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Low-Code Platform for Health Protocols Implementation in Sabilussalam Mosque During The COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic condition has changed various aspects of life, especially Muslims' prayer activities. COVID-19 pandemic has especially affected mosques as a place for Muslims to pray five times a day and to have Friday prayer congregation. To prevent the spread of COVID-19, the Sabilussalam Mosque located at Jl. Dr. Hatta Bandung has restricted its capacity and ensured visitors' body temperature below 37,4 C manually. However, physical contact still occured, and its capacity still exceeded 50%. Therefore, the adoption of self-check temperature and automatic capacity counter as a method of mitigating the COVID-19 pandemic in mosques was needed. This community service aims at implementing a system for controlling mosque capacity and for avoiding physical contact during praying. The Low Code-based app counts temperature data broadcasted by K3 Pro and stored in NowDB cloud-service. As a result, the system manages to control the mosque's capacity to a maximum of 50% without any physical contact because it relies on internet connection.

Keywords*: K3 Pro, cloud-data-service, NowDB, Low-Code, Node-RED*

1. INTRODUCTION

The current COVID-19 pandemic has brought about changes in various aspects such as social, economic, education, tourism, and worship. On the aspect of worship, governments around the world prohibit social gatherings in religious places of all religions and cancel celebrations that allow large numbers of people to take part. Almost all houses of worship such as churches, mosques, synagogues, and temples are strictly guarded and even temporarily closed with the aim of avoiding the spread of the COVID-19 virus. Considering that the transmission of this virus is very fast, it is important for the government to pay attention to religious worship activities in public places **(Syahrul RA et al., 2020).** In Indonesia, accordance with the MUI Fatwa No. 14 of 2020 concerning the Implementation of Worship in Situations of a COVID-19 Outbreak, Article 4 explains that in conditions of uncontrolled spread of COVID-19, in life-threatening areas, Muslims may not hold Friday prayers or Congregational prayer. in the area, until normal conditions return, and must

replace it with the Zhuhur prayer. Even though the fatwa has been issued, the enthusiasm of the community to carry out Friday prayers in congregation in certain areas is still high. In response to this, the government allows Friday prayers only in the green zone where the COVID-19 situation in the area is under control.
In carrying out Friday prayers at the mosque, the congregation must follow the health protocols as recommended by the Majelis Ulama Indonesia (MUI), including checking body temperature before entering the mosque, maintaining distance, bringing their own prayer tools, wearing masks during worship, and not shaking hands after prayer. Although educational media regarding the Adaptation of New Habits (IMR) are often conveyed by the government, institutions, and mass media, it is still a challenge, especially for mosque administrators, in ensuring that every Friday prayer is carried out according to health protocols. This also happened in Sabulussalam Mosque.

Worship activities at the Sabulussalam Mosque have tried to implement health protocols, especially during Friday prayers it is known as Friday prayer. However, there were several obstacles, such as operator-assisted temperature checks, congregational capacity still exceeding the limit, and due to excess capacity so that the distance between congregations was less than 1 meter when praying. Based on these problems, an application solution was proposed to assist pilgrims in implementing health protocols during Friday prayer. Considering the need for fast and easy application development, we propose a low-code-based application development.

Low Code Platform is a tool that can be used by programmers and non-programmers to create applications with minimal programming knowledge **(Waszkowski, 2019)**. The purpose of this platform is to produce applications with effective, faster delivery process to users and fast and continuous testing **(Sanchis et al., 2019)**. There are several low code platforms including Microsoft Power Apps, Google App Maker, Salesforce and Node-RED. The platform used in the development of this application is Node-RED. Node-RED can operate on hardware with minimal specifications such as the Raspberry-Pi. Node-RED can be used to visualize program logic in this case to connect K3 Pro devices to the NowDB data service. NowDB data service is a cloud-based data service that uses a NoSql database. In this PKM, we developed a Low-Code based application for self-check temperature called TEMAN app using the Node-Red and NowDB data service.

