Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2005 Proceedings

Americas Conference on Information Systems (AMCIS)

2005

Effective Knowledge Management for Hospital Nurses

Diswadip Ghosh
University of Colorado at Denver, bghosh@yahoo.com

Judy Scott
Univrsity of Colorado at Denver, judy.scott@ucdenver.edu

Effective Knowledge Management for Hospital Nurses

Biswadip Ghosh
University of Colorado - Denver
bghosh@yahoo.com

Judy E. Scott
University of Colorado - Denver
judy.scott@cudenver.edu

ABSTRACT

Knowledge Management (KM) tools and processes, while established in many industries, are relatively new to healthcare. Healthcare organizations resemble virtual organizations that build flexible and dynamic care networks of multiple medical providers and professionals to address a patient's needs. This research studies the major factors impacting knowledge management strategy and processes in the clinical nursing function in a large metropolitan area hospital. Empirical data has been collected and analyzed to understand what infrastructure components and process capabilities are the most important contributors to KM effectiveness in floor nursing. The results indicate that technology can play a pivotal role in KM initiatives among nurses, provided it supports the processes involved with knowledge acquisition and application to solving new problems. The findings have implications for the selection and deployment of information technology to enable knowledge management.

Keywords

Knowledge management, Healthcare, Process, Systems, Information Technology.

INTRODUCTION

Increasingly, healthcare organizations are adopting knowledge management systems (KMS) to achieve organizational goals. Among the reasons for this trend are pressures to reduce costs, which have been growing at an unsustainable rate (Warner, 2004), and to improve the quality of healthcare (Grimson, Grimson and Hasselbring, 2000). KMS, such as just-in-time knowledge management (KM) at Partners HealthCare (Davenport and Glaser, 2002) and the computerized KM system at Premier (Martin, Myers and Murdoch, 2000), have the potential to reduce medical errors, which cause an estimated million injuries and 98,000 deaths each year, reduce costs and help healthcare professionals to cope with information overload and to learn current research developments. There has been an exponential growth in the medical information available to clinical practitioners, which is exacerbated by the proliferation of information databases (Davenport and Glaser, 2002), (Dwivedi, Bali, James, Naguib and Johnson, 2003). With a rate of 400,000 new entries being added annually, it would take a medical practitioner 550 years to catch up with a year's worth of entries. Furthermore, new research, which can dramatically influence the quality of patient care, is going unused due to the lack of clinical KM.

RESEARCH GOALS

The premise of this study is to evaluate KM strategy in a healthcare organization in two dimensions – KM Infrastructure and KM processes and determine the components that contribute most to the organizational effectiveness of KMS. The key areas of investigation in this research that have not been considered in previous studies are:

1. Performing a KM study at the operational level with the nursing staff of a large hospital.
2. Evaluating the KM process and KM infrastructure components and measuring their contributions to a successful KMS.
3. Extending the KM Capabilities and Organizational Effectiveness Model developed by Gold, Malhotra and Segars (2001) to include a component to measure the perceived benefits of KM effectiveness by the patient.
4. Evaluating the impact of the KMS dimensions – process and process enablers on organizational effectiveness and perceived patient benefits.

RESEARCH BACKGROUND AND LITTERATURE REVIEW

Theoretical Background

In the business context, knowledge is defined as any information that is relevant, actionable and is based on a person's experience (Davenport, 1998). Systems, policies, processes and procedures used to manage the creation, storing, sharing and reuse of knowledge fall into the category of knowledge management systems (KMS). Grover and Davenport (2001) state that knowledge stems partly from organizational artifacts like processes, structures and technologies, however, the dynamic context to knowledge is provided by the people – knowledge workers – their culture and the flow of interactions.

The concept of a KMS is a system that allows for the creation, diffusion or transfer and the ready availability of knowledge in the organization. With the use of KM systems, the owner of the knowledge, once it is entered into the system is the organization. This is referred to as the codification approach. If the knowledge creation is external to the system and belongs to an individual, then the onus is on the individual to create and update his/her knowledge into the system. Several factors and variables have emerged as contributors to the behavioral study of knowledge creation and sharing. Lee and Choi (2003) identify knowledge enablers as the factors that provide the infrastructure necessary for the organization to increase the efficiency of knowledge processes, separately from the knowledge processes themselves, which include typical KM activities of creation, storing, sharing and usage. Their study showed definite impact of these two categories of KM factors – "*the process enablers"* and "*the processes"* on organizational performance. However, the study did not go as far as to evaluate the translation of these organizational performance gains from KM initiatives towards end-customer benefits.

