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INTERNATIONAL JOURNAL ON INFORMATICS VISUALIZATION

A Knowledge Management System Conceptual Model for the Sorong COVID-19 Task Force

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Abstract— **Sorong is a city located in the West Papua Province, Indonesia. The city covers 1.105,00 km² or approximately 1.13% of the total area of West Papua and is located in the coordinates of 131o17' East Longitude and 0o53' South Latitude. It has a strategical location because it serves as the gateway of the West Papua Province. In 2019, its population has reached 247.084. Such condition has been deemed risky during the Covid-19 pandemic. The performance of the Sorong City Task Force for Covid-19 handling acceleration (Satgas Covid-19) had been considered ineffective by the citizens because it had not provided a system which would provide valid information regarding the Covid-19 progress in the city, resulting in worry and panic buying among the citizens. To overcome the problem, the knowledge possessed by the Sorong City Covid-19 Task Force should be developed into a Knowledge Management System (KMS). The implementation of the system had been expected to be able to optimize the documentation, dissemination and creation of knowledge as well as its evaluation. The KMS then was built to improve the performance effectiveness of the Sorong City Covid-19 Task Force in managing and disseminating knowledge regarding Covid-19 to the citizens. The methods utilized in this research were the qualitative method and the 10-step knowledge management roadmap. The research produced a conceptual model of KMS which could be utilized by the Sorong City Covid-19 Task Force.**

Keywords— **Knowledge Management System; KMS; Covid-19; Sorong City Covid-19 Task Force.**

I. INTRODUCTION

Coronavirus Disease (Covid-19) was first discovered in Wuhan City, Hubei Province, China in December 2019 [1],[2],[3],[4],[5],[6],[7],[8],[9],[10],[11],[12],[13],[14],[15]. Initially, it was considered as a type of pneumonia disease with common flu symptoms such as heavy breathing, fever and coughs. Covid-19 has been spreading fast and worldwide, resulting in infections more severe than flu. This condition has led World Health Organization (WHO) to declare Covid-19 as pandemic in March 11, 2020 [1],[16],[17],[18],[19],[20],[21]. The status "pandemic" implies that the spread of Covid-19 is very fast and worldwide, and Indonesia has been among the countries affected by it [2],[22],[23],[24],[25],[26],[27].

To handle the virus attack, the Indonesian government has created Task Forces for Acceleration of Covid-19 Handling (popularly known as *Satgas Covid-19*). The task forces were aimed to mitigate the Covid-19's fast spread in the country [22],[24],[25],[26]. Every district head was made the chief of the task force in their respective region. In Sorong City, the task force has been commanded by the Mayor.

Sorong is a city located in the West Papua Province, Indonesia. The city covers 1.105,00 km² or approximately 1.13% of the total area of West Papua and is located in the coordinates of 131°17' East Longitude and 0°53' South Latitude. It serves as the gateway of West Papua and is surrounded by other districts. Sorong is rich of potential natural resources, making it the center of industries, trades and services [28],[29],[30]. In 2019, the city's population has reached 247.084, consisting of 128.861 males and 118.223 females [31]. Due to its high population and role as the gateway of West Papua, Sorong is highly prone to the Covid-19 attack.

The spokesman of the Sorong City Covid-19 Task Force officially announced two patients under surveillance on March 27, 2020. Since then, the number of Covid-19 cases has been increasing, ranging from the People under Monitoring (ODP), Patients under Surveillance (PDP), People without Symptoms (OTG), Covid-19 positive patients, deceased Covid-19 patients, and red zone areas (areas exposed to Covid-19). The data of Covid-19 cases in Sorong can be seen in Table 1.

Hospital		People under Monitoring		Patients under Surveillance		Laboratory processes	
Number of hospitals	7	Number of people under monitoring	132	Number of patients under monitoring	17	Positive laboratory	4
Number of referral hospitals	3	Finished monitoring	82	Patients under monitoring who have discharged	9	Negative laboratory	22
Number of people without symptoms	6	In the monitoring process	50	patients under monitoring who are still being treated	6	Died positive	1
Total check laboratory	35	Died	0	Died	1	Died negative	0
Number of laboratory processes	8						

(source of the Ccovid-19 Task Force in the city of Sorong, April 19th, 2020)

The condition had been increasingly worsened by hoaxes surrounding Covid-19 and the city government's regulation and policy on starting area quarantines. It has caused worry among the citizens and drove them to conduct panic buying (see Figure 1). The citizens demanded the Sorong City Covid-19 Task Force to provide a system which would provide valid information regarding Covid-19 and could be accessed at ease and real time by them. In order to develop a system rather easily, abilities to manage and develop knowledge are required. Such knowledge management in turn would be a reliable support for the Sorong City Covid-19 Task Force [32],[33],[34],[35].

