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Collaborative System for Friday Preacher Scheduling
An Overview on Two years of Implementation

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ABSTRACT

In 2016, we have started to develop a collaborative system for Friday prayer scheduling. The system was intended to cope with some problems that corresponded with the high probability collision occurrences while compiling a timetable. In order to measure the effectiveness of the system implementation, we undertook a survey that started from late 2017 to September 2019. We observed the implementation of the system throughout the years and investigated the impact of its implementation. The objective of this research is to determine whether the system can diminish the collision rates and foster a user-friendly experience both for MTM and client users in managing, requesting, compiling, viewing and organizing the schedules. The pre and post- questionnaires clearly indicated that the system managed to diminish or almost deal with all the problems that regularly occurred during timetable compilation. In regard to usability, users found that the system was useful and easy to use as the system gained the highest possible score for overall satisfaction.

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1. Introduction

Majlis Tabligh Muhammadiyah (Muhammadiyah Council for Propaganda), in short MTM, is a unit within the Muhammadiyah Islamic Organization that plays an important role in improving the quality of Islamic da'wa or propaganda [1]. In Southern Bandung area, West Java-Indonesia, MTM is responsible for managing 28 mosques activities including Friday prayer. For Friday prayer providence, each year MTM should provide preachers or imam to lead the prayer and deliver the sermon for all mosques. There are 1.092 slots to arrange in one year. Accordingly, with only 75 imams existed, scheduling compilation is hard to implement for high collision probability and special requirements stated by imams or mosques managers [2].

In 2016, to cope with the problem, we developed a collaborative system for managing preacher scheduling. The system is divided into two parts, web-based part for administration or server: and Android-based for client access. There are three users defined including the administrator (MTM user), preachers (imams), and mosque managers as depicted in Figure 1.
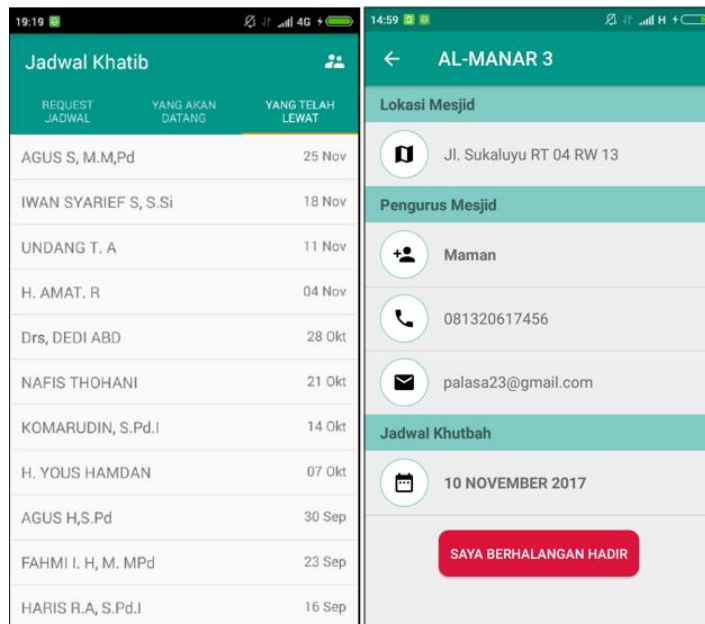

Figure 1 A Collaborative System for Friday Preacher Scheduling

This paper provides an overview for the implementation of collaborative system for Friday preacher scheduling in a two-year period (2017-2019). We observed the implementation of the system throughout the years and investigated the impact of its implementation. For this project, we engaged several respondents comprises of imams (preachers), mosque managers, and MTM members. The objective of this research is to determine whether the system can diminish the collision rates and foster a user-friendly experience both for MTM and client users in managing, requesting, compiling, viewing and organizing the schedules.

The rest of the paper is organized as follows: Section 2 reviews some main features of the collaborative system followed by the method that we used for this research in section 3. After that, we discuss our findings and results in section 4 and then it concluded in section 5.