Organizational Factors in KMS

Organizations vary by the nature of the knowledge ownership and vehicle of accumulation. It is seen that for knowledge held by individuals, the organizational culture and structure play a big role in the individual's propensity to create the knowledge and then share it with others. The later approach to KMS relying predominantly on culture and structure is known as the personalization strategy (Hansen, Nohria and Tierney, 1999). Several research papers have studied the relationships between different enablers – structure, culture and the environment in different organizations in different industries (Bennett and Gabriel, 1999; Bierly and Chakrabarti 1996; Simonin, 1997). Nidumolu, Subramani and Aldrich (2001) demonstrate the importance of understanding the patterned interactions in an organization's activity system as an important consideration of the implementation of KM initiatives. This study found that expected changes in the activity system take place when careful attention is paid to the roles of the KM infrastructure and the KM processes.

Research Frameworks to Study KMS

Several frameworks have been proposed in the literature to study the processes in knowledge management (Gallupe 2001; Holsapple and Joshi, 2002). These frameworks categorize knowledge management into process flows of different knowledge activities, such as knowledge creation, codification and storage, protection, dissemination and use. These frameworks also look at the knowledge cycle based on the use of knowledge in either recognizing or solving new or previously solved problems.

Therefore, in addition to the culture, structure and technology in the organization and their contribution to the organizational KMS, the actual flow of knowledge and its use is a facet needing to be studied. Illustrating these factors in a diagram, Figure 1 shows that the organizational structure, culture and technology contribute to the underlying knowledge processes of acquiring/creating, converting, protecting (or "hoarding") and applying (or "diffusing") the knowledge. These factors have been presented in Gold, et.al. (2001), which has modeled the impact of the "process enablers" and the "knowledge processes" on organizational effectiveness.

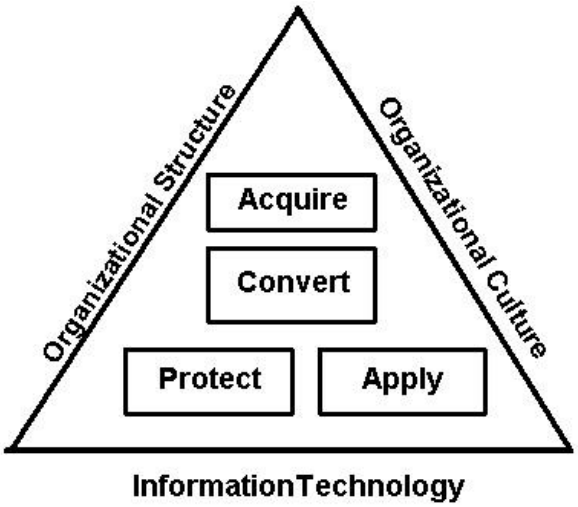

Figure 1. Organizational Knowledge Management Process and Infrastructure Components

Becerra-Fernandez and Sabherwal (2001) show that content oriented organizations focus on the "*know what*" or declarative knowledge, while process oriented organizations emphasize the means to attain the goal of "*know how*" or the procedural knowledge. Performing tasks that are "broad" in domain emphasize the interactions among the actors (i.e., stressing KM processes), while the tasks requiring "deep" knowledge emphasize the use of repositories (i.e., stressing KM infrastructure). It is necessary to evaluate the contributions of both these dimensions to KMS in healthcare organizations in the nursing function by applying a comprehensive KM evaluation model, such as that presented in Gold, et. al. (2001).

KNOWLEDGE MANAGEMENT IN THE NURSING PROCESS

Healthcare maps closely into the newer KM model advocated by Fischer and Ostwald (2001), which supports the paradigm of emphasis on knowledge creation. In the nursing function, the key knowledge creation transaction is between the nurse and the patient. The organization's role is to provide the IT and systems environment to achieve efficiencies by facilitating knowledge integration. Knowledge is created during the interaction between the nurse and the patient and is stored in the KMS by the nurse. The knowledge is then available to other nurses (as well as physicians and specialists) in future patient interaction scenarios (See Figure 2). The knowledge is also disseminated to patients to promote better health compliance. Personalization of knowledge is done by the collaboration among nurses during the problem identification stage and may not always rely on the organization and it's IT.