2. METHODS

2.1 Prototype Model

The proposed application is developed using the SDLC (Software Development Life Cycle) model with the Prototype model approach. The prototype life cycle model is used to develop software to clarify user requirements for operational software **(Schwalbe, 2016)**. This model is one of the simplest models of software creation that allows users to have an initial/basic description of the program and carry **(Susanto & Meiryani, 2019)**. This model requires the involvement of users and developers using the model to generate functional requirements and physical design specifications simultaneously. Before the system is deployed, prototypes are created through an interactive and iterative process that incorporates the steps of the traditional development cycle. The prototype is then evaluated several times during Friday prayers to test if there are obstacles in its implementation. Figure 1 shows prototyping model which has six SDLC phases as follow:

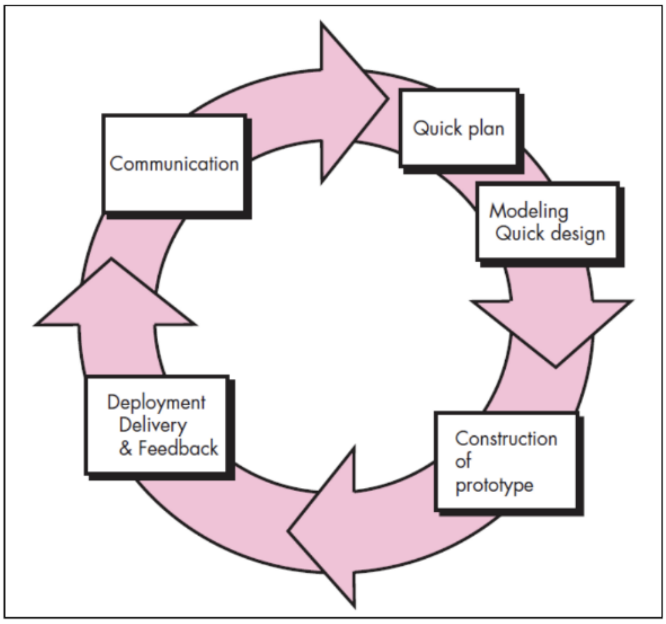

Figure 1. Prototype Model (Pressman & Maxim, 2019)

1. Communication
   System requirements analysis is defined in detail at this stage. The technique used in this phase is interviewing stakeholders to define what their expectations are from the system and the overall objectives of the software. Furthermore, prototype iterations are planned for rapid and modeling of the system.
2. Quick design
   The next is develop the quick design. The system design is made in a simple way to provide a brief overview of the system to the user. Quick design should be representation of aspects that the software will be visible to user. Quick design will lead to prototype build
3. Construction of Prototype
   In this phase, the actual prototype is designed based on the information gathered from the quick design in the previous phase. After the prototype is built, the system is then presented to the user to assess the system. Comments and feedback will be collected to be provided to the developer. If there are functions in the prototype that do not match the user's needs, the developer needs to improve it according to user feedback and suggestions. This phase will be final once the user is satisfied with the proposed prototype.
4. Deployment, Delivery and Feedback
   Once the final system is developed based on the final prototype, it is thoroughly tested and deployed to production. Systems undergo regular maintenance to minimize downtime and prevent large-scale failures.

2.2 Problems Analysis

Analysis of problem and opportunities is carried out to find out the needs and description of the system that will be proposed so that the usefulness of the system can be perceived by community service partner, Sabilussalam Mosque. The analysis was carried out to see various current conditions including the components used such as hardware, software, networks, and human resources. at this stage information system activities including input, processing, output, storage, and control are documented **(O’brien & James A, 2005)**. To model the root cause of the problem, fishbone is used to show the cause and effect of a problem **(Coccia, 2018)**. Figure 1 shows a fishbone diagram of the problems in this PKM.