2. System Overview

In this part, we discuss some main features of the collaborative system for Friday preacher scheduling that started by the start screen and ended by imam replacement finder. Figure 2 describes the whole system architecture of the collaborative system scheduling. There are three main users: preacher/imam, mosque manager, and administrator. Preacher/imam and mosque manager use the mobile-based application while the administrator can use both mobile-based interface and web-based interface defending on what feature he access.
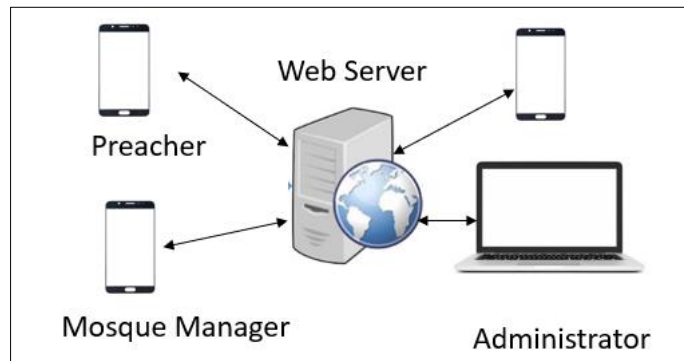

Figure 2 System Architecture

2.1. The Login Interface

The start screen interface contains a login process to the system (Figure 3). We decided to utilize Google Mail account to avoid password forgetfulness since the majority of targeted users are, currently, the elderly people. Most of user's smartphones were Android-based, accordingly, they have at least one Gmail account installed on their devices.
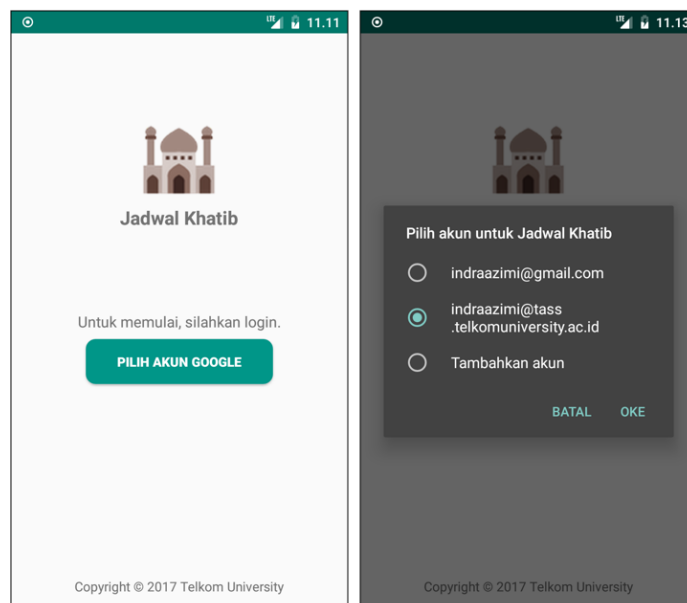

Figure 3 The Start Screen Interface

2.2. Schedule Request Screen

Preachers/Imams and mosques managers can propose their expected schedules (*request jadwal*) as depicted in Figure 4. This kind of users can ask MTM

Administrators to point them when to preach and which mosque they intend to. Ahead before that, MTM Administrator set the request period. Only the users who apply special request inside the period will be considered.
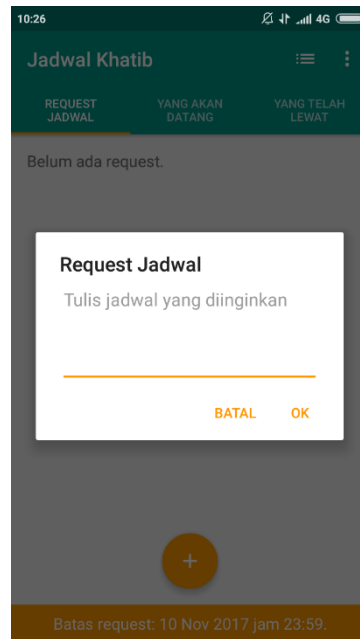

Figure 4 Request for Special Schedule Interface

2.3. Specialized Programmed Excel Sheet

After the end of the request period, MTM Administrator will compile the whole schedules using a specialized programmed Excel sheet (Figure 5) that comprises some rules and constraints stipulated by Mosque Managers and Imams. This sheet can detect schedule collision and constraint violation. Next step, MTM Administrator will bring the compiled schedule to be discussed at a plenary session. Should all plenary participants agree with the schedule, MTM Administrator then uploads such agreed schedule file to the server.

