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Implementation of Knowledge Management to Support the Knowledge Sharing for Rural Community Empowerment Programs during the Covid-19 Pandemic

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Abstract: The empowerment of rural communities has an important role in supporting the village's Sustainable Development Goals (SDGs). The Covid-19 pandemic has greatly influenced the implementation of rural community empowerment programs. Knowledge sharing using a knowledge management system (KMS) can be a solution to overcome obstacles in implementing rural community empowerment programs, such as counselling, training, mentoring, knowledge distribution, and reporting. The application of knowledge sharing using a KMS can be an innovation in program implementation, enabling partnerships of various parties, as well as being applicable in the conditions of the Covid-19 Pandemic with features of tacit knowledge management, explicit knowledge management, and knowledge-seeking from various related parties.

Keywords: *knowledge management, knowledge sharing, counseling, pandemic Covid-19, partnership, string-matching, Boyer Moore's algorithm, Sustainable Development Goals, Village Community Empowerment Encryption*.

1. INTRODUCTION

The Covid-19 pandemic that has hit the world since the beginning of 2020 has had a profound impact on various fields. Based on data obtained from Our World in Data, the total cases that have occurred in the world have reached 82 million cases spread throughout the world [7].

Indonesia, as one of the largest countries in Southeast Asia, has 727,122 cases of Covid-19 which have also received the impact of the Covid-19 pandemic in various fields, such as education, economy, industry, tourism, and others. The impact of the Covid-19 pandemic has also reached all communities and the smallest areas of a country, namely a village.

Village development is carried out by the Ministry of Villages, Development of Disadvantaged Areas and Transmigration, Republic of Indonesia. Village development concerning the Village Sustainable Development Goals (SDGs) to gain relevance, namely preparing total village development: conceptualization, policy, and institutional support, as well as detailed data collection from within the village [8]. With the Covid-19 pandemic, there are obstacles in efforts to achieve these goals, including training programs, provisioning, and face-to-face mentoring [18] which are difficult to carry out. Besides, the use of manuals, supporting documents, and making reports in hardcopy form is quite risky for virus transmission.

This partnership to achieve village development goals is basically a means of implementing and revitalizing village partnerships to realize all sustainable development goals. Because village development will not be fully successful without the involvement of the parties involved. Starting from community leaders, youth driving villages, women driving the village economy, university experts, business owners, supra villages, of course also village officials and the Village Consultative Body [10].

New methods or innovations are the keywords for the Research and Development, Education and Training, and Information Agency to develop Superior Rural Human Resources to be able to manage village

development with higher quality [9]. A success factor that leads to innovation is knowledge sharing. Innovation can take place only in the presence of knowledge sharing [11]. Knowledge sharing is human behavior that helps members to share and use new knowledge with one another [17].

Efforts to share knowledge using a knowledge management system can be called a new way because it can involve partnerships of various parties, a case study-based learning process, and the use of information technology to support the achievement of the Village SDGs.

Knowledge sharing using a knowledge management system has been carried out in various fields, including in the fields of education [15], [16], government [13], health [17], tourism [14], religion [12], and village granary management [19]. Therefore, during pandemic Covid-19, we need a knowledge management system that can be a forum for sharing knowledge, documenting, and managing knowledge so that it is easily accessible by all village development partners and village officials.

The knowledge sharing feature, as a tool to help share knowledge, can be supported through a search feature with the string-matching method with Boyer Moore's Algorithm to search for a string consisting of several characters in a document [1] so that all user can easily find documented knowledge based on the entered keywords. This algorithm will help to search for strings into the text of the document more effectively [2], making it easier for the user to search for knowledge, even in a larger file size [5], and can streamline the time used.

2. METHODOLOGY

The research method used in this study refers to the Knowledge Management 10-step KM Roadmap framework methodology [6] shown in Fig.1.

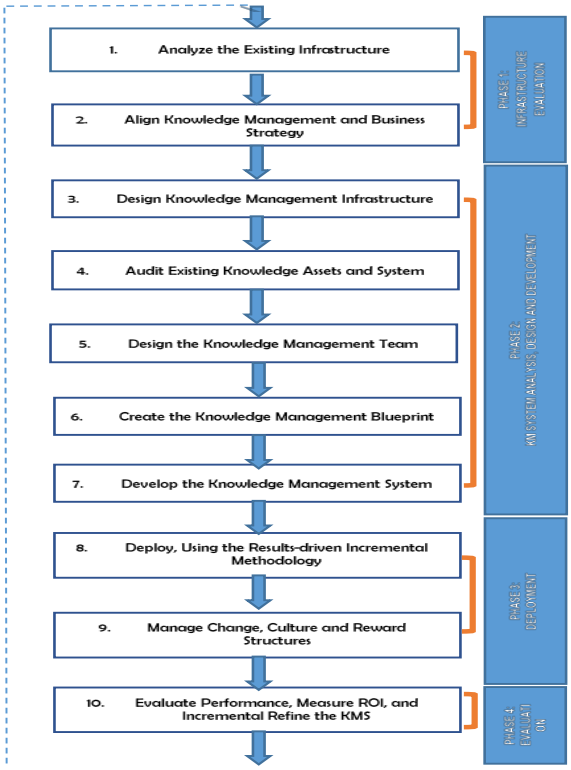

Fig. 1. The 10-step knowledge management roadmap method [6]

