Knowledge Management System Design of Indonesian General District Hospital

Theresia Puspa Wijayanti, Ave Adriana Pinem, Putu Wuri Handayani and Yova Ruldeviyani
Faculty of Computer Science, Universitas Indonesia, Depok, Indonesia

Abstract: Hospital as one of unique and complex entitiy needs to manage the knowledge for providing high quality health services to patients. The objective of this research is to design compatible knowledge management system for hospital in managing medical and non-medical knowledge. Methods used in the research are observation, questionnaires and interview within the hospital environment. This research adopts knowledge management system design methodology by Fernandez and Sabherwal by analyzing contingency factor aspect, technology, process, infrastructure and mechanism of knowledge management. The final result is the design of knowledge management system including the knowledge management processes that enable it which are externalization, socialization for knowledge sharing and knowledge discovery, direction, routines, exchange, internalization and combination in importance/urgency order.

Key words: Knowledge management design, contingency factors, healthcare knowledge management system, design compatible, managing medical

INTRODUCTION

Hospitals are health service institution that affected by the development of health science, technology and socio-economic life of society to serve public. They have a very important role in providing health services in improving public health. In Indonesia, hospitals are grouped in some categories, one of them are based on hospitals ownership. From these criteria there are public and private hospitals. Public hospitals are government owned hospital that provides health service for public with generally lower cost compare to private hospital. However, they are still expected to deliver excellent service in medical or administrative task.

In order to fulfill the expectation, hospital needs to manage its knowledge (Borousan *et al.*, 2012) to improve service quality. Knowledge management increases the effectiveness of organizations by using existing knowledge that has been owned by organizations or individuals. Practically, this will be achieved by improving the quality of decision making processes and building the learning culture within organization (Becerra and Sabherwa, 2010). Individuals do not have to meet directly to transfer the knowledge and experience they have. Such knowledge will be stored into the system so that it can be reused by other individuals. This system will all hospital's staffs to update, validate and share their knowledge. Others can also verify the stored knowledge to improve the validity patient safety is one most important aspect in

healthcare industry, it is important to have effective and immediate decision regarding patient condition. Thus, availability and validity of information are very crucial in this process. This research would conduct a case study in a hospital in Indonesia. This hospital is a general district hospital of Pasar Rebo which holds a role as reference hospital. It means that every patient that sign up in this hospital is usually referred from other public clinics or hospitals. Based on the interview, knowledge management in the hospital currently only limited to collection of files, instructions, policies, records/documents in hardcopy form. Thus, it is also difficult to search information regarding a case that been happened before. At the end, the medical staff has to redo some activities and caused repetitive work in some common cases. This affect the quality of health service and slowdown the decision making process. Another reason for implementing knowledge management in this hospital is job rotation. Knowledge and valuable experience will disappear when individuals are no longer working in the hospital or moving to the other units. So, it is crucial to store individual knowledge to increase organizational knowledge.

From that perspective, this study aims to design knowledge management system that can be used by hospital. The characteristics of the hospital was defined and analyzed so design of knowledge management system will fit the organization.

Corresponding Author: Theresia Puspa Wijayanti, Faculty of Computer Science, Universitas Indonesia, Depok, Indonesia

Table 1: Knowledge management contingency factors

KM Processes	Contingency factors						
	1*	2*	3*	4*	5*	6*	7*
Combination	Low	High	E	P/D	Small/large	D	High
Socialization for knowledge discovery	High	High	T	P/D	Small	D	High
Socialization for knowledge sharing	High	High	T	P/D	Small	LC/D	Low
Exchange	Low	High	E	P/D	Large	LC/D	Low
Externalization	Low	Low	T	P/D	Small/large	LC/D	Low
Internalization	Low	Low	E	P/D	Small/large	LC/D	Low
Direction	High	High/Low	T/E	P	Small	LC	High
Routines	Low	High/Low	T/E	P	Large	LC	High

*Task uncertainty; task interdependence; explicit/tacit knowledge; procedural/declarative knowledge; organizaional size; business strategy; environment uncertainty

Literature study

Knowledge management system: Knowledge Management System (KMS) integrates knowledge management process for create, capture, support, share and apply knowledge to generate value (Dimitrijevic, 2014). KMS also apply knowledge management mechanism and technology (Becerra and Sabherwa, 2010). KM mechanisms are means used to promote knowledge management process viz face to face meeting, on the job training, learning by observation. KM technologies are information technologies used to facilitate knowledge management process viz. mailing list forum discussion, wiki and teleconferences (Becerra and Sabherwa, 2010).

Contingency factor of knowledge management process: Contingency factor is an approach used to develop knowledge management solution. Generally, contingency factor and KM infrastructures affect knowledge management fitness for a certain organization. Contingency factors consist of task characteristic, knowledge characteristic, organizational characteristic and environmental characteristic (Becerra and Sabherwa, 2010) Table 1.

