
Research article

Model Of Suspected Discovering, Warning, And Monitoring Of Tuberculosis

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Abstract: Tuberculosis (TB) treatment in puskesmas is borne by a person in charge of TB (PJTB). One of the programs in handling TB is the detection of TB suspects (TB suspects). The discovery of suspected TB is one of the factors that greatly influences the eradication of TB disease. However, the number of TB suspects in the health center is still quite low. This is due to the wide coverage area of the puskesmas, overlapping responsibilities of PJTB, there is no active collaboration between PJTB and cadres or partners so that when TB suspects are found and scheduled to be absent, they are not monitored. To deal with this, it is proposed an information system model that can be used by PJTB and cadres or partners to report the discovery, warning, and monitoring of TB suspects so that it can increase the number of TB suspect detection findings. Based on the questionnaire from the information system model testing of 7 respondents conducted to PJTB and cadres or partners using the USE Questionnaire, the results obtained were 83.42% usefulness, 75.23% easy of use, 82.38% easy of learning and 78.57% satisfaction.

Keywords: *TB suspect detection model, TB suspect detection model, TB suspect warning model.*

1. Introduction

Tuberculosis (TB) is a disease caused by the Mycobacterium Tuberculosis bacteria which attacks parts of the human body such as the skin, bones, lungs and eyes. TB is the first disease in the infectious disease group and third in the list of deadly diseases [1]. In 2017, Indonesia was ranked second in the country with the highest TB burden (HBC) in the world with 420,994 cases [2] and it is estimated that there are still many TB cases that have not been discovered.

Puskesmas as the government's spearhead in providing TB services are required to have a person in charge of TB (PJTB). PJTB feels that its performance is not optimal because the number of TB suspects found is still low. This is due to the wide area coverage and overlapping work, the low willingness of the community to seek treatment, and the lack of active cooperation between PJTB and cadres or partners so that when there are TB suspects who are absent from follow-up at scheduled examinations they are no longer monitored [3].

The implementation of technology for tuberculosis (TB) management has been explored in various

studies, ranging from the utilization of image processing [4-6] to the development of expert systems for TB diagnosis [7-10]. This research differs from previous studies by focusing on the identification of suspected TB patients at Community Health Centers (Puskesmas). The objective is to ensure proper data recording, thereby facilitating health officers or partners in monitoring the suspects' conditions to prevent disease transmission. Furthermore, this research design aims to foster collaboration between the TB Program Coordinator (PJTB) and community cadres or partners

So far, screening for TB suspects has only been carried out by medical personnel at community health centers or health clinics. Meanwhile, the role of cadres (community) has not been optimized properly. If TB suspects are found at a health clinic or other medical personnel (partners) they will be referred to the community health center for a sputum examination. However, there are many cases of suspected TB who fail to go to the health center for treatment and are difficult for PJTB to monitor and there is no follow-up because they are out of control. This is because there is no good coordination between the PJTB and a system that can alert when TB suspects are absent. The absence of good cooperation between PJTB and cadres or partners has the potential to fail 26 times when screening TB suspects [3][11][12].

To overcome existing problems related to the low number of TB suspect screenings, an information system model is proposed that can be used to report TB suspects carried out by cadres or partners to the PJTB. Next, a schedule is made for a phlegm examination at the community health center. If the TB suspect is absent, the system will alert the PJTB and cadres or partners so that further action can be taken, such as visiting the TB suspect's house. Active collaboration between PJTB and cadres, integrated recording and warnings if suspected defaulters are expected to increase the number of TB suspects being screened.

The method used in this research is Design Science guided by Design Science Research Methodology (DSRM). Design Science is oriented towards making prototypes [13] where prototypes are the core of information system development [14].

2. Research Method

DSRM has six stages, namely problem identification, solution proposal, design, demonstration, evaluation, and communication as shown in Figure 1.