This study implements a string-matching search method with Boyer Moore's algorithm as follows [3]:

i. Run preBmBc and preBmGs procedures to get initialization.
   a. Execute the preBmBc procedure. The results of the preBmBc procedure are stored in the BmBc table which contains the Occurance Heuristic (OH) value. (OH) is used as the shift value obtained when finding a character mismatch.
   b. Execute the preBmGs procedure. The results of the preBmGs procedure are stored in the BmGs table containing the Match Heuristic (MH) values. (MH) is used as the shift value obtained when finding a suffix match.

ii. Perform a string search process using the results of the preBmBc and preBmGc procedures, namely the BmBc and BmGs tables.
   a. PreBmBc . procedure
      Steps for implementing the procedure:
      1. Create or assign an empty value to the BmBc stack.
      2. Perform calculations on the length of the pattern. If the length is not more than one, then stop the process by adding the OH value and character directly to the BmBc stack. If not, then proceed to the next process.
      3. Count the pattern characters starting from the 2nd character on the far right.
      4. Compare each character that is counted against the stack BmBc, if the character that is counted is not found in the stack, then add the character to the stack where OH is equal to the number of character shifts that have been made.
      5. Perform step 4 again, by moving 1 character to the left until it reaches the leftmost character continuously.
      6. If you have reached the leftmost character, count the rightmost character and then return to step 4.
   b. PreBmGs procedure
      The preBmGs procedure has four important values, including:
      1. Compare, as a suffix or some characters to the left of a character pattern obtained from right to left shift.
      2. Prefix, as a prefix or character pattern obtained from shifting from left to right.
      3. Suffix, as the suffix to the right of the prefix.
      4. Shift, as the value achieved when shifting from compare.

iii. BM procedure
   Steps for implementing the procedure:
   1. Matching starts from the smallest text index or the leftmost character.
   2. Matching per character starts from the rightmost character of the pattern.
   3. Whenever a character mismatch is found, then take the OH value on the BmBc stack with the corresponding character to the text, then the OH value is reduced by the number of matches that have occurred. Take the MH value on the BmGs stack with the character index found to be a mismatch, then compare it with the OH value that has been operated. With the largest value, move the pattern to the right of the text and repeat the match.
   4. If the match value is equal to the pattern length, the pattern has been found in the text.

3. RESULT AND DISCUSSION

The result of this research is a web-based Knowledge Management System (KMS). Users who have the right to access this KMS are village government officials/partners, employees, validators, administrators, and the head of the related government office. In this KMS, there are features of knowledge capture, knowledge discovery, and knowledge sharing. Knowledge capture is a feature for uploading tacit knowledge, the knowledge discovery is a feature for uploading explicit knowledge in the form of a PDF or Microsoft Word file. Knowledge sharing is a feature for searching for knowledge, both tacit knowledge, and

explicit knowledge. Searching for tacit knowledge uses the SQL Query command, while for explicit knowledge uses the Boyer Moore algorithm.
Knowledge Sharing solutions in supporting obstacles to implementing rural communities empowerment activities are listed in Table I.

TABLE I. KNOWLEDGE SHARING SOLUTIONS TO SUPPORT RURAL COMMUNITY EMPOWERMENT ACTIVITIES

No.	Rural Community Empowerment Activities	Obstacles	Knowledge Sharing Solution
1	*Counselling*	Face-to-face activities are difficult to implement, participants are very limited, strict application of health protocols.	Distributing counselling materials (explicit knowledge) through KMS
			Share tips and counselling experience (tacit knowledge) through KMS
2	*Training*	The number of training is very limited. The training mechanism has no specific instructions.	Access training materials (tacit and explicit knowledge) through KMS
3	*Debriefing for Assistance Team*	Face-to-face activities are difficult to implement, participants are very limited, strict application of health protocols.	Distributing debriefing materials (explicit knowledge) through KMS
			Debriefing for Assistance Team through KMS
4	*Assistance*	Face-to-face activities are difficult to implement, participants are very limited, strict application of health protocols.	Discussion Forum through KMS
5	*Use of Printed Guide Books*	Books can be an intermediary for the spread of viruses	Share digital books in the form of explicit knowledge on KMS
6	*Search for knowledge*	It is difficult to access references in physical form in the village, access via search engines often gets less relevant knowledge	Knowledge can be searched by keyword, both in documents and available knowledge databases.
7	*Problem solving*	Consultation to expert is difficult to be done.	Study the solutions used to solve current problems based on analogies or past knowledge associations
8	Preparation of Physical Reports	Physical reports can mediate the spread of the virus	History of training, provision, mentoring, and reference books have been recorded in KMS

Based on Table 1, modeling of users and activities carried out using the use case diagram is shown in Figure 2. In the use case diagram in Figure 2, the village official, community leader, village consultative body, the woman driving village economy, youth driving village, business owners, university experts, and supravillages are depicted as actors who are associated with outreach, training, mentoring, debriefing for for assistance teams, seeking knowledge, solving problems and preparing reports activities are described

as use cases associated with these actors. As the main actors in this model, the village officials related to the extension, mentoring, training, problem-solving, knowledge-seeking, and report preparation activities.