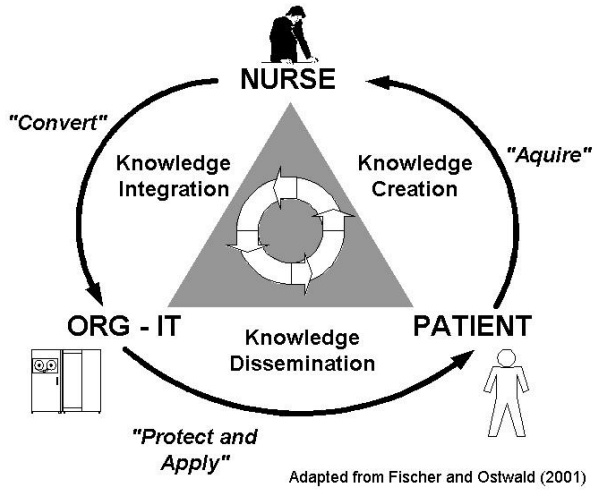

Figure 2. Knowledge Management Process in HealthCare

Healthcare falls into the category of professional organizations and the industry is an "Agent Industry", where transactions are highly standardized (Lampel and Mintzberg, 1996). Clinical activity involves a very high degree of knowledge application and creation in the stage of new problem identification. The interactions between the nurse and the patient are the drivers of this knowledge creation, yet the information going back and forth is often non-standard. The response (i.e., transaction) from the nurse as a result of this interaction is usually a standard set of clinical activities such as interventions and procedures. In hospitals, therefore, the nursing processes are tailored customizations to deal with different environments and patient pools; yet the ultimate transaction is very much standardized – a set of diagnostic tests, medical procedures or clinical interventions (Lampel and Mintzberg, 1996).

RESEARCH HYPOTHESES

The Knowledge Management Capabilities and Organizational Effectiveness Model (KMCOE model) developed in Gold et al. (2001) captures the relationship of the key infrastructure items – technical, organizational structure and cultural capabilities and knowledge process capabilities on organizational effectiveness. The model also provides constructs to measure the different types of knowledge management capabilities – acquisition, conversion, application and protection as well as captures constructs to measure the knowledge infrastructure capabilities of technology, structure and culture. The model from Gold et al. (2001) is well suited to measure the absolute scores of all of the constructs and measure the strength of the relationships between knowledge process capability, knowledge infrastructure capability and organizational effectiveness. Additionally, Perceived Service Benefits and Risks (PSBR) from Hu, et al. (2002) is added to the KMCOE model to measure the extent that organizational effectiveness leads to service benefits for the patient. The extended KMCOE model is shown in Figure 3. Note that this is a second order model. The indicators of the latent variables are not shown in the diagram, rather they can be referenced from the survey at the end of the paper.

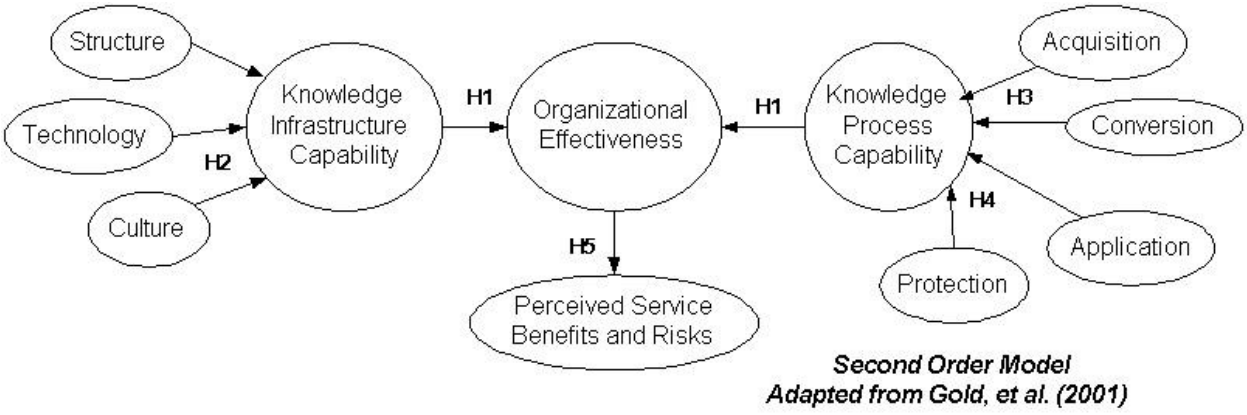

Figure 3. Research Model Showing Constructs and Relationships

KM Framework

Minztberg and Heyden (1999) point out that the logical structure of how work is accomplished in an organization is very different from what the organization chart documents. The authors find that some organizations function like "hubs" while others are "webs" and chains". In a healthcare organization, the clinical professionals usually work at the same level of expertise with "webs" being formed to synthesize knowledge sharing differences in experience and domains of specialization. These informal structures imply that knowledge infrastructure capability will contribute more to organizational effectiveness than knowledge process capabilities.