D	E	F	G
AL-MANAR 3	AL-MANAR 4	AL-IKHLAS	NURUL IMAN
KOMARUDIN, S.Pd.I	AJANG. D	NAFIS THOHANI	DADANG NURDIN
PENDI, L.C	DADANG NURDIN	PENDI, L.C	AMAN
GUNGUN,S.Ag	H. AMAT. R	E. K. ISKANDAR	AEP S,S.Pd.I
ITA SASMITA	AEP S,S.Pd.I	Drs, RAGANIE E	H. AMAT. R
DONI C. A	H. SUHANA	FAHMI I. H, M. MPd	KOMARUDIN, S.Pd
HARIS R.A, S.Pd.I	AWAN. F	GUNGUN,S.Ag	UNDANG T. A
AGUS S, M.M,Pd	KOMARUDIN, S.Pd	H. AMAT. R	ARIS SY, S.S
FAHMI I. H, M. MPd	H. ABAS TOYYIB	AGUS S, M.M,Pd	Drs, RAGANIE E
UNDANG T. A	FAHMI I. H, M. MPd	GUNGUN,S.Ag	AGUS S, M.M,Pd
KOMARUDIN, S.Pd.I	AJANG. D	Drs,H. IWAN S	DADANG NURDIN

Figure 5 Specialized Excel Sheet

2.4. Schedule Screen

When the users open the schedule screen (*Jadwal Khatib*), it will display their past (*yang telah lewat*) and upcoming (*yang akan datang*) schedules, including the date when to preach and the mosque where to attend for performing their tasks. If their wish, they can also view other imams' schedules and filter them by mosque or by imam's name as depicted in Figure 6.

Figure 6 Past and Upcoming Schedule

2.5. Notification of Absence

While an imam cannot perform his task, he can notify MTM Administrator confirming that he was unable to preach at a particular date and mosque by clicking "**I am Unable to Attend**" (*SAYA BERHALANGAN HADIR*) button that appeared in red. This button depicted in red color button at Figure 7 (a). Upon clicking that button, the system will give notification to MTM Administrator stated that there is an imam unable to come. Figure 7 (b) displays a notification to MTM Administrator that there is an imam which unable to commit his schedule at *Mesjid AL-MANAR 3* (Al-Manar 3 Mosque) on 10th November. Figure 7 (c) depicts the list of imams that unable to perform their tasks.
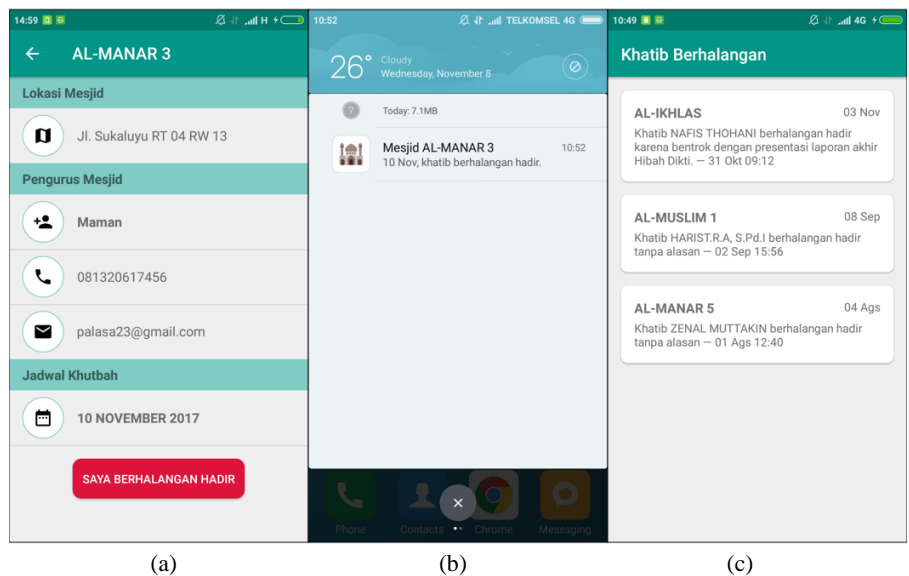

| (a) | (b) | (c) |

Figure 7 Notification of Absence Screen

2.6. Imam Replacement Finder

As previously stated, Imam can notify MTM Administrator when he was unable to perform his task. Accordingly, MTM Administrator is responsible for finding another imam to replace the unavailable imam. In doing so, simply click the imam replacement finder menu, the system will display the availability of other imams in a particular date. Figure 8 shows imam replacement finder interface. A minus sign (-) represents the availability of imams to be nominated as substitutes. With this feature, MTM Administrator can easily find and contact imam replacement.