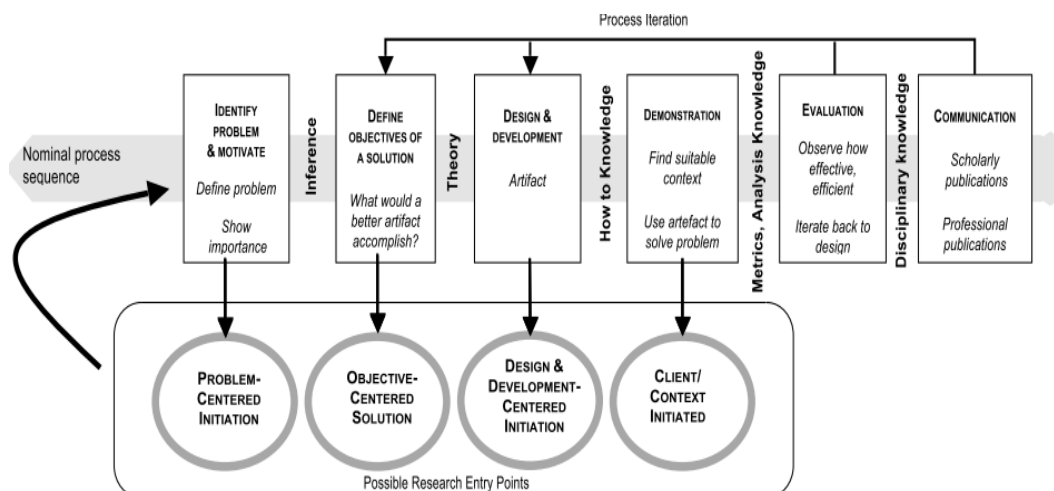


Figure 1. Model DSRM (Peffers, 2007)

2.1 Identification Of Problems

Problem identification is the stage of finding out what is wrong or not yet optimal in the health center, both through literature and interviews. The problems obtained are as follows:

- [1]. Wide puskesmas coverage area.
- [2]. The number of TB suspect screenings is still low.
- [3]. There is not yet optimal cooperation between cadres or partners.
- [4]. there is no recording and warning when patients are lost to follow-up when referred.
- [5]. low public awareness and concern regarding TB disease

2.2 Proposed Solution

This stage is the stage of determining the objectives from the results of problem identification carried out at the community health center. Based on the existing problems, the proposed solution is to create a prototype or model of an information system for finding, warning and monitoring TB suspect screening.

2.3 Design and development

This stage is the stage of designing and developing an information system model for finding, warning and monitoring TB suspect screening in accordance with the agreed solution proposal.

2.4 Process Requirements

This stage is the stage of designing the proposed system model in the form of a context diagram. The results of the context diagram of the agreed solution proposal are as shown in Figure 2.

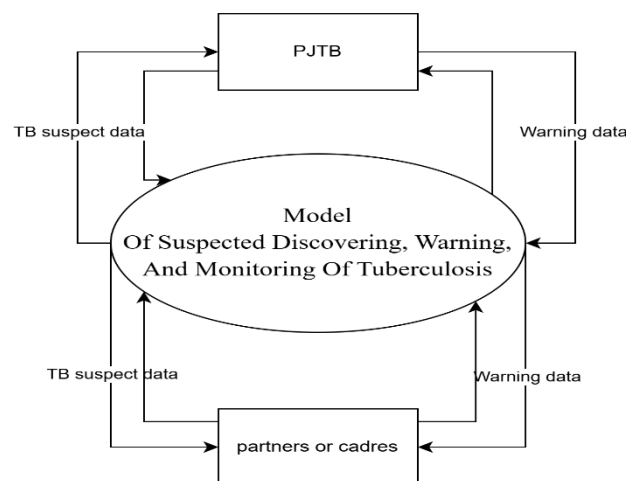


Figure 2. Diagram context

A context diagram is a level 0 DFD that describes the relationship between systems and entities. The entities in this context diagram consist of PJTB and Partners or Cadres. The Partner Entity or Cadre enters TB suspect data, then the data is returned and the entity is sent a warning that there is a TB suspect who is absent. PJTB entities send and receive TB suspect data, and receive alerts when TB suspects are absent. The details of the process required are as in Table 1.

how to read table contents Y = yes and * will only appear according to assignment.