MATERIALS AND METHODS

This study was conducted to design a knowledge management system for a healthcare organization. The methodology used is the methodology proposed by Becerra-Fernandez and Sabherwal. This methodology consists of seven steps to be done; assess the contingency factors, identify the KM processes based on contingency factor, prioritize KM processes needed identify the existing KM processes, identify the additional needed KM process, assess KM infrastructure define KM systems, mechanisms and technology (Becerra and Sabherwa, 2010).

Table 2: Employee transference

Transfer	2010	2011	2012	2013	2014	2015
Begin to work	30	33	10	132	134	90
Between unit rotation	445	405	317	108	500	86
Quit the job	26	39	28	41	22	19

Instruments: Interviews, observation and questionnaires were used in this study. Questionnaires were used to map the contingency factors and knowledge management processes.

Case study: General district hospital pasar rebo was the object of this study. The number of employees in this hospital is 992 people. Job rotation is a common activity in this hospital. To date, the employees transfer can be seen in Table 2. The hospital perceived knowledge as a crusialcrucial factor to improve its performance in operational or patient handling process. However, knowledge management system has not been implemented yet. Most of the knowledge still resides in each employee's head. Explicit knowledge stored electronically and physically. Electronically they only stored patient examination data and employee data as hospital information system input data. Patient medical report, standard operating procedures, policies, meeting report, memo and other documents still kept physically in accordance shelves. Thus, finding relevant information for some tasks will take some time. Information about case handling has not documented yet so face-to-face meeting need to take place when employee need to handle similar cases.

Based on organization structure, knowledge management has not been in any division responsibility. Each division only manages their own document and kept them in each units.

Respondent demographic: Data collecting was conducted with purposive sampling in three divisions of the organization viz. human resources division, medical treatment division and marketing and general affair division. The questionnaires was filled out by 131 respondents with detail provided in Table 3.

Table 3: Respondents demographic

Categories	Total	Percentage
Gender		
Male	34	26.0
Female	97	74.0
Age (years)		
20-29	54	41.2
30-39	46	35.1
40-49	20	15.3
>50	11	8.4
Education		
High school	14	10.7
Diploma	92	70.2
Graduate	23	17.6
Postgraduate	2	1.5
Duration of work (years)		
<5	62	47.3
5-14	37	28.2
15-30	31	23.7
>30	1	0.8

Table 4: Contingency factor analysis result

Contingency factor	Mark	Percentage
Task uncertainty	Low	79.4
Task interdependence	High	58
Procedural/declarative	Procedural	91.6
Tacit/explicit	Tacit	93.1
Organization Size	Small	N/A
Business Strategy	Low cost	N/A
Environmental uncertainty	Low	63

Table 5: Future knowledge management process

KM processes	Score	Max. score	Percentage	Rank
Externalization	4.5	5.5	82	1
Socialization for knowledge sharing	5.0	6.5	77	2
Exchange	4.0	6.0	67	3
Direction	4.0	6.0	67	3
Routines	4.0	6.0	67	3
Internalization	3.5	5.5	64	4
Socialization for knowledge discovery	3.5	6.0	58	5
Combination	3.0	6.0	50	6

Table 6: Current knowledge management process

KM processes	Score	Max. score	Percentage	Rank
Socialization for knowledge sharing	3.92	5	78.40	1
Direction	3.92	5	78.40	1
Routines	3.87	5	77.40	2
Externalization	3.74	5	74.80	3
Internalization	3.72	5	74.40	4
Combination	3.66	5	73.20	5
Socialization for knowledge discovery	3.66	5	73.20	5
Exchange	3.61	5	72.20	6

RESULTS AND DISCUSSION

Step 1 (Assessing the contingency factors): Contingency factor analysis conducted by distributing questionnaires and interviewing hospital's staffss to determine a contingency factor of the organization. Seven factors were analyzed; Low task uncertainty as there would be low changes and uncertainty in staff's duty within the organization. High task interdependence, occurred because of the success of an activity depends on activity of other staffs or units. It's indicated that there were duties interconnections between units; Procedural knowledge is defined based on working condition that based on Standard Operating Procedure (SOP) that already been established; Tacit knowledge was dominant because knowledge still stored in each individual minds and shared when staff discuss directly with one another; Small size organization, defined by the number of organization member. This hospital employed 992 people which is categorized as small organization; Low cost business strategy as the hospital serves all people regardless of socioeconomic status and also accepts public and private health insurance) Low environment uncertainty, external parties involvement would not cause a major change on individual task. The results of this analysis are shown in Table 4

Step 2 (Defining the knowledge management process): Based on assessment in contingency factors, KM processes is defined by following the framework in Table 1, the result is shown in Table 5.