> **H1: The relationship of Knowledge Infrastructure capability with Organizational Effectiveness is stronger than the relationship of Knowledge Process Capability with Organizational Effectiveness as measured by the path coefficients.**

KM Infrastructure

Hansen, Nohria and Tierney (1999) identified a personalization strategy for KMS, which has greater emphasis on culture verses a codification strategy with emphasis on technology. Alavi and Leidner (2001) in a study conducted among executives from various industries point out the differences between technology based and culture based knowledge management perspectives. Culture based organizations such as healthcare focus more on collective processes while technology based organizations use intelligent systems and data stores to focus their knowledge management initiatives.

H2: Culture has a stronger relationship than Technology with Knowledge Infrastructure Capability as measured by the path coefficients.

KM Processes

The nurse is the professional entity responsible for the care plan of a patient admitted to a healthcare organization such as a nursing home or hospital. Clearly, nurses need to collaborate with other professionals to obtain the knowledge used to identify and solve patient needs. In healthcare, the role of knowledge management falls in the domain of knowledge application in the identification and definition of new problems (Gallupe, 2001).

H3: The relationship of Knowledge Acquisition Capability with Knowledge Process Capability will be stronger than the relationship of Knowledge Conversion Capability with Knowledge Process Capability as measured by the path coefficients.

H4: The relationship of Knowledge Application Capability with Knowledge Process Capability will be stronger than the relationship of Knowledge Protection Capability with Knowledge Process Capability as measured by the path coefficients.

KM Benefits

In Healthcare, the major share of the knowledge belongs to the clinical practitioner. Due to high staff turnover, the attempts at operational excellence are hindered without effective knowledge management. Prior research indicates that trust issues in knowledge management are greater when the knowledge belongs to the individual (Jarvenpaa and Staples, 2000). Due to the trust issues the organizational effectiveness in KM may not translate strongly into perceived benefits for the patient.

H5: The relationship of Organizational Effectiveness with Perceived Benefits and Risks will be weak as indicated by a path coefficient that is not greater than 0.5.

Hypotheses & Sources	Summary
KM Framework ***(H1)*** (Lampel and Mintzberg, 1996)	Webs to "expand the domain" with knowledge creation to solve new problems needing to be grounded in strong infrastructure capabilities.
KM Infrastructure ***(H2)*** (Hansen, et. al., 1999; Alavi and Leidner, 2001)	Personalization based approach to KM leading to larger emphasis on organizational culture then on technical infrastructure.
KM Processes ***(H3, H4)*** (Gallupe , 2001)	*Knowledge Acquisition and Application play a bigger role in versus Knowledge Conversion and Protection in order to support the need to discover and solve newer problems.*
KM Benefits ***(H5)*** (Jarvenpaa and Staples, 2000)	Organizational effectiveness of KM has a small impact on perceived patient benefits.

Table 1. Sources of the Research Hypotheses

RESEARCH METHODOLOGY

A questionnaire was developed to conduct a survey in the healthcare organization to collect quantitative data to test the five hypotheses. The questionnaire has five indicators to measure each latent variable. All indicators were selected from constructs defined in the Gold et. al. (2001) and Hu et. al. (2002) studies. The number of indicators per construct was reduced by identifying and dropping closely related items. To identify the dropped indicators from the original instruments, a comparison can be done between the survey items at the end of the paper and the surveys in Gold et. al. (2001) and Hu et. al. (2002). Small sample sizes were anticipated for this study given that several floors of only one hospital was being surveyed. Hence to allow for the smaller sample size, the fewest possible indicators were used to measure each latent variable. Care was taken to not hamper the content validity of the measures when items were dropped from the survey. The survey is attached at the end of the paper.