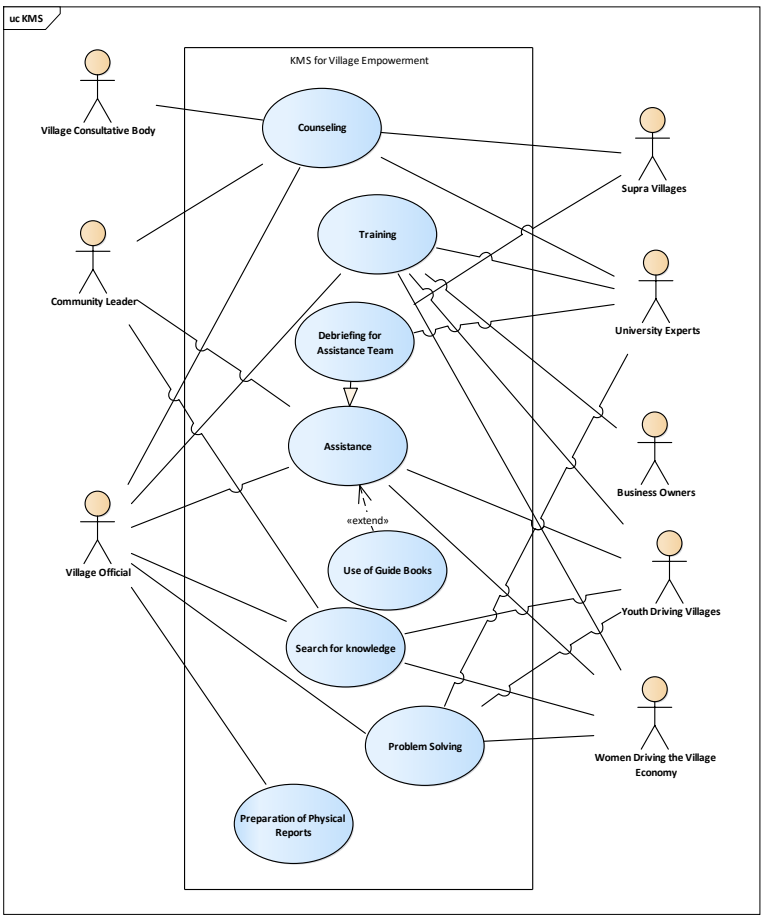

Fig. 2. Use Case Diagram for Knowledge Management System

The Knowledge Management System has passed the test using black-box testing. All test cases were carried out, indicating success. This indicates that the software meets the software requirements defined in the software analysis and design phase.

Meanwhile, to test the performance of the knowledge search algorithm, the Boyer Moore algorithm uses Precision and Recall testing. The purpose of the Recall and Precision tests is to obtain search result information obtained by the search feature. The search results can be assessed for their recall and precision levels. Precision can be considered as a measure of accuracy or precision, while recall is a measure of success. This test is carried out on documents owned by the village community empowerment office.

The Recall calculation formula is:

$$R = \frac{Number\ of\ relevant\ items\ retrieved}{Total\ number\ of\ relevant\ items\ in\ collection} \quad (1)$$

While the calculation formula for Precision is:

$$P = \frac{Number\ of\ relevant\ items\ retrieved}{Total\ number\ of\ items\ retrieved} \quad (2)$$

The results of the knowledge search test using (1) and (2) with 10 keyword trials are shown in Table II.

TABLE II. RESULT OF RECALL AND PRECISION TESTING

No.	*Search Keywords*	*Total Number of Relevant Items in Collection*	*Total Number of Items Retrieved*	*Number of Relevant Items Retrieved*	*Recall*	*Preci-sion*
1	Village	12	12	12	1	1
2	Empowerment	10	10	10	1	1
3	Regency	4	4	4	1	1
4	Village fund	5	5	5	1	1
5	Policy	14	14	14	1	1
6	underdeveloped regions	6	6	6	1	1
7	Headman	10	10	10	1	1
8	Village administration	8	7	7	0,87	1
9	Village development	6	6	6	1	1
10	Village officer	9	8	8	0,88	1
Average					0,98	1

The average recall value of 0.98 and the average precision value of 1 generated by this search indicate better success and accuracy in the search. The average recall value is better than similar research with an average recall value of 0.86 and the average value of precision is 1 [4].

4. CONCLUSIONS

Knowledge sharing for Village Society Counsellor during the Covid-19 Pandemic using Knowledge Management System has several features, namely tacit knowledge features, explicit knowledge, my knowledge, and profiles that can be used for all system users. Furthermore, there is a validation feature that can only be used by validators, a reward feature that can be seen by all users except village government officials, and a report feature that can only be seen by the head of the department.

Knowledge Management System has a knowledge search feature using a string-matching method with Boyer Moore's algorithm with accurate search results so that the user can search for the knowledge according to the entered keywords.

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