Table 1. Process Requirements

No	Process	Actor	
	Requirements	PJTb	Partners / Cadres
1	Adding TB Suspects	Y	Y *
2	Seeing TB Suspects	Y	Y *
3	Edit TB Suspect	Y	Y *
4	Get TB Suspect Absentee Warning	Y	Y *
5	View TB Suspect Absentee Warning	Y	Y *
6	Responding to Suspect Absentee Warnings TB message	Y	Y *
8	Adding material	Y	
9	change material	Y	
10	view material	Y	Y

2.3.2. Database Design

Based on the process requirements in table 1, a database design is created. This database design is often known as an Entity relational diagram or ERD which is used to describe the relationship between entities [15]. ERD consists of 3 entities and 3 N:M relations as in Figure 3. The three entities are users, materials and suspects. While the 3 relations are assignments, schedules and chatting. The ERD is then normalized into six tables, namely the users, suspects, assignments, schedules, materials and chatting tables as shown in Figure 4. The users table is used to store application user data. The suspect table is used to store TB suspect data. The assignment table is created to assign tasks to partners or cadres to supervise suspects. The scheduling table is used to store TB suspect examination schedule data to the health center. The chatting table is used to store message data between application users. The material table is used to store TB-related material data written by PJTB.

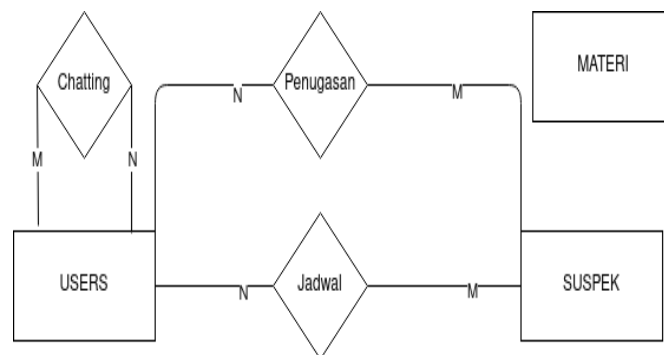


Figure 3. Model ERD main entities

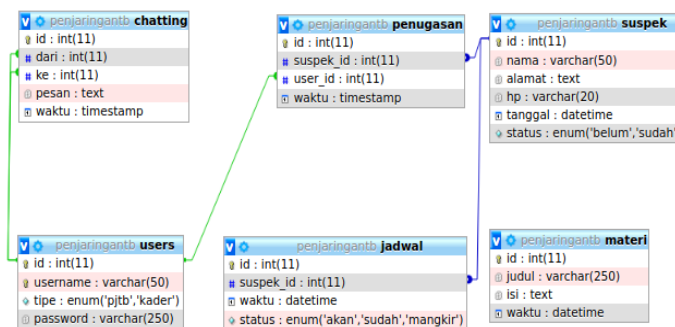
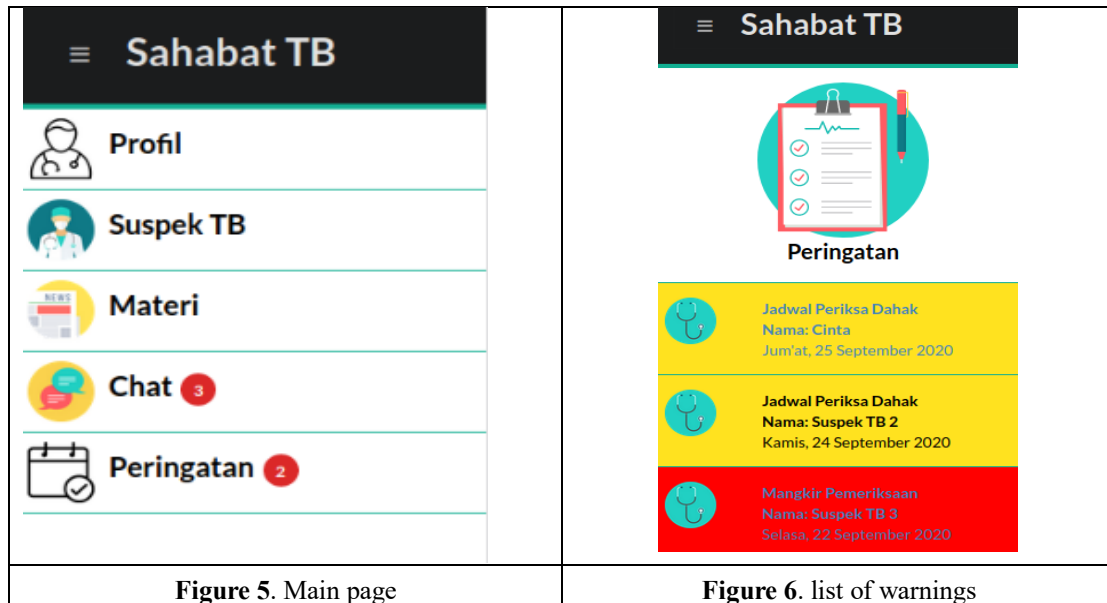