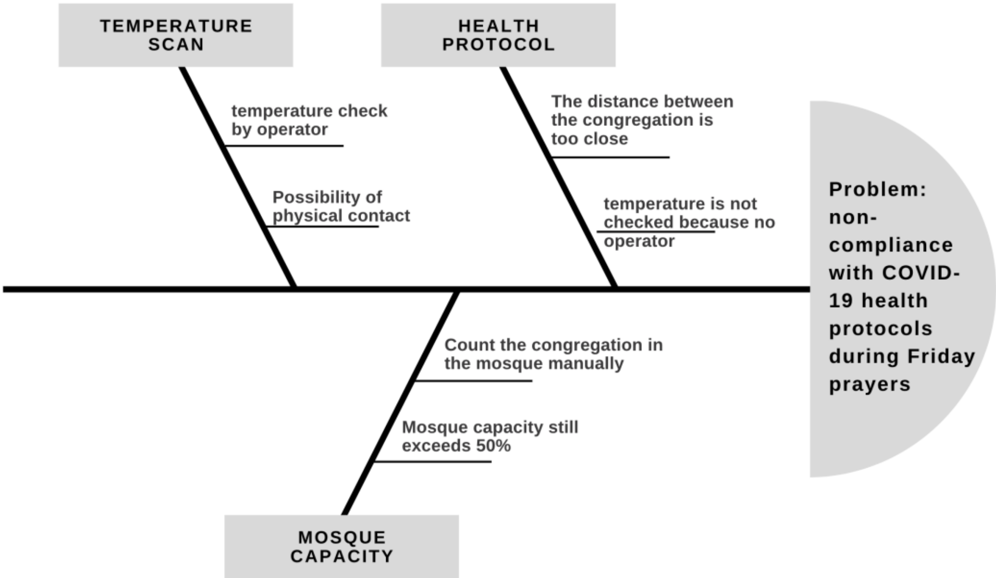

Figure 2. Fishbone Diagram for Problem Analysis at Sabilussalam Mosque

According to Figure 2, the main problem faced by Sabilussalam Mosque is the applying of health protocols in Friday prayers needs to improve, especially in controlling the capacity of mosque congregations with the provisions of normal body temperature. Often when prayer time approaches, there are still new congregations arriving while the operator in charge of scanning the temperature has already entered the mosque. Therefore, those who arrive late are not checked for temperature. Furthermore, the body temperature check is still done manually by the operator, which allows for physical contact between the congregants and the operator. In addition, because the congregants are counted by the operator, often the congregants themselves do not know whether the capacity is full, they still enter even though the capacity is full. Accordingly, the distance between worshipers in the mosque is less than 1 meter. Based on the problems above, the problem formulation of this PKM is as follows:

1. How to design a self-temperature scanning application without any physical contact between pilgrims which connected to a computer device.
2. How is the temperature data from the congregation stored and processed in real-time to find out the number so that congregants would notice and control the capacity in the mosque.

The following are opportunities that arise based on the results of the analysis of the problems that occurred, including the following.

1. The development of technology is very rapid. Currently, software development tools have provided many choices according to needs. One of them is low-code-based programming that allows fast application development.
2. Comfort and order in the implementation of Friday prayers, especially during the pandemic, is very important. mosque administrators need an easier and communicative way to guide congregations to care about health protocols.

2.3 Design Processes

2.3.1 System Overview

According to the results of the analysis of problems and opportunities, it is necessary to have a temperature scanner without direct physical contact that can be connected to a computer device so that data can store and count the number of worshipers who come so that it can assist mosque administrators in managing the congregation who come.

This system is designed and built based on the results of the analysis of actual problems with partner. This system consists of a K3 Pro body temperature scanner that is connected to a Raspberry Pi using a USB C cable. The application installed on the minicomputer will pull data every time K3 Pro scans the congregation's temperature and through an internet connection the temperature data and the date will be stored in the NowDB cloud-based data service. If the number of congregants has exceeded the 50% limit, information will appear that the capacity is full, so that the prayer should prays at the outside area the mosque. This sistem proposed in this PKM called TEMAN app.

2.3.2 Requirements Analysis

After a month of Friday prayers not being carried out according to government regulations, considering that the Sabilussalam Mosque is in the green zone area, it is allowed to carry out Friday prayers by following strict health protocols. Therefore, Sabilussalam mosque needs a more effective mechanism for implementing health protocols for congregational prayers. To overcome excess capacity, an automatic congregation counter is required with a maximum limit of 50% of the original capacity. This counter will increase whenever the temperature checked is below 37.4 degrees Celsius. If there is a congregation with a temperature above, then it does not count, and the congregation is not allowed to attend Friday prayers. To prevent physical contact, temperature checks must be carried out independently without the assistance of an operator. The system must provide information on the total number of congregations inside the mosque. If it has exceeded the capacity and it must inform to congregants, and the congregation is directed to pray outside the mosque. Considering that the Sabilussalam Mosque is monitored directly by the COVID-19 Task Force, visitor data every time Friday prayers are held is needed as evidence that the Sabilussalam Mosque is carrying out health protocols properly. Therefore, mosque administrators want to know how many worshipers are present each week to ensure congregational Friday prayers do not exceed the mosque's capacity. The Functional and non-functional requirements of the system are described in Table 1 and

Table **2**.

Table 1. Functional Requirements of TEMAN

No.	Functional Requirements
FR-01	The system can scan the body temperature of pilgrims
FR-02	The system can store data on the body temperature of pilgrims
FR-03	The system can send data on the body temperature of pilgrims to the NowDB cloud-based data service
FR-04	The system can count the number of congregants automatically
FR-05	The system can display the total number of congregants and inform when it has exceeded the maximum limit

Table 2. The Non-Functional Requirements of TEMAN

No.	Non-Functional Requirements
NFR-01	System is always available during Friday Prayers
NFR-02	The system has 90% reliability of data delivery on cloud-based

	services

2.3.3 Quick Design

The proposed application architecture model can be seen in Figure 3. The model describes the workflow of the system and the devices used to support each process. The explanation of the architectural model is as follows:

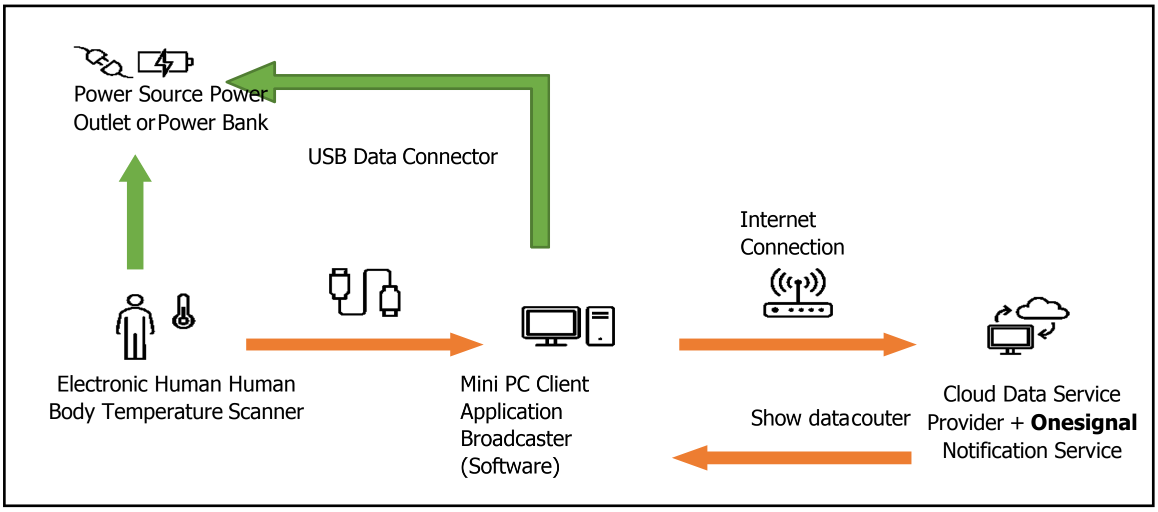

Figure 3. Architecture model of TEMAN

The following is an explanation of proposed architecture model:

1. The K3 temperature scanner is connected to the Raspberry Pi Mini PC via USB and GPIO connection. Every time the K3 thermometer scans the temperature, the data will be sent via the serial port on the K3 thermometer. The Raspberry Pi Mini PC is connected to the internet.
2. The application that has been installed on the Raspberry Pi receives the data and reformats the data according to the application needs, namely body temperature data, room temperature, date and time.
3. After the data is reformatted, then the data is stored in the NowDB cloud data service via an internet connection
4. The data that has been stored is displayed on the application for use by Sabilussalam Mosque partners in the form of visitor counter data and reports on the implementation of Friday prayers.
5. Once the counter exceeds the maximum limit, it will provide information to the congregation to carry out Friday prayers outside the mosque.

2.3.4 Software and Hardware Requirements

Prototype is build using software as follow:

1. Javascript and NodeJS
2. NowDB Desktop Manager and Android SDK
3. Onesignal SDK
4. Cloud Services Accounts (NowDB, Firebase, Onesignal, and Github)
5. Node-Red Framework

In addition, the hardware used in this prototype include the following:

1. Infrared Thermometer K3 Pro Body Temperature Reader
2. Type C USB cable
3. Raspberry Pi
4. Power Bank 10000 MAh
5. Micro SD 32GB

3. RESULT AND DISCUSSION

3.1 Build Prototype

The proposed application was developed by applying a Low-code-based programming approach accordance with architecture model in Figure 3. The user interface of the application was developed using JavaScript code to display the counter results each time there is an additional body temperature scan. The functions and program logic flows are made using the low-code Node-Red platform. The logic flow of the TEMAN application using Node-Red can be seen in Figure 4.

