IMPLEMENTATION OF KNOWLEDGE MANAGEMENT SYSTEM AT NURSING SECTION OF PELABUHAN HOSPITAL CIREBON

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ABSTRACT

Pelabuhan hospital Cirebon (RSPC) is a company that provides public health services, which have the purpose to serve the health of its customers, the general public, as well as the hospital's own employees and their families. To maintain the quality, RSPC always follow the development of science and one of which is in the field of nursing, such as for example, by implementing equitable distribution of knowledge and information or sharing knowledge among nurses. But in practice there are some problems faced by the hospital such as: manager of nursing have difficulty in knowing whether the actions taken by the nurses was appropriate or not in accordance with the SOP, assistant manager askep & quality experiencing difficulties in SOP deployment and renewal, supervisor having difficulty in managing the experience and actions of nurses. The problems caused by the development of increasingly advanced nursing patterns resulting nurses are not able to adjust to new patterns of nursing.

Knowledge Management System is the perfect solution to answer the the problem, by using text mining that can help managers of nursing determine the actions of nurses based on the experiences nursing actions, help assistant manager askep and quality in the making and renewing of SOP and help head of the room for sharing experiences among nurses action.

Based on the results of systems testing, knowledge management systems have been able to assist managers of nursing in monitoring the actions of nurse, helps assistant managers of nursing askep and quality in the making and renewing of SOP, and able to help supervisor to make sharing actions experiences between nurses personnel.

Keywords : *Nursing Knowledge Management System, Text Mining, Monitoring*

1. INTRODUCTION

Pelabuhan Cirebon Hospital is one of PT.Rumah Sakit Pelabuhan branch. PT.Rumah Sakit Pelabuhan is one of the subsidiaries of PT. (Persero) Pelabuhan Indonesia II is a state-owned enterprises that plays an important role in the Indonesian economy. Pelabuhan Cirebon Hospital has the purpose to serve the health of employees and their family, the customers and the general public. Pelabuhan Cirebon Hospital have the facilities and services such as: outpatient, inpatient, medical check-up and support services such as radiology, UltraSonography (USG), Endoscopy, Laboratory, and Physiotherapy. The hospital is a company or organization that provides health services community by providing health services to the community well. Pelabuhan Cirebon Hospital has the main focus is to service the surrounding community, and to improve the services, the hospital always follow the development of science, which is one of them on the field of nursing. One way to keep abreast of science, namely by making knowledge sharing among nursing personnel.

Based on interviews with the supervisor and a questionnaire distributed to nurses ± 50 sheets questionnaire, concluded that there is an actions of nurses that are not in accordance with the Standard Operation Procedure (SOP) and the development pattern of nursing make to the hospital to renew SOP nursing actions that lead to nurses unfamiliar with the new patterns of nursing. This makes the hospital to apply the concept of nursing credentials. The credentials process is a process to give clinical authority for health personnel to perform certain clinical measures. Clinical authority conducted based on professional career of the clinical nurse that is Perawat Klinik I (PK I), PK II, and PK III, the action taken by Perawat Klinik (PK) according to their ability and knowledge of nurses. Credentials Purposes is to protect patient safety by ensuring that nursing personnel who give nursing care and midwifery are competence and authorizes clinically apparent [6]. However, there is a problem when an emergency occurs and the required action should be done by PK III, while in the room there is only PK I and PK II, in emergencies that make the patient should not wait too long, then the PK II will take action under the supervision of the senior nurses. Supervision that accompanied by a senior nurse makes the patient feel like he was getting the experimental action, it is feared the complaints from patients because patients assume all nurses have the same knowledge and are proficient in all nursing

actions. Those problems due to lack of knowledge and experience possessed by clinical nurse regarding the action taken by other clinical nurse, it is feared to be the occurrence of mistakes in dealing with patients.

There are difficulties experienced by nursing managers to know the nursing actions performed by nurses is appropriate or not in accordance with standard operating procedures that are established by the hospital. The distance between the location of the room nursing manager with room nursing actions are different, making manager not fully aware of the actions of nurses in patient care process is appropriate or not in accordance with standard operating procedures that are established by the hospital. Actions that are not in accordance with SOP is feared an error of nurses in nursing action on the process of care for patients. In addition, "the assistant manager askep & quality" have difficulties in deployment training documents, because only nurse that attend the training course who will get the training material. Nurses who are already doing the training will distribute training materials to other nurses, but It took quite a long time until the training material could get into the other nurses due to nurses working hours and the rooms were different. This resulted in not all nurses receive and know the training materials from another nurse

Knowledge Management System is a knowledge management using information technology to increase the useful knowledge in the organization, providing an opportunity to learn and share knowledge. Where the business is going to create and sustain an increase in the value of the core business competencies by utilizing of existing information technology. Knowledge Management System can apply text mining to support the process of sharing knowledge and experience. Text mining is a process of analyzing texts to extract useful information on a particular goal. Text mining can be used in case of matching between the two documents. One algorithm used to calculate the degree of similarity between the two documents can use Jaro-Winkler algorithm. Jaro-Winkler algorithm is an algorithm to measure the similarity between two strings. The higher the Jaro-Winkler distance for two strings, the more it resembles the degree of similarity between the two strings.