Organization Surveyed

The healthcare organization selected is a large metropolitan area hospital with over 300 beds and over $350 million in patient revenues. Inpatient nursing staff consists of over 400 nurses. The hospital boasts centers of excellence in trauma and infectious disease care and is also a premier teaching hospital in the region.

Demographics

A total of 150 surveys were distributed to the nurses working on the medical and surgical departments at the chosen Hospital during the daytime shifts on a weekday. A total of 51 fully completed surveys were collected through a collection box over a two week period. The response rate was 34%. The demographics are summarized in Table 2.

		Mean	*Std Dev*
Years of Schooling (include 13 years for K-12)		16.75	1.611
Years on Current Job		2.88	2.59
Years in Profession		6.22	5.95
Daily Computer Use		8.59%	9.74%
Task Collaboration		65.20%	19.16%
Percentage of Patient Communications	Email	0%	0%
	Telephone	1.86%	3.78%
	Face to Face	95.98%	14.39%
Percentage of Internal Communications	Email	2.25%	5.59%
	Telephone	19.65%	12.68%
	Face to Face	76.63%	16.86%
Gender		Males: 14	Females: 37

Table 2. Demographic Information

As seen from Table 2, the nurses have on average an Associate or Bachelor's degree. On average the nurses had roughly 6 years in the nursing profession and their average tenure on the current job was under 3 years, supporting the well known demographic that there is significant turnover among the nursing population.

Nurses used predominantly face to face communications with their patients. The nurses relied on predominantly face to face communications (76%) and some telephone communications (19%) but hardly any email for communications with their co-workers and other clinical staff. Again these observations are in line with the personalization strategy of knowledge management in healthcare with a reliance on personal interactions among nurses. Finally the sample of nurses was 73% female.

Model Validation

The benefit of adopting a research model and constructs from earlier research is that the instruments have already been validated for content and construct validity. The additional job is to ensure that the instruments are still valid in the current research domain, which is the operational nursing staff level. The constructs were rechecked to ensure that they demonstrated construct validity (discriminant and convergent validity) and reliability. This was done in three steps:

The data was analyzed with SPSS version 12.0 to determine the Cronbach's alpha for each measurement block (latent variable) to ascertain reliability of the instruments. One item each was dropped from the perceived benefits measure (item 5) and the structure measure (item 1) to increase their respective Cronbach's Alphas. All measured latent variables exhibited Cronbach's Alpha's over 0.7. Moreover, 7 of the 9 measures had Cronbach's Alpha's over 0.8.

Secondly, a factor analysis with Varimax rotation was done to ascertain the discriminant and convergent reliability of the measures. The data set indicated 9 factors (or latent variables) with eigenvalues greater than 1.

Finally, a third validation was done using the Composite Reliabilities (CR) and Average Variance Extracted (AVE) from the measurement model in PLS-Graph (Chin, 1998). This is discussed in the next section.

PATH ANALYSIS USING PLS-GRAPH

Path analysis was done using PLS-Graph to analyze the results from the survey. A component based analysis was done using PLS version 0.3.0 build 1017. This model allowed the analysis of latent (unobserved) variables measured by their indicators or manifest variables and the strength of the relationships among these latent variables were also determined using the path coefficients. All manifest variables were modeled as reflective indicators of the latent variables, which is consistent with the prior studies by Gold et. al. (2001) and Hu et. al. (2002).

To assess reliability and validity of the constructs, the block of indicator's composite reliabilities (CR) and the average variance extracted (AVE) are calculated. The CR's should be greater than 0.7. The AVE measures the variance captured by the indicators relative to measurement error and it should be greater than 0.5 to justify using a construct. Finally, to demonstrate discriminant reliability, the square root of each construct's AVE must also be greater than the correlation of the construct to other latentvariables. These results are shown in the Tables 3 indicate adequate scores in the CR and AVE measures to justify the validity of the structural model.