Fig. 1 The citizens' panic buying in Sorong (left: traditional market, right: supermarket)

The Sorong City Covid-19 Task Force could manage knowledge in its creation, transfer and dissemination with the requirement that they could perform the data, information and knowledge activities well [32],[36],[37],[38],[39],[40]. Such documentation activities are very important to the task force because it requires a great amount of data, information and knowledge from various actors involved in the Covid-19 handling.

Fig. 2 How information was manually delivered by the Sorong City Covid-19 Task Force

Based on the analysis result, it had been identified that there was a great amount of important knowledge which could support the activities and performances of the Sorong City Covid-19 Task Force. Furthermore, the goals of the knowledge documentation were 1) to preserve knowledge possessed by each actor involved in the Covid-19 handling, prevent them from being lost and share them to the citizens and 2) to create a means for discussing or distributing problems. The activities of handling Covid-19 in Sorong had been considered ineffective by the citizens because there was no system which could manage and disseminate knowledge (see Figure 2). To solve such problem, knowledge owned by the Sorong City Covid-19 Task Force could be built into a Knowledge Management System (KMS) [32],[33],[36].

KMS is the right solution and has become the center of managing, saving and discussing both old and new knowledge [1],[33],[41]. The benefits and strengths of KMS are improving services for the citizens, optimizing the effectiveness of work process and procedure, increasing knowledge assets, making information and knowledge search easily, accurately and fast, providing collaborative means for experts, and sharing knowledge and experience possessed by each user.

The application of KMS was expected to optimize the documentation, dissemination, adoption, development and creation of knowledge as well as its evaluation. The KMS also aimed to improve the performance effectiveness of the Sorong City Covid-19 Task Force in managing and disseminating knowledge regarding Covid-19 to the citizens

II. THE MATERIALS AND METHOD

The methods employed in this research were the qualitative method which was employed to acquire or produce better understanding or descriptive data [42],[43],[44] and the 10-step knowledge management roadmap method which was divided into four phases (see Figure 3) [32],[35],[45],[46]. The four phases are described as follows:
1) Infrastructure Evaluation, i.e. to analyze the current condition regarding infrastructure, knowledge management and its management strategy.
2) KMS Analysis, Design and Development, i.e. to design knowledge management infrastructure, audit assets and knowledge system, design knowledge management team, create knowledge management system and develop knowledge management system.

3) Deployment System, i.e. to deploy/disseminate KMS results, manage change and give reward.
4) Evaluation, i.e. to evaluate performance, measure and revise KMS.

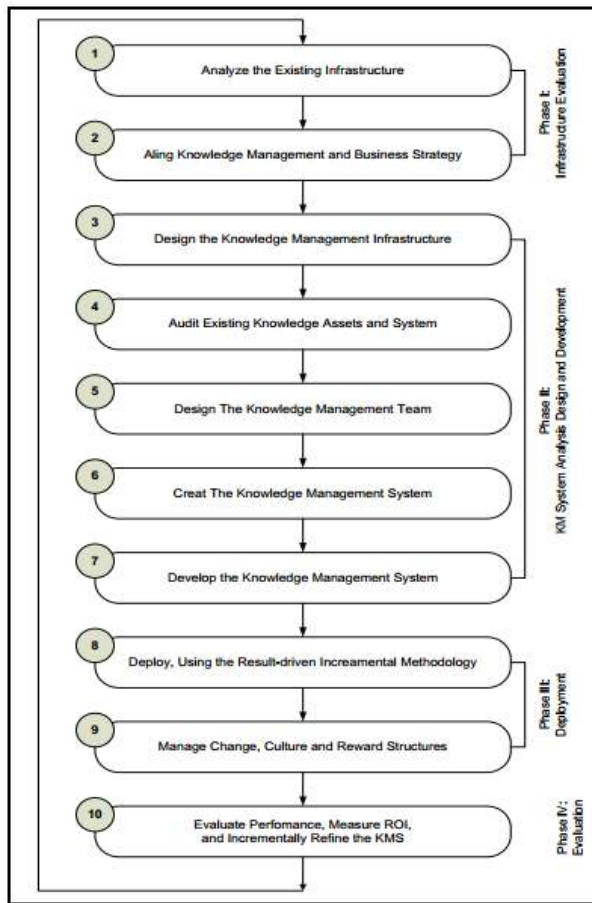
Fig. 3 The 10-Step Knowledge Management Roadmap