Based on these problems, it needed an information system "Application of Knowledge Management System Nursing Hospital Cirebon Harbour".

1.1 Knowledge Management

Knowledge Management is an attempt to increase the useful knowledge in the organization, of which nurture a culture of communication between personnel, provide opportunities for learning and sharing knowledge. Where the business is going to create and sustain an increase in the value of the core business competencies by utilizing the existing information technology [2].

1.2 Knowledge Cycle

Knowledge Conversion Model by Ikujiro Nonaka and Hirotaka Takeuchi divided into 4 way:

a. Tacit knowledge to Tacit knowledge called Socialization
   The socialization process is a process of sharing and creation of tacit knowledge through interaction and direct experience
b. Tacit knowledge to Explicit knowledge called Externalization
   Externalization process is the articulation of tacit knowledge into explicit knowledge through a process of dialogue and reflection.
c. Explicit knowledge to Explicit knowledge called Combination
   The Combination process is the process of converting explicit knowledge into explicit knowledge that is new through systemization and application of explicit knowledge and information.
d. Explicit knowledge to Tacit knowledge called Internalization
   The internalization process is a process of learning and knowledge acquisition are performed by members of the organization through their own experience that it becomes tacit member organization [14].

1.3 Text Mining

Text mining is to mine data in the form of text where the source data is usually obtained from the document, and the goal is to find words that can represent the contents of the document so it can analyze the connectivity between document [9].

Steps on text mining is as follows [4]:

1. Case Folding and Tokenizing
   Case folding is changing all the letters in the document to lowercase. Only the letters a through z are acceptable. Characters other than letters removed and considered delimiter. Phase tokenizing / cutting stage string parsing is input by every word that constitute it.
2. Filtering
   Filtering is the stage of taking important words from the token. There are several algorithms in filtering that is stoplist, and wordlist.
3. Stemming
   Stemming is the process of combining or separating each of the variants of a word to be a basic word.

4. Analyzing
   Analyzing stage is the stage of determining how far the similarity between text documents. There are several methods to determine the similarity between the document text that uses mathematical equations to determine the value of similarity between text document files.

1.4 Algoritma Nazief dan Adriani

Nazief and Mirna Adriani algorithm has the following stages [2]:

1. Find a word that will be stemmed in the dictionary. If it is found then it is assumed that the word is the root word. Then the algorithm stops.
2. Inflectional Suffixes ("-lah", "-kah", "-ku", "-mu", atau "-nya") removed. If the form of particles ("-lah", "-kah", "-tah" atau "-pun") then this step is repeated to remove possesive pronouns ("-ku", "-mu", atau "-nya") , If there are.
3. Remove Derivational Suffixes ("-i", "-an" atau "-kan"). If the word is found in the dictionary, then the algorithm stops. If not then to step 3a
   a. If "-an" has been removed and the last letter of the word is "-k", then "- k" also deleted. If the word is found in the dictionary then the algorithm stops. If not found then go to step 3b.
   b. Suffix is removed ("-i", "-an" atau "-kan") is returned, go to step 4.
4. Remove the Derivation Prefixes. If in step 3 the suffix is removed then go to step 4a, if not go to step 4b.
   a. Check the prefix-suffix combination table that is not allowed. If found, then the algorithm stops, otherwise go to step 4b.
   b. For i = 1 to 3, specify the type of the prefix and then remove the prefix. If the root word has not been found complete steps 5, if it is then the algorithm stops. Note: if the second prefix same with the first prefix the algorithm stops.
5. Do Recording.
6. If all steps have been completed, but that does not work then the initial word is assumed to be the root word. The process is complete.

Prefix type is determined through the following steps:

a. If the prefix is: "di-", "ke-", atau "se-" then type the prefix in a row is "di-", "ke-", atau "se-".
b. If the prefix is "te-", "me-", "be-", atau "pe-" then it takes an additional process to determine the type of the prefix.
c. If the first two characters is not "di-", "ke-", "se-", "te-", "be-", "me-", or "pe-" then stop.