Construct	Mean	S.D	C.R.	Correlation of Constructs and Square Root of AVE								
				1	2	3	5	6	7	8	10	11
(1) TECH	4.66	1.27	.93	.85								
(2) STRUC	4.41	1.39	.85	.71	**.77**							
(3) CUL	4.91	1.48	.84	.73	.67	**.74**						
(5) ACQ	5.12	0.98	.91	.74	.61	.80	.82					
(6) APPL	5.02	0.95	.89	.54	.25	.57	.53	**.79**				
(7) CONV	4.98	1.03	.94	.58	.59	.83	.71	.59	.87			
(8) PROT	5.45	1.22	.89	.25	.01	.33	.29	.52	.39	**.79**		
(10) OE	4.93	1.27	.90	.65	.73	.61	.62	.32	.58	.25	**.81**	
(11) PSBR	5.28	1.20	*.90*	.18	.42	.31	.37	.05	.38	.33	.49	**.84**
Second Order Latent Variables – KIC and KPC: Composite Reliability a & Square Toot of AVE												
(4) KIC			*.93*	.71								
(9) KPC			*.93*	**.65**								

Table 3. Means, Standard Deviations, CR, AVE and Correlation of Constructs

The path coefficients of the relationships in the PLS-Graph among the latent variables are shown in Figures 4. A bootstrapping procedure was used to generate the t-statistics and standard errors for each path coefficient. Interpreted like multiple regression, the R-square value from the PLS-graph indicates the amount of variance explained by the model. The model R-square value of 0.5518 indicated that nearly 55% of the variance was explained by the model.

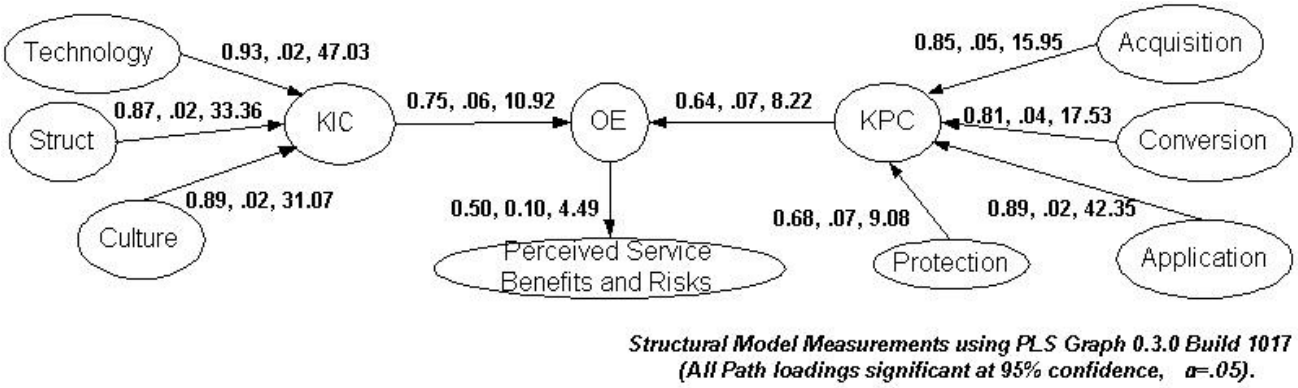

Figure 4. Structural Model results (Path Coefficient, Std Err, T-value) from PLS-graph

DISCUSSION OF RESULTS

Positive support was found for four (H1, H3, H4 and H5) of the five hypotheses.

The success of H1 indicates the clear need to emphasize the KM infrastructure enablers (KIC) when a KMS is being introduced into the clinical nursing setting. Most nursing processes are individualistic and therefore the organizational structure, IT and culture need to be emphasized during the implementation of the KMS.

Hypothesis H2 was not supported indicating that for this particular healthcare organization, technology was perceived to have a stronger relationship with knowledge infrastructure capability than culture. It is quite possible that the healthcare organization used in this study may have had more emphasis on technology driven KM initiatives at the time of the survey and therefore technology was emphasized by the nurses in the survey. Indeed, a subsequent discussion with the CIO of the hospital indicated that they were in the process of implementing workstations with internet and messaging capabilities at the nurse's stations.

The support for H3 and H4 demonstrate the strong relationships of knowledge acquisition and knowledge application processes with knowledge process capabilities for healthcare organizations. These processes are critical in dynamic healthcare organizations, which are primarily involved with identifying and solving new problems.. In a more static environment, such as technical support which uses a codification KM strategy, conversion and protection processes could have been more important capabilities indicated by stronger relationships with KPC.

Finally, hypothesis H5 had support from the model. Clearly the number of factors involved in the healthcare setting is quite large with a large number of unknowns. Hence even if the knowledge management system improves the operations of the organization, the patient care may not be perceived to be better. In an organization where human interactions and responses often determine the true perceived results of the treatment, this result is only to be expected.