III. RESULTS AND DISCUSSION

First, interviews with 100 respondents regarding the Covid-19 pandemic were conducted [33],[36],[47]. The respondents were members of the Sorong City Covid-19 Task Force, health experts and citizens. The results of the interviews were actual information on Covid-19 spread (spread map), Covid-19 handling procedure, regulation, and the citizens' worry due to the lack of information on Covid-19 in Sorong.

The next process was to express the situation in form of rich picture. This was performed to identify actors involved in the Covid-19 handling, explain the existing knowledge and identify any unfulfilled knowledge needs [34],[36],[44]. The inside actors, those who were directly commanded by the government to handle Covid-19 outbreak, are The Sorong City Covid-19 Task Force, Covid-19 experts and the Designer whereas the outside actors are the citizens. Their activities in handling Covid-19 outbreak include the socialization and education of the virus to the citizens/civil society. Its details can be seen in Figure 4 and Table 2.
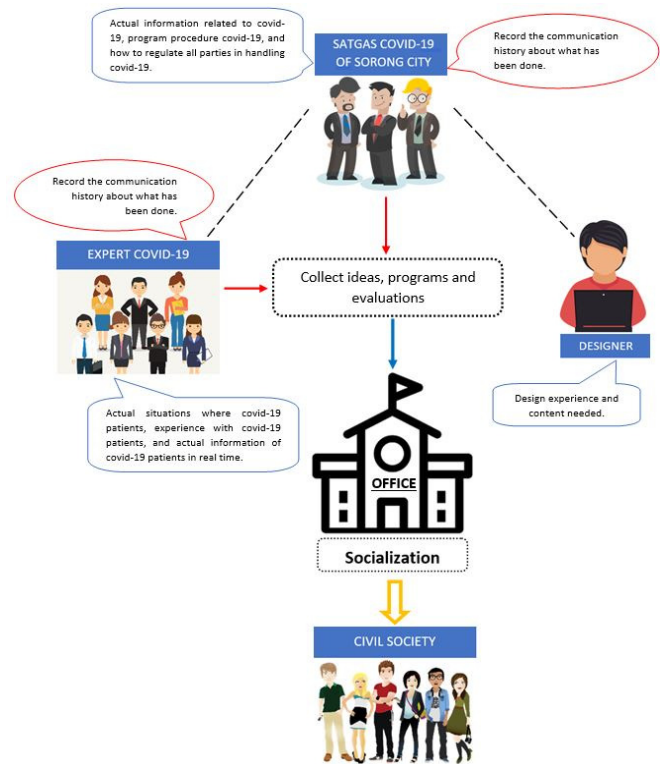

Fig. 4 The Rich Picture

TABLE II
NOTES ON THE RICH PICTURE

Symbols	Notes
	Involved actors
– – – –	Interconnectedness between elements
:.........:	Types of activities to be conducted
→	Direction to where information will be disseminated
→	Activities performed by actors
⇒	Actors involved in the activity
💬	What each actor knows
⬭	Actor's unfulfilled need

The Sorong City Covid-19 Task Force is actor who is interconnected with other actors such as Covid-19 experts and the Designer. They possess actual information regarding Covid-19 and the Covid-19 program procedure. They also know how to manage other parties in handling Covid-19. The Covid-19 expert actor possesses knowledge on actual situations where Covid-19 patients are treated, experience with the patients, and actual information about them. The expert actor's unfulfilled need of information was communication history regarding what had been done. The task force had this unfulfilled need also. Both actors were accumulating Covid-19 related ideas and programs. They also evaluated the progress. The results of those activities would be socialized to other actor, i.e. the citizens. The Designer actor possesses design experience and identifies which content should be disseminated through KMS.

Next, an analysis was performed to provide a correct rich picture in the conceptual model of KMS. This KMS has primary feature, i.e. managing knowledge regarding Covid-19 in Sorong. The conceptual model consists of several factors needed to improve the performance effectiveness of Sorong City Covid-19 task force in managing and disseminating Covid-19 related knowledge to the citizens. The knowledge management in this KMS is divided into three types. The first type is the basic knowledge from written, formal knowledge or commonly known as knowledge base. The second type is knowledge from experts' experiences, as known as best practices. The last type is common knowledge, in which the content can be from personal experience or other people.