Figure 4. ERD Model of Information System

3. Result and Discussion

3.1 User interface

The main page displays a list of application menus consisting of profile menus, TB suspects, materials, chat, and warnings as seen in Figure 5. The profile menu contains user data. The TB suspect menu contains a list of TB suspects that have been reported. The material menu contains TB-related materials filled in by PJTB and used as a guide by partners or cadres. The chat menu contains messages between application users. The warning menu contains warnings sent to users.



The warning list page (Figure 6) can be accessed by PJTB and Partners or Cadres according to user type (see Table 1). The TB suspect list page displays a list of warnings when a TB suspect enters the examination time or is absent according to the assignment, see Table 1. Yellow warnings are useful for informing the TB suspect's schedule and red warnings are useful for informing the TB suspect is absent when scheduled.

On the warning details page (Figure 7) displays detailed information related to TB suspects. PJTB and partners or cadres can send messages to assigned partners or cadres so that TB suspects can be monitored as shown in Figure 8.

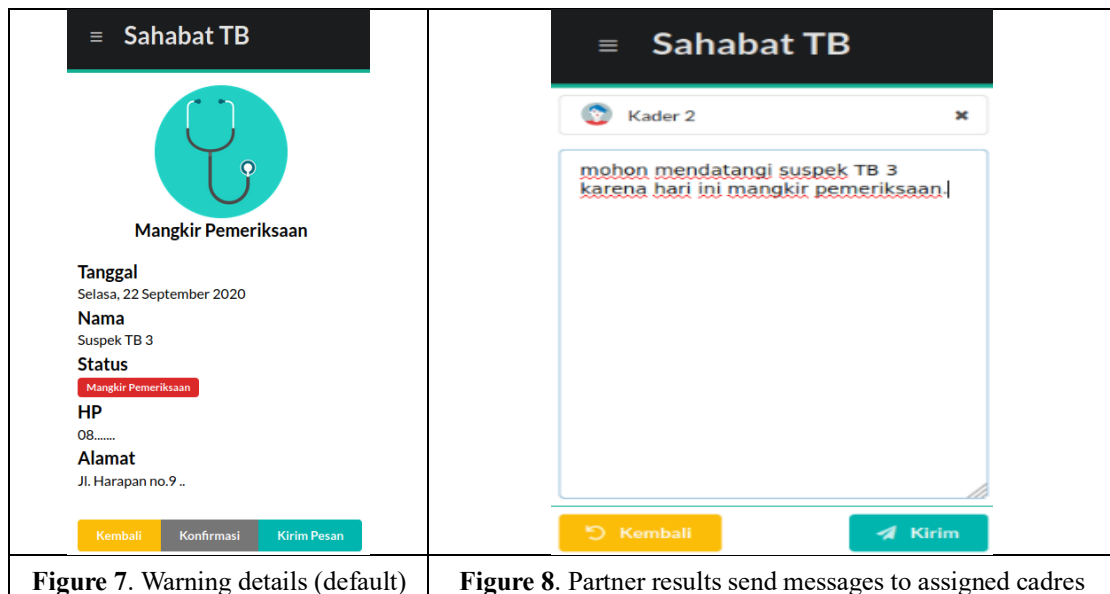


Figure 7. Warning details (default)

Figure 8. Partner results send messages to assigned cadres

The material list page is used to display a list of existing materials. On the PJTB page, an add button appears to add TB-related materials as in Figure 9.

