge management is a tool set for the automation of deductive or inherent relationships between information, objects, users and processes”. Finally, the third definition states that knowledge management is “the process of creating, capturing, and using knowledge to enhance organizational performance”.

Taking the KM Temperature at Partners HealthCare Information Systems (PHISIS)

Having defined knowledge management, the next step is identifying which strategy and which types of KM are best suited to the organization. Horak [3] makes the point that “staff should be directly involved in all aspects of the KM program, including: 1) what data/information are needed; 2) how to make the technology and KM system easy to use; 3) how the data are presented and accessed; and 4) how to make information and best practices applicable in their work settings.” Having already identified that a KM solution should be considered, the next step was taking the KM temperature at Partners.

Partners HealthCare is a large integrated delivery system. The organization consists of two large tertiary care hospitals, a cancer care hospital, a rehabilitation hospital, several community hospitals, and roughly 5,000 primary care providers throughout the Greater Boston area. Partners HealthCare employs roughly 750 information systems staff. While Partners is considered an integrated delivery system, there are variations of health-related information systems across the organization – including differing variations of order entry systems, clinical decision support logic, a single outpatient electronic longitudinal medical record system, various radiology and laboratory systems, several clinical departmental systems, and various financial and administrative systems. The organization shares a common network, intranet, email system, clinical data repository, and enterprise master patient index. As relates to IS, there are several small-scale, independently operating KM sites available on the Partners Corporate Intranet – including a Partners phone directory, a Who’s Who directory of IS employees, an application development FAQ site, and an IS Communication Portal web site, just to name a few. Also noteworthy about the IS department is that the roughly 750 employees are spread across several physical locations.

A survey format was selected to gather information about the overall IS culture, appropriate KM strategy, types of knowledge, change management, and KM governance recommendations. The survey contained 22 questions. The questions include nine (9) likert scale rating questions, three (3) yes/no questions, and ten (10) free-text response questions. The survey was conducted via email over the course of about one month. Respondents included thirty-three (33) senior and middle IS managers from all IS divisions. The response rate for the survey was 33/53, or about 62%. Survey Results were analyzed and categorized to determine 1) the current state of the organization, 2) KM Requirements, and 3) Post-implementation survey-based predictions.

Current State of the Organization

Several common themes were heard from respondents as relates to current KM practices and beliefs. A majority of respondents indicated that they do exert time and energy locating appropriate sources of knowledge, and felt that a more complete KM solution is needed. “Who to ask?” was the most common response given in identifying challenges in getting the right knowledge, followed by time to locate the right person, and availability of that person. Shared file areas represent the most common KM method employed today, followed by departmental and project oriented intranet sites. Finally, current intranet KM microcosms appear widely used, with the most common weaknesses of these tools being inclusion of outdated/inaccurate/incomplete knowledge, no common thread between sites, and the lack of a gatekeeper for content.

Specifically, the survey showed the following about the current state of the organization. More frequently than not, staff seek knowledge from others (1=almost never / 10=almost always), mean = 6.8 (See FIGURE 2). Time seeking knowledge from others appears reasonable (1=minimal / 10=very time consuming), mean = 6.3 (See FIGURE 3). Twenty (20) of thirty-three of (33) respondents could identify
and name recent projects where the knowledge of others was required. Respondents identified the following as the most common obstacles to getting to the required knowledge (in rank order): who to ask; time to find the right person; availability of the right person; multiple sources of knowledge; getting the incorrect person or knowledge; physical location barriers (IS staff are not all at the same physical location); and knowledge experts outside of the IS Department. Respondents identified the following as the most common KM methods at the time of the survey: shared file areas; departmental/project intranet sites; presentations from and meetings with knowledgeable parties; and word of mouth (to determine who is the expert). The survey of intranet use revealed that most respondents use current intranet applications – though some site use was limited to the group that owned the site. Strengths of the current intranet sites surveyed were identified as ease of deployment, access, and use. Weaknesses of the current intranet sites survey were identified as outdated/inaccurate/incomplete content, lack of formalized programming resources to pull all of the sites together; no gatekeeper or editor of content; and the extensive use of word processors and email means that most documents are not available on the sites. As relates to the current willingness of IS employees to make their knowledge available to others, a majority of respondents indicated acceptance of the concept. Most agree that their individual and group knowledge should be captured in an online format (1=strongly disagree / 10=strongly agree), mean = 8.1 (See FIGURE 4). A majority indicated a willingness to make their own knowledge available to others by updating a KM system (1=strongly disagree / 10=strongly agree), mean = 7.9 (See FIGURE 5). A majority indicated a willingness to index/map keywords within their own documents and upload them (1=strongly disagree / 10=strongly agree), mean = 7 (See FIGURE 6). A slight majority felt that the above would be a trade-off in time and effort spent seeking information today (1=strongly disagree / 10=strongly agree), mean = 6.5 (See FIGURE 7).