Step 3 (Prioritizing KM process needed): Based on Table 5, externalization is concluded to be the most relevant KM mechanism for this hospital followed by socialization for knowledge sharing, exchange, direction

routines, internalization, socialization for knowledge discovery and combination. Thus, transforming tacit knowledge into explicit will be the first action necessary to be taken. Writing experience in case handling or lesson learned will support this process. First of all, the hospital needs to capture the knowledge to able to manage it in effective manner.

Socialization for sharing knowledge can be accommodated with forum discussion and community in practice. Effective socialization will be happened if management can allocated some dedicated time for employee to share their knowledge, experience and information.

Exchange is possible when hospital have enough explicit knowledge to be exchange within the organization. Other units can use some information across organization to improve decision making. Effective problem solving will have to consider many aspects thus it will be good to have sufficient data and information regarding it.

Step 4 (Identifying existing KM processes): Knowledge management process that currently undertaken practiced was assessed by filling out questionnaires result is shown in Table 6 questionnaires were gathered to rank KM

Table 7: Future and current KM process comparison

KM processes	Future condition rank	Current condition rank
Externalization	1	3
Socialization for knowledge sharing	2	1
Direction	3	1
Routines	3	2
Exchange	3	6
Internalization	4	4
Socialization for knowledge discovery	5	5
Combination	6	5

Table 8: KM mechanism and technologies

KM processes	KM mechanism	KM technologies
Externalization	Experience, best practices, lesson learned	Forums discussion Document management
Social for knowledge sharing	Job rotation, disscusion, brainstorming, seminar	Forum discussion, mailing list, chatting Video conference
Direction	Help desk	Forums, knowledge
Routines	Organization policy, SOP, job experience	News/article Management, searching tools
Exchange	Memo, presentation,	News/article Management, searching tool

processes that undertaken in hospital. Socialization for knowledge sharing and direction were rated to be the most frequently proceeded KM processes. Employee usually shares their knowledge by informal communication between them. Direction by standard operating procedure, policy and other rule become a common process when employee does their daily tasks.

Step 5 (Identifying additional KM processes needed): Comparison of future KM processes and current KM processes was conducted to show any gap that need to be solved for achieving effective use of knowledge management in this organization. Table 7 shows that externalization and exchange need to be improved within organization as the rank in future condition is lower than in current condition. The improvement of this process will be elaborated in the next study.

Step 6 (Assessing KM infrastructure): The next step is to assess KM infrastructure currently owned by organization. KM infrastructures would support the system that would be implemented in organization.

Organizational culture: Organization members support the implementation of knowledge within organization and agree that knowledge is an important asset in organization. This is positive culture toward implementation of knowledge management system.

Organizational structure: The hospital is operated with function structure where hierarchical line needs to be abode in decision making. This would make management support in implementing knowledge management system deemed to be important. Based on questionnaires result, organization members are ready to actively participate in managing knowledge in their own task and function.

Information technology infrastructure: Observation has been made to assess the IT infrastructure. The hospital already has internet or intranet access by LAN and VPN with suffice bandwidth. Staffs are able to communicate and transfer documents by electronic media. For information and data were currently stored in physical cabinets and server repositories. Data and information availability could be improved by electronically saved them in servers.

Common knowledge: Related to individual knowledge about the routines and traditions in their task related group or in organization as a whole. This knowledge could reside in people, organization and artifact. Standard Operating Procedures (SOP) are example of artifact in this hospital

Physical environment: Meeting rooms, staffs' desk, nurse rooms, canteen, lobby and computers are some facilities that provided for staffs to do their tasks and communicate with others.

Step 7 (Defining KM mechanism and technology): This step was conducted to identify and define knowledge management mechanism and technologies that need to implement in future knowledge management system for the hospital. Based on Table 7, five KM processes in top three ranks has been defined, in Table 8 the KM processes map in to KM the mechanism and technology sorted by therank of the process.

KMS design for this hospital need to enable the KM mechanisms especially externalization, socialization and exchange. Some functional requirements for this system listed in use case diagram inare developed by analyzing KM mechanism in Table 8. Some of the features are forum discussion, document management, news/article management and searching tools. To ensure the validity of knowledge, information and document stored in the system, expert involvement will be needed. Therefore, three user categories haves been defined in the system, general users, experts and administrators (Fig. 1).