1.5 Algoritma Jaro-Winkler

Jaro-Winkler algorithm Distance has a quadratic time complexity runtime, complexity is very effective on a short string and can work faster than edit distance algorithm [7]. The basis of this algorithm has three parts, as follows:

1. Calculate the length of the string
2. Find the same number of characters in the two strings

$$d_j = \frac{1}{3} \times \left(\frac{m}{|s_1|} + \frac{m}{|s_2|} + \frac{m-t}{m} \right)$$

m = number of characters are exactly alike, | s1 | = Length of string 1, | s2 | Length of string = 2, t = amount of transposition.
The theoretical distance of two characters who likened can be justified if it does not exceed -1:

$$\left(\frac{max\left(|s_1|, |s_2|\right)}{s} \right) < -1$$

However, when referring to the value that will be generated by the Jaro-Winkler algorithm then the maximum distance value is 1, which signifies that the string similarity that is compared reaching 100% or exact. S1 usually used as a reference to a sequence in the search for transposition.

3. Find the number of transposition

$$d_w = d_j + (lp\,(1 - d_j))$$

dj = Jaro distance for strings s1 and s2, l = length of the common prefix at the beginning of the string value of maximum 4 characters (the same character length, before it was discovered the inequality max 4), p = constant scaling factor. The default values for these constants according to Winkler is p = 0.1.

2. RESEARCH CONTENT

2.1 Knowledge Conversion Model of Nursing Section

Knowledge cycle using SECI conversion model by Ikujiro Nonaka and Hirotaka Takeuchi. Conversion model which will be used is an externalization, combination, and internalization. Here is a SECI conversion model at knowledge management system in the field of nursing:

a. Tacit knowledge to Explicit knowledge called Externalization
   Externalization process is the articulation of tacit knowledge into explicit knowledge through a process of experience sharing.
b. Explicit knowledge to Explicit knowledge called Combination
   The Combination process is the process of converting explicit knowledge into explicit

knowledge that is new through systemization and application of explicit knowledge and information. Such as SOP storage and training materials.

c. Explicit knowledge ke Tacit knowledge disebut Internalization
The internalization process is a process of learning and knowledge acquisition are performed by members of the organization through their own experience that it becomes tacit member organization.

2.2 Knowledge Taxonomy of Nursing Section

Here is the taxonomy knowledge that will be stored on the system to be built:

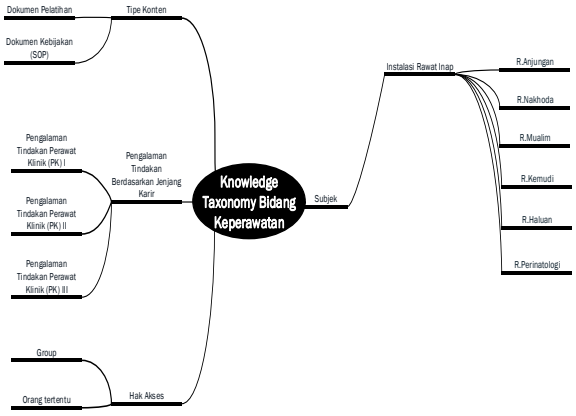


Figure 3-1 Knowledge Taxonomy In the system to be set

2.3 Implementation of Knowledge Management System

Text mining is a process of analyzing texts to extract useful information on a particular goal. Text mining can be used in case of matching between the two documents. One of algorithm used to calculate the level of similarity between two documents or query with the document can use the Jaro-Winkler algorithm. Jaro-Winkler algorithm is an algorithm to measure the similarity between two strings. The higher the Jaro-Winkler distance for two strings, the more it resembles the degree of similarity between the two strings. Preprocessing process on the system to be built can be seen in Figure 3-2.

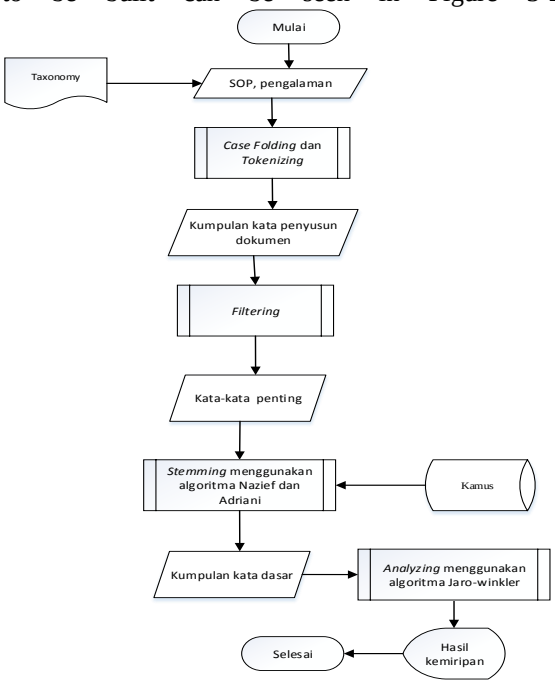


Figure Error! No text of specified style in document.**-2 Preprocessing Process**