IMPLICATIONS FOR PRACTICE AND FUTURE RESEARCH

The study does shed light on the most important contributors to a KMS in a healthcare organization., which are knowledge infrastructure capabilities and knowledge acquisition and application processes. Knowledge infrastructure capabilities like structure, culture and technologies can improve the interaction among nurses and therefore support the personalization strategy. Systems that reduce the personalization activities of a clinical nurse are not likely to meet with success. Therefore, for successful implementations of KMS in healthcare organizations, the systems should be modified to (1) increase the amount of personalization information captured; (2) provide real-time communications among nurses; and (3) support t knowledge creation activities.

Implications for Research

These results may be used as a launching pad for additional empirical research. The findings in this study can help develop successful KMS implementations in healthcare organizations using trade–offs between the different knowledge management infrastructure and process capabilities.. It is intended that future research can focus on extending the findings of this study to determine the suitable emphasis of these factors in different healthcare organizational scenarios – both at the micro and macro levels. Data from additional healthcare organizations need to be collected and analyzed to further validate these findings and allow the results to be generalizable.

This study also extended the model to evaluate the impacts of improvements in organizational effectiveness on the benefits that are experienced by customers or patients. Clearly there are many measures of the manifestations of organizational effectiveness. Future research can extend this study to determine the impacts on measures such as return on investment (ROI) and intellectual capital (Bontis, 2001).

REFERENCES

1. Alavi, M. and Leidner, D. (2001) Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues, *MIS Quarterly*, 25, 1, 107-136.
2. Becerra-Fernandez, I. and Sabherwal, R. (2001) Organizational Knowledge Management: A Contingency Perspective, *JMIS*, 18, 1, 23-55.
3. Bennett, R. and Gabriel, H. (1999) Organizational factors and knowledge management within large marketing department: An Empirical Study", *Journal of Knowledge Management*, 3, 3, 215-225.
4. Bierly, P. and Chakrabarti, A. (1996) Generic Knowledge Strategies in the U.S. Pharmaceutical Industry, *Strategic Management Journal*, 17, 10, 123-135.
5. Bontis, N. (2001) Assessing Knowledge Assests: A review if the Models used to Measure Intellectual Capital, *International Journal of Management Reviews*, 3, 1, 41-60.
6. Chin, W.W (1998) Issues and Opinions on Structural Equation Modeling, *MIS Quarterly*, 22, 1, 7-16.

7. Davenport, T.H. and Glaser, J. (2002) Just-in-Time Delivery comes to Knowledge Management, *Harvard Business Review*, 107-111.
8. Davenport, T.H., De Long, D.W. and Beers, M.C (1998) Successful Knowledge Management Projects, *Sloan Management Review*, 43-57.
9. Dwivedi, A., Bali, R.K., James, A.E., Naguib, R.N.G. and Johnson, D. (2003) Clinical Knowledge Management for HealthCare, *Proceedings of the 4th Annual IEEE Conference on Information Technology Applications in Biomedicine*, UK, 90-93.
10. Fischer, G. and Ostwald, J. (2001) Knowledge Management: Problems, Promises, Realities and Challenges, *IEEE Intelligent Systems*, 60-72.
11. Gallupe, B. (2001) Knowledge Management Systems: Surveying the landscape, *International Journal of Management Reviews*, 3,1, 61-77.
12. Grimson, J., Grimson, W. and Hasselbring, W. (2000) The SI Challenge in Healthcare, *CACM*, 43, 6, 49-55.
13. Gold, A.H., Malhotra, A. and Segars, A.H. (2001) Knowledge management: An organizational capabilities perspective, *JMIS*, 18, 1, 185-214.
14. Grover, V. and Davenport, T.H. (2001) General Perspectives on Knowledge Management: Fostering a Research Agenda, *JMIS*, 18, 1.
15. Hansen, T., Nohria, N. and Tierney, T. (1999) What is your strategy for Managing Knowledge? *Harvard Business Review*, 106-116.
16. Holsapple, C.W. and Joshi, K.D. (2002) Knowledge Management: A threefold Framework, *The Information Society*, 18, 47-64.
17. Hu, P., Chau, P. and Sheng, O. (2002) Adoption of Telemedicine Technology by Healthcare Organizations: An Exploratory Study, *Journal of Organizational Computing and Electronic Commerce*, 12, 3, 197-221.
18. Jarvenpaa, S.L. & Staples, D.S. (2000) The Use of Collaborative Electronic Media for Information Sharing: An Exploratory Study of Determinants, *JMIS*, 9,2, 129-154.
19. Lampel, J. and Mintzberg, H. (1996) Customizing Customization, *Sloan Management Review*, 38, 1, 21-31.
20. Lee, H. and Choi, B. (2003) Knowledge Management Enablers, Processes and Organizational Performance: An Integrative View and Empirical Examination, *JMIS*, 20, 1, 179-228.
21. Martin, M., Myers, L.A. and Murdock, D. (2000) Facilitating Change Through KM at Premier Inc, *Knowledge Management Review*, 3, 4, 20-23.
22. Mintzberg, H. and Heyden, L. (1999) Organigraphs: Drawing How companies really work, *Harvard Business Review*, 77, 5, 87-100.
23. Nidumolu, S.R., Subramani, M. and Aldrich, A. (2001) Situated Learning and the Situated Knowledge Web, *JMIS*, 18, 1, 115-150.
24. Simonin, B. (1997) The Importance of Collaborative Know-how: An Empirical Test of the Learning Organization, *Academy of Management Journal*, 40, 5, 509-533.