The KMS functions like a searching machine for documents, pictures (Covid-19 spread map), audio and video files related to the Covid-19 cases. When a user enters a search word in the system, the system will display the search results. Next, to support the performance of the Task Force, the system will employ two functions taken from knowledge management: the function to see a preview of the data being taken so that it will be easier to collect information via search word and the function to facilitate information sources from validated experts (see Figure 5)
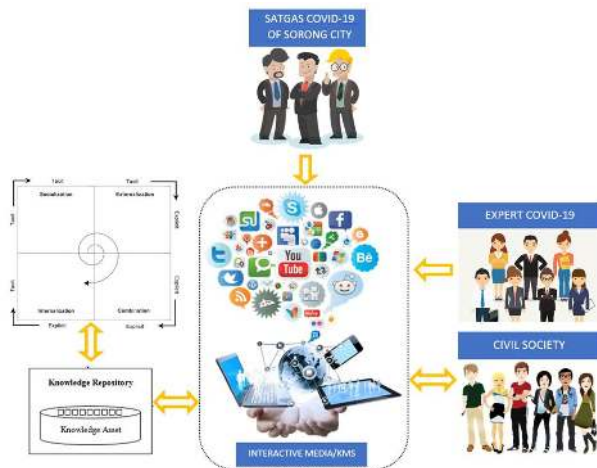

Fig. 5 The conceptual model of knowledge management system

KMS could also provide real-time information regarding the progress of Covid-19 in Sorong, covering the number of referred hospitals, the total number of OTGs, OTGs being treated in the laboratories, the total number of ODPs, ODPs after observation, ODPs under observation, deceased ODPs, the total number of PDPs, PDPs going home, PDPs under treatment, deceased PDPs, Covid-19 positive patients, deceased Covid-19 positive patients and the Covid-19 spread area zoning based on village offices. The system could also serve as an early warning system: when a citizen enters a red zone, the system will automatically provide warning or recommendation on avoiding or leaving the area.

Other benefits of the system are intended to the OTGs, ODPs dan PDPs. They could use the system to get checked from the isolation or quarantine location because the system is connected online to the health experts who are handling Covid-19. This way will prevent the virus from being transferred to other people.

For the medical staffs, the system reduces their work load because it can monitor patients' condition being treated without direct contact. However, in case of critical or prioritized patients, the medical staffs will still have to attend to them directly. The medical staffs and health experts may monitor and supervise patients through the system. Their knowledge in handling the problems is increased since they could share information and knowledge via the system quickly.

The previously citizens who were worried and panicked regarding the lack of Covid-19 related information now are feeling better because they could access the information via the KMS. The only problem regarding the usage of the KMS is internet connection since not all citizens of Sorong City have 24 hour internet access due to various factors, including economics [48].

Every actor involved in the KMS has their own tasks and functions. For the citizens, the KMS has been very helpful because now all information and knowledge regarding Covid-19 could be accessed easily and real time. The KMS has also been helpful to The Covid-19 Task Force and the health experts because they could use the system to provide education and actual information as well as add new knowledge to the citizens. The KMS itself possesses the Knowledge Repository (KR) which was designed in form of ontology and has the function to preserve all knowledge regarding Covid-19.

Ontology explains concepts and relations between one domain with another domain [40], [41], [49], [50], [51], [52], [53]. Therefore, it makes the knowledge exploration process related to the Covid-19 handling easier and faster. Without ontology, it would be more complex in performing the tables merging operation in database management. The Knowledge Repository design outlines two basic components from knowledge, i.e. knowledge as concept and as structured object.

IV. CONCLUSIONS

This conceptual model of KMS could be utilized by the Sorong City Covid-19 Task Force for optimizing the processes of documentation, dissemination, adoption, development and creation of knowledge as well as its evaluation. The KMS could also improve the effectiveness of the task force's performance.

The KMS provides Covid-19 information and knowledge and thus positively influences the lives of the citizens of Sorong City who had been previously worried by the pandemic and even performed panic buying at certain times.

Hopefully, future development will allow the KMS to accommodate attempts to provide logistics and supports to the citizens who are directly affected by Covid-19.

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