After the phase of folding case, tokenizing, filtering and stemming on the Standard Operation Procedure (SOP) with experience of nursing actions, then the next phase is analyzing by using an Jaro-Winkler algorithm. Here is a calculation using the Jaro-Winkler algorithm:

Kata yang sama antara SOP dengan pengalaman perawat :

SOP : siap, alat, liput, spuit, cc, buah, bengkok, handscoon, kapas, alcohol, perlak, kecil, bak, pasien, pasang, tangan, infus, selang, phlebitis, aff, alir, darah, abocath, buka, badan, jarum, pisah, luar, sumbat, usaha, baru, nama, hapus, sambung, tutup, ujung, ganti

Perawat : siap, alat, liput, spuit, cc, buah, bengkok, handscoon, kapas, alcohol, perlak, kecil, bak, pasien, pasang, tangan, infus, selang, phlebitis, aff, alir, darah, abocath, buka, badan, jarum, pisah, luar, sumbat, usaha, baru, nama, hapus, sambung, tutup, ujung, ganti

t = 0 (karena urutannya sama semua)

m = 37, s1 = 150 , s2 = 67, l = 4

Hitung jarak (dj) dapat menggunakan rumus 1, dapat dilihat pada perhitungan sebagai berikut:

dj = 1/3((37/150) + (37/67) + ((37- 0) / 37)) = 0,599

Hitung Jaro-winkler distance (dw) dapat menggunakan rumus 3, dapat dilihat pada perhitungan sebagai berikut:

dw = 0,599+ (4(0,1)(1 - 0,599)) = 0,7594

Here is an indicator SOP conformity assessment chart with the nurse action experience that can be seen in Table 3-1

Table 3-1 Indicators Rating

No	Indicators	Information
1	Dw < 0,50	Very inappropriate
2	0,75 < Dw > 0,50	Inappropriate
3	0,90< Dw > 0,75	Appropriate enough
4	Dw > 0,90	Appropriate

The degree of similarity between the SOP value to the experience of nurses is 0.7594, then the nurse is quite in accordance with the SOP.

2.4 Perancangan Data

Here is the result of design data on Knowledge Management System, which will be built can be seen in Figure 3-3

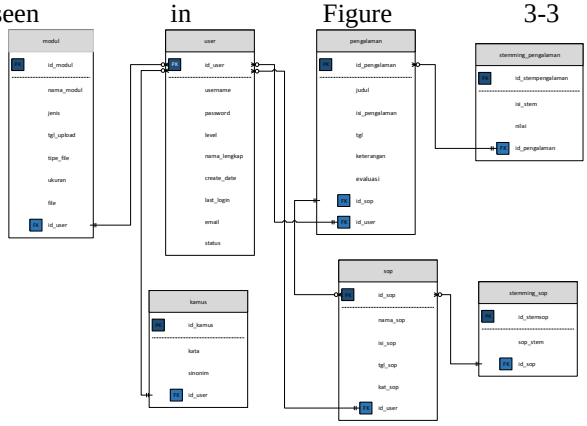


Figure Error! No text of specified style in document.**-3 Table Relationships**

2.5 Blackbox Testing

The implementation phase of the system is a stage that is performed to determine the system that has been built. can operate well or not. The implementation phase of the system there is a description of the implementation and testing program.

2.6 Blackbox Testing

Black box testing focuses on functional requirements of the software. Stages of functional testing to be performed is Test Plan and test results.

2.7 Pengujian Beta

Beta testing is testing conducted objectively to ensures whether the system has been made accepted or not by the nursing field of Pelabuhan hospital. Through interviews with nursing manager, assistant manager askep and quality, and the Supervisor.

3. CLOSING

3.1 Conclusion

The conclusion that can be obtained after the analysis and testing of the system is built is as follows:

1. Knowledge Management System that has been built to help the nursing manager and assistant manager of Askep and quality in manage training materials so that the nurses who do not follow the training will receive training materials quickly, managing SOP such as reform the SOP.
2. Knowledge Management System that has been built can be facilitate nursing manager, assistant manager askep and quality, the Supervisor, and nurse to share nursing actions experiences so that among nurses can figure out nursing action experience possessed by the other nurses.
3. Knowledge Management System can help the nursing manager to find out that the nursing actions are in accordance or less appropriate with SOP based on the experience of nursing actions experience owned by the nurse.

3.2 Advice

Based on the conclusion, the system has met the intent and purpose which is aimed, but it still can be developed along with the development needs of the user and also the development pattern of nursing, then the suggestions are expected to build the system for the better is for coverage not only on hospitalization alone, However outpatient care can access this system. In addition, this system can be developed where users not only on the nursing field, but also the medical field so that nurses and doctors can share their knowledge and experience in the field of health. In addition, mobile-based system via the mobile web browser still needs to be developed to facilitate the nurses do a search of knowledge on the the working hours of nurses at Pelabuhan hospital.

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