SURVEY INSTRUMENT

Questions *(All indicators were measured on a 7 point Likert scale from Strongly Agree to Strongly Disagree)*
Our organizational knowledge management: *Improves the timeliness of patient care* *Improves service productivity of nursing staff* *Reduces unnecessary patient transfers or returns* *Improves the overall effectiveness of patient care* *Hinders my relationship with the patient*
My organization has: 1. Clear rules for formulating or categorizing its clinical services knowledge. 2. Clear rules for formulating or categorizing its clinical process knowledge 3. Technology to allow collaboration with other clinical people inside the organization 4. Technology to map the location of specific types of knowledge 5. Technology to retrieve and use knowledge about its services or processes
My organization has improved its ability to: 1. Identify new clinical service opportunities 2. Anticipate potential opportunities for new clinical services. 3. Adapt quickly to unanticipated changes

4. React to new information about the patient 5. Be responsive to new patient demands (*** Item dropped to increase reliability ***)
In my organization: 1. Structure of departments and units inhibits interaction and sharing of knowledge (**** Item dropped for reliability ***) 2. Structure promotes collective rather than individualistic behavior 3. Designs processes to facilitate knowledge exchange across functional boundaries. 4. Encourages employees to go where they need to for knowledge regardless of structure. 5. Structure facilitates the creation of new knowledge across structural boundaries
In my organization: 1. High levels of participation are expected in capturing and transferring knowledge 2. Employees are encouraged to ask others for assistance when needed 3. Employees are encouraged to discuss their work with people in other workgroups 4. The benefits of sharing knowledge outweigh the costs 5. Management clearly supports the role of knowledge in our firm's success.
My organization: 1. Has processes for acquiring knowledge about our patients 2. Has processes for generating new knowledge from existing knowledge 3. Uses feedback from projects to improve subsequent projects 4. Has staff devoted to identifying best practices 5. Has processes for exchanging knowledge between individuals.
My organization has processes for: 1. converting knowledge into the design of new clinical services 2. distributing knowledge throughout the organization 3. integrating different sources and types of knowledge 4. organizing knowledge 5. replacing outdated knowledge
My organization: 1. has processes for applying knowledge learned from experience 2. has processes for using knowledge in the development of new services 3. has processes for using knowledge to solve new problems 4. makes knowledge accessible to those who need it 5. quickly links sources of knowledge in solving problems
My organization has processes to: 1. protect knowledge from inappropriate use inside the organization 2. protect knowledge from inappropriate use outside the organization 3. has technology to restrict access to the sources of knowledge 4. values and protects knowledge embedded in individuals 5. clearly communicates the importance of protecting knowledge

1. Number of years in current Job _____
2. Number of years in current profession _____
3. Schooling (include 13 for K-12): _____
4. Gender: M F
5. Percentage of daily hours spent using computers:
___under 10% ___10-25% ___26-50% __51-75% ___76-100%

6. Percentage of <u>daily</u> Communications with <u>co-workers</u> using:
email _____ telephone_____ face-to-face_____
7. Percentage of <u>daily</u> Communications with <u>patients</u> using:
email _____ telephone _____ face-to-face_____
8. Percentage of daily Tasks requiring collaboration with one or more co-workers _____