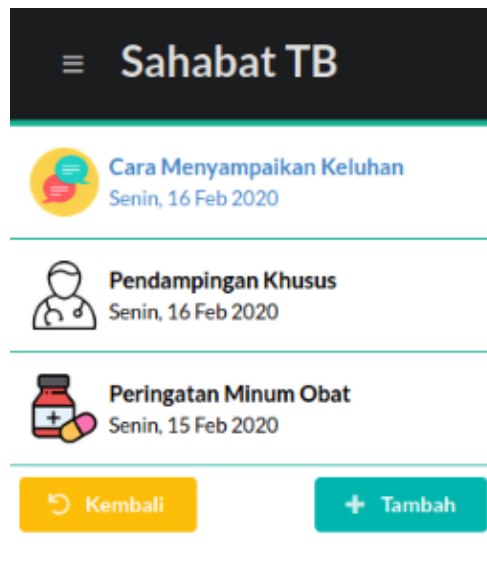


Figure 9. Material list page

3.2 Evaluation

Evaluation is conducted after the model (application) is demonstrated to the user. Evaluation is conducted to 1 PJTB person and 6 partners or cadres. Evaluation is conducted by conveying the purpose of using the application and how to use it. Then the user provides feedback on the model by filling out a questionnaire after using the application. The questionnaire used to measure usability testing on the application using the USE Questionnaire consists of 15 questions in 4 categories (usefulness, ease of use, learning of use, and satisfaction). The usability testing scale uses a Likert scale. The application testing assessment in this study uses 5 alternative choices for respondents, namely Strongly Disagree (STS) = 1 point, Disagree (TS) = 2 points, Neutral (N) = 3 points, Agree (S) = 4 points, and Strongly Agree (SS) = 5 points. The usability test can be seen in attachment 1. Based on the results of the usability test on 7

respondents, the results were obtained as in Table 2, namely 83.42% usefulness, 75.23% ease of use, 82.38% ease of learning and 78.57% satisfaction.

Table 2. Application Usage Questionnaire Results

No	Questions	Assessment					Percentage
		STS	TS	N	S	SS	
Usefulness							
1.	This application makes it easier for me to monitor the TB suspect screening process.				5	2	83,42 %
2.	This application makes it easier for me to remind TB suspects to check their schedules.			1	1	5	
3.	This application makes it easier for me to find, remind, and monitor the screening of TB suspects.			1	1	5	
4.	This application makes it easier for me to communicate between users.			1	3	3	
5.	This app saves me time when I use it			1	5	1	
Easy of Use							
6.	This application is easy to use			1	4	2	75,23 %
7.	This application is easy to understand			1	4	2	
8.	I can use the app without having to use the guide.			2	4	1	
Easy of Learning							
9.	I can master the application quickly				5	2	82,38 %
10.	How to use the application can be mastered easily				5	2	
11.	I quickly became proficient in using the application.			1	5	1	
Satisfaction							
12.	I am satisfied with this TB application			1	3	3	78,57%
13.	The application is as I expected			1	3	3	
14.	This app is fun to use			2	4	1	
15.	This app is worth using				6	1	

4. Concussion

Based on the results of the tests conducted, it can be concluded that the model helps make PJTB and partners or cadres (users) report and record TB suspects, the model is able to help users in monitoring TB suspects, the model is able to help remind when there is a schedule for examination and absenteeism of TB suspects, the model can be used as an educational medium for cadres or partners. For future research, research is needed to integrate the model with existing TB applications.

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