Other than those features, we also incorporated context-aware [3][4][5] for monitoring assigned imam position an hour before sermon time. Should an imam's position seem too far from a mosque where he must deliver a sermon, the application will notify MTM administrator about the possibility of absence.
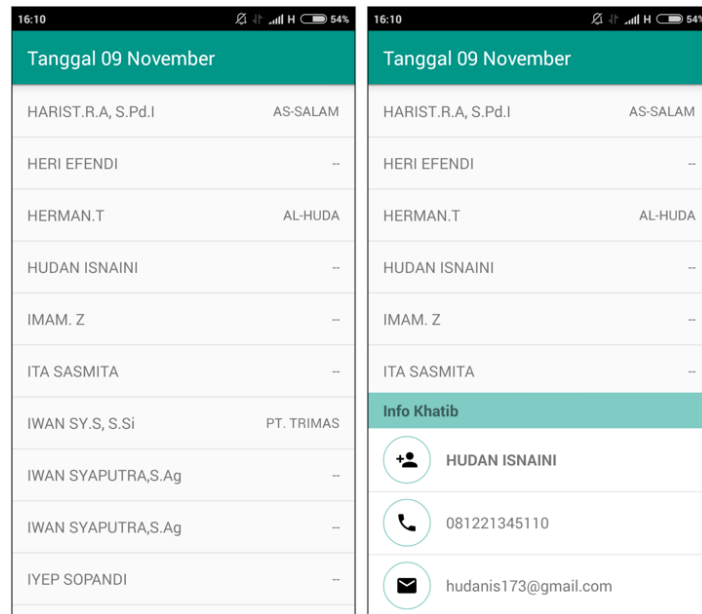

Figure 8 Imam Replacement Finder Screen

3. Method

We engaged all (100) users including a total of 75 *imams*, 20 mosque managers, and 5 MTM administrators to participate in this project to analyze and evaluate user experience and the overall satisfaction of the software [6]. We started to collect data in late November 2017 by providing pre-questionnaire to all imams, mosque managers, and MTM administrators as shown in Table 1. This step was aimed to obtain user's experience on committing the traditional way of timetable compilation process altogether with problems, advantages, and disadvantages.

The post-questionnaire (again refer to Table 1) was divided into two rounds. The first round was conducted in the mid of 2018. This evaluation intended to gain the first six-month experience on using full package of application. Each participant of imam users was asked to use the application regularly from early 2018 to mid-2018. While for mosque managers and MTM administrators, we asked them to use the application 2 months before imam users. This because they have to experience timetable compilation features before being used by imam users. The final result of this round will be used for improving the application as well as adding or remove its features according to the user's experiences.

The second round was designed for gaining final user's perspective [7][8] on using the application for the whole year as well as their satisfaction level. After receiving feedback as stated in the first round, we adjusted the application and improved it based on user needs and expectations. After such implementation, we asked users to use the revised application from November 2018 to September 2019. The result of all rounds will be discussed in the next section: Result and Discussion.

Table 1 Type of Questionnaires for The Study

Type of respondents	Questionnaire content
Imam's Pre-questionnaire	This step used to assess the user's existing experience on the timetable compilation process including requesting, compiling, and collision rate frequency in a year-period.
Mosque Managers and Administrators pre-questionnaire	Generally encompassed open-ended questions to obtain detail insight on managing timetables in a traditional way.
Imam's Post-questionnaire	This questionnaire was used to figure out user's opinion as well as their experiences of the application.
Mosque Managers and Administrators post-questionnaire	The questionnaire was closely similar to imam's one which also provides opinion and experience from the perspective of mosque managers and MTM administrators. Besides, it also created to observe the collision rate during timetable compilation and its implementation.

4. Result and Discussion

The result of questionnaires given by respondents were in the form of agree or disagree with the respected statements. We then input those data to SPSS to investigate the following scopes.

1. Analysis of user's experience on traditional way. This includes the timetable compilation process along with its problem during compilation and implementation such as long duration for timetable compilation and the high of collision rate.
2. Analysis of user's experience (usefulness and ease of use) [9][10]. This user experience is the most important analysis of this study as it rules which method (traditional or application way) the users preferred in how to manage timetables [11].
3. Analysis of overall user's satisfaction. We need to ascertain whether all users appeased with the new system or not in order to measure overall satisfaction.

4.1. User's Experience on Traditional Way

The user's experience on the previous system was investigated through a pre-questionnaire session. All users were asked to answer to the following statements:
Q1: It took only a few times to compile timetable
Q2: The collision rate was very high
Q3: It was easy to find khatib/imam replacement
The result of Q1 statement unveiled that 98% of the respondents were disagreed (82% strongly disagreed and 16% disagreed), whereas only 2 respondents agreed that the timetable compilation process was fast enough. From open-ended questions, we inferred that it would take 4 months in total to compile such agreed timetable. This includes three plenary sessions and some printed revisions of the timetable display.

As for Q2, all respondents admitted that there was a very high collision probability on compiling timetable even after such timetable was agreed. This was due to the difficulty of inspecting all possible slots of manual timetable plotting.