Knowledge management system will facilitate employee to capture the knowledge with given features in the system. Learn from other's experience on solving problem, gather information on for decision making process or simply know about some information can be accommodate by accessing knowledge management
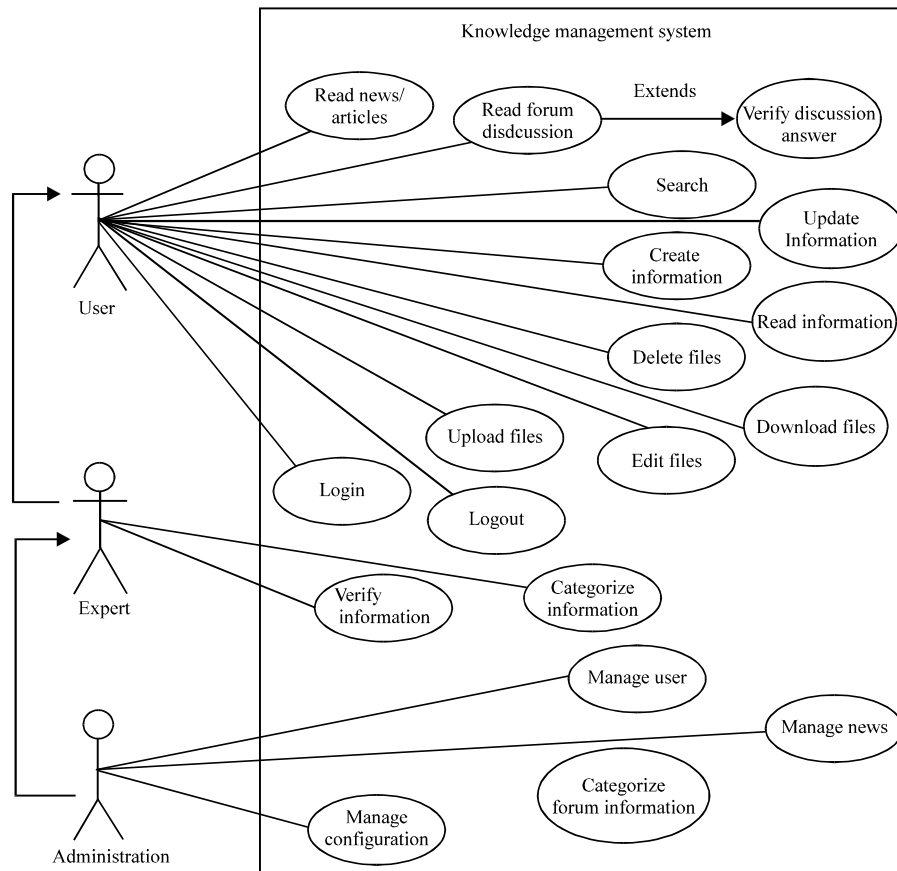
Fig. 1: Use case diagram

features. Forum dissuciondiscussion feature has advantages for externalization and socialization process. It will keep the information and knowledge that has been exchanged between employees. Some issues need to consider in this feature is employee intention to share their knowledge. Thus, management need to apply some scheme to encourage them to use the discussion feature. Document management feature organize existing file in orderly manner to help employee accessing information they need and effecientlyefficiently perform their task. This feature will boost up the exchange process. Security, accountability, privacy and access role are some issues need to resolve in this feature. Confidential information and data should only be able to be access by certain users.

Research and news feature are implemented to disseminate information widely. Notification by online media enables employee to access information anytime and anywhere. This feature also facilitates hospital to keep track their information in electronic manner in other hand enrich their explicit knowledge. Before implementing knowledge management system it is necessary to evaluate the readiness of the physical environment, organizational structure, policies, commitment, organizational culture and others so that the implementation of knowledge management systems can provide optimal results. As for the KM infrastructure, the hospital need improve some social conduct and facility for the employees. Organizational culture would be a significant factor to a successful knowledge management implementation as knowledge management is a matter of culture (Beliveau *etal.*, 2011). Collaborative environmental could help employee to share knowledge and discover new knowledge (Beliveau *etal.*, 2011). Arranging regular team work could help improve collaborative activity. Reward system is also a positive culture toward knowledge management (Wei *et al.*, 2009). Encouraging employee to use the system by giving rewards or gifts to employees would have positive effect of KMS performance. When employee willingly shares their knowledge, organization would have additional knowledge stored in their artifact or employee. Strong commitment and supportive policies from top management would be very important for the implementation and use of knowledge management

system. Organization structure that operated hierarchical resulted centralized decision making that made top management has strong contribution in how the hospital works.

CONCLUSION

In managing the existing knowledge in the hospital environment, should the knowledge management system developed and implemented base on its need and characteristic. Externalization is one of the most important KM processes that need to be implemented. It means that the employee has to externalize their knowledge in to a media. Forum discussion, articles, document management are some features that support this process. Other example of this process is writing report or lesson learned of finished task or project (Schulze and Hoegl, 2008). From the perspective of knowledge management infrastructure, this hospital has already have sufficient facility that will help the implementation of KMS. Culture, structure, infrastructure, common knowledge and physical environment have showed positive capability to support KMS. However, the hospital need to define some policies regarding KMS implementation and appoint a certain people or office to manage and maintain the KMS.

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