KM Requirements
The survey identified that users would expect any KM tool to be easy and fast, provide free-text searches (and allow for Boolean operators as part of search criteria), a knowledge directory by person and/or group, and links to knowledge resources external to the organization (URL’s, Research Firms, etc.). Several respondents also indicated the need for a gatekeeper or content editor, a structured input method to ensure consistency, password protection that limits system use to IS employees, and the ability of the system to integrate with the current directory structure. In addition to that mentioned above, respondents indicated that the following content should be included – conference/meeting notes, documents (white papers, project plans and summaries, research abstracts/results), architectural and technical standards, process documentation (how to?), intranet and internet content, and vendor liaisons. Specifically, the majority agreed that a KM tool should provide free-text searches based on keyword mapping within documents (1=strongly disagree / 10=strongly agree), mean = 9 (See FIGURE 8). A majority agreed that KM tools should provide a knowledge directory based on individual and/or group (1=strongly disagree / 10=strongly agree), mean = 8.1 (See FIGURE 9). A majority agreed that KM tools should provide links to knowledge resources external to the organization (1=strongly disagree / 10=strongly agree), mean = 8.5 (See FIGURE 10).

Post-implementation Survey-based Predictions
Post-implementation predictions from the survey focused on governing the use of a KM solution and the challenges of populating the tool. A majority of respondents indicated that use of a KM tool should be encouraged, while only half recommended mandating use with review as part of an annual employee performance appraisal (see FIGURE 11). Many of the latter respondents predicted failure of the tool if use is not mandated. Encouraging use with subordinates by example was also a common theme. Populating the tool, as the survey supports, would be a task of great proportions – there is a lot of knowledge out there already, and users will expect it to be available immediately. If the tool does not provide what users expect, knowledge input could be limited, as the frequency of access to the system would decline as people do not find what they are seeking. These factors must be carefully and continuously managed – defining the KM scope is a first step.

Survey Analysis and Initial KM Scope
Based on the results of this survey and the continuing evolution of the field, the time to begin seriously considering a KM solution is immediately. Hansen et al’s [2] recommendation to select one strategy does not seem feasible for the longer term. Users expect both codification and personalization. The survey should be analyzed further to determine if the size of the organization makes the codification strategy the right approach for some groups, and the personalization strategy right for others. There are some groups within the organization that need quick and repetitive access to the same knowledge (the
codification strategy), while others require the flexibility of tactical knowledge offered by the personalization strategy. The survey results suggest that there are already several KM solutions that are widely accepted and used, most of a codification nature. The starting point should be the one that offers the greatest likelihood for success. That being said, the initial scope should focus on refining those tools that are already accepted, incorporating feedback from users, and the integration of those tools (or creating the appearance of integration through a common portal).

Survey-based Requirements Definition

The survey supports an integrated three-part stepwise KM approach, in the following order: 1) a web-based search tool that integrates the current web applications; 2) browser searchable input/output (I/O) application for content that is currently unavailable – most critical being shared file area content; and 3) an I/O application that manages expertise directories – searchable by name, group, area of expertise/knowledge, and past/current projects (see FIGURE 1).

Choosing the Right Solution

A KM team should be identified to guide tool selection and oversee change management issues. The team should include an executive or senior management champion and representatives from core IS roles (including application development, architecture, implementation, and enterprise solutions). The team should assist in formulating a more detailed requirements definition that includes the broader survey-based requirements definition – but also incorporates technical and architecture requirements. The team would also be faced with managing many challenges — identifying the appropriate KM strategy for groups within PHSIS, identifying appropriate incentives for knowledge entry, managing the pace of entry, and devising the taxonomy for data entry and searching the knowledge repository.

Post-Survey Questions and Issues

While the survey results and the evolutions in the field support the need for a KM solution and provide direction, there remain several important questions and issues. First, careful attention should be given to determining the correct KM strategy for a specific IS division. Some knowledge transfer must be of the face-to-face variety. Care should be given not to allow a document driven system to replace important face-to-face communication. Email is a good example of the inherent problems that arise when “intent” or “tone” must be interpreted by the reader, rather than witnessed first hand. The interpretation of tacit knowledge from codified documents could be equally problematic. Second, knowing who to ask or where to go for knowledge does nothing to address the fact that the knowledgeable party may be unavailable. This factor could limit the return on investment promised by KM vendors. Finally, while the survey responses indicate that most respondents would be willing to index and upload documents and knowledge sources, predicting willingness is difficult, as there are many factors that can alter ones willingness.

Summary

The same complexities that prevent effective plug and play clinical systems will be at play when selecting and implementing a KM tool. The survey supports the need for an integrated browser based tool that combines current intranet content, a variety of additional content that is currently owned by groups and individuals (but is not shared), and an expertise/knowledge directory of PHSIS human resources — in that order. Conceptually, for all of the reasons already stated, PHSIS must approach the KM project with the same scrutiny as they would any clinical system.

References


600