The result of Q3 indicated that sometimes it was easy to find khatib replacement but in some cases was not. About almost equal numbers responded to agreed (49%) and disagreed (51%). For some mosques that provide full-time backup, there was no problem finding khatib replacement. While was not true for other majority mosques which did not have a regular backup. Even sometimes the absence of khatib generated new problems such as the delay of sermon and miscommunication among imams: some imams at the same time came together to replace khatib without proper coordination.

4.2. User's Experience on Application with Usability Testing

The key point of this study is to gain a big picture on whether the system provides a solution to the existing problems or needs some advanced improvement. In doing so, we would like to see the beneficial aspect of this application, particularly in assuring the users were accustomed to use it regularly and were found the application useful and easy to use. Accordingly, Table 2 illustrates the statements together with their scores that were challenged in the post-questionnaire session (first round).

Table 2 Usability and User's Experience Result

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
R1 It helps me be more effective	-	1%	51%	48%
R2 It is useful	-	-	35%	65%
R3 It make the things I want to accomplish easier to get done	-	-	42%	58%
R4 It saves me time when I use it	-	-	57%	43%
R5 It meets my needs	-	-	52%	48%
R6 It does everything I would expect it to do	-	-	43%	57%

The result of the post-test indicated that almost all users have given positive experience on using the application. They found that the application was useful—with 63% of users strongly agree (R2), and easy to use which marked by 58% of users strongly agree to R3 statement.

In addition to a close-ended statement, we also asked all participants to list the most negative aspects of the application. We found only 5 participants who filled out this field. 4 out of 5 participants agreed with a drawback on khatib replacement finder feature. This because whenever an administrator tried to find a khatib replacement, the screen would display all name of khatib/imams along with their status (available or unavailable). They requested that the screen should only display khatib/imams with the available status.

4.3. User's Overall Satisfaction

The second round of post-questionnaires was intended to assess the level of satisfaction toward the application. Ahead before, we have revised the application based on our findings on the first-round post-questionnaire. To assess overall satisfaction, we asked them 4 questions as written in Table 3 based on [11]. The responses showed almost similar findings to the preceding result with 100% of participants had an overall acceptable experience and appreciation for the application (56.75% strongly agree and 43.25% agree) as depicted in Table 3.

Table 3 User's Overall Satisfaction

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
S1 I am satisfied with it	-	-	35%	65%
S2 It is wonderful	-	-	49%	51%
S3 I feel I need to have it	-	-	44%	56%
S4 It is pleasant to use	-	-	45%	55%
Average	-	-	43.25%	56.75%

To support the findings, we also repeated Q1, Q2, Q3 questions (see user's experience on traditional way section) and compared the result with the previous one to figure out whether the application had managed to cope with or diminish the occurrence of the problems. Table 4 shows a comparison of the problem occurrence before and after the system implementation.

Table 4 Problem occurrence comparison

Problems	Number of Occurrences	
	Manual Compilation	Collaborative based Application
Duration of timetable compilation	4 months	1 month
Collision rate	17	2
Improper coordination on khatib replacement	11	0

5. Conclusion

The collaborative system application was developed to assist MTM administrator in compiling timetable for Friday prayer. As the system has been implemented since late 2017, we need to figure out whether the system was reliable during the first implementation to the current days. This paper presented a review of two years of implementation on the aforementioned system. We used some types of questionnaires to measure user's experience, usefulness, easy to use, as well as overall user's satisfaction by comparing the pre-condition (before system implementation) and post-condition (after system implementation).

The pre-questionnaires indicated that, before the system implementation, almost all users encountered bad experience while managing and compiling timetable. Other than long time consuming, the collision rate was very high and the difficulty on finding imam replacement was considered as a major problem. However, it was not the case for post-questionnaires. The post-questionnaires were intended to measure user's experience and overall satisfaction toward the collaborative system. The result of this phase clearly indicated that almost all users have good experience on using the system. They found that the application was useful and easy to use.

As for overall satisfaction, we conducted another post-questionnaire after system revision as a response to user's feedback. 100% of users were totally satisfied with the new version of the system. This because the system managed to diminish or almost deal with all the problems that regularly occurred during timetable compilation. The duration of timetable compilation was reduced from 4 (four) months to only 1 (one) month. Similarly, the collision rate was dramatically decreased from 17 (seventeen) occurrences to only 2 (two) occurrences. Amazingly, the system has successfully solved the improper coordination on the process of finding imam replacement (Table 4).

However, one possible drawback of this system is that it only fits within the MTM scope. It might not be possible to be implemented directly to another similar

organization. In accordance with that, soon, we plan to design a more customizable system so it can be easily implemented to different organizations or mosques.

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