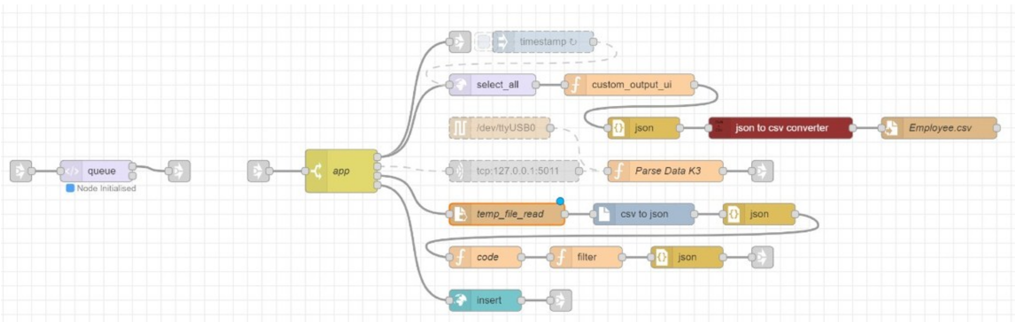

Figure 4. Node-Red flow for TEMAN app

Figure 4 shows the program logic flow used in developing the TEMAN application. The logic flow in the picture represents a set of connected nodes. A node is the basic building block of a flow. Each node is triggered by either receiving a message from previous node or by waiting some external event such as GPIO hardware change. In this flow, we use Raspberry Pi to connect with this flow. Through GPIO of K3Pro temperature checker, the function node received temperatures data broadcasted by K3Pro to be proceed by another function.

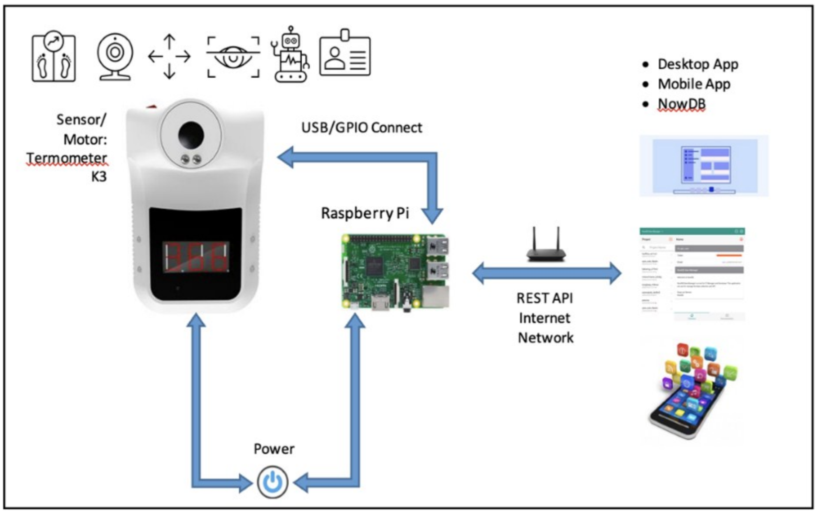

Figure 5. TEMAN Application Workflow

The implementation of the TEMAN application architecture can be seen in Figure 5. This model shows the workflow of the TEMAN system. Starting from the temperature checked by the K3 thermometer, then the temperature data is broadcast by K3 to the TEMAN application installed on the Raspberry. The data received by the TEMAN application, follow the logical flow of the program built using Node-Red sends the data to NowDB, a cloud-based data service. So that the data is calculated and finally displayed to the Raspberry Pi output via the TEMAN application.

3.2 Deployment, Delivery and Feedback

The next stage is system testing to test the system's ability to receive temperature data, store data and display data again for recording. Prior to implementation, the system was tested 6 times before and during Friday prayers. This stage is carried out in stages starting from the trial phase 6 times during Friday prayers, and the implementation phase 2 times. The first system testing was carried out by congregational Friday prayers at the Sabilussalam mosque to make sure that temperature data successfully broadcasted so that TEMAN app can received the data. Figure 6 shows the implementation of the first test.

Figure 6. 1st System Testing

After the first test was carried out, several obstacles were found as follow:

1. The K3 thermometer used is apparently not usable in an open space (outdoor) so the position of the thermometer must be in the mosque area
2. Data from the K3 Thermometer was not saved to the NowDB data service due to an error in the data format rules read from K3 thermometer
3. Counter data from K3 cannot be displayed.

Following up on the problems found at the first testing, improvements were made to the program logic in Node-Red and changed the K3 thermometer to K3 Pro. The K3 Pro thermometer has the advantage of the previous version in that it can be placed in an open space. The data sent from the K3 Pro uses a USB-C connected to a Raspberry-Pi device. The counter display was improved using the Low-code Node-Red platform to provide information on the capacity of the pilgrims who came. The results of improvements after the first trial can be seen in Figure 7.

Figure 7. TEMAN App Improvement

The TEMAN application with improvements as shown in **Figure 7** has successfully implemented the broadcast data storage mechanism from K3 Pro, so that when temperature data is scanned through the K3 Pro, the data is stored in real-time to NowDB and then the data is counted to show the number of Friday Prayer Congregants that have been scanned. The temperature data stored in NowDB then displayed on the TEMAN application that has been installed on the Raspberry as shown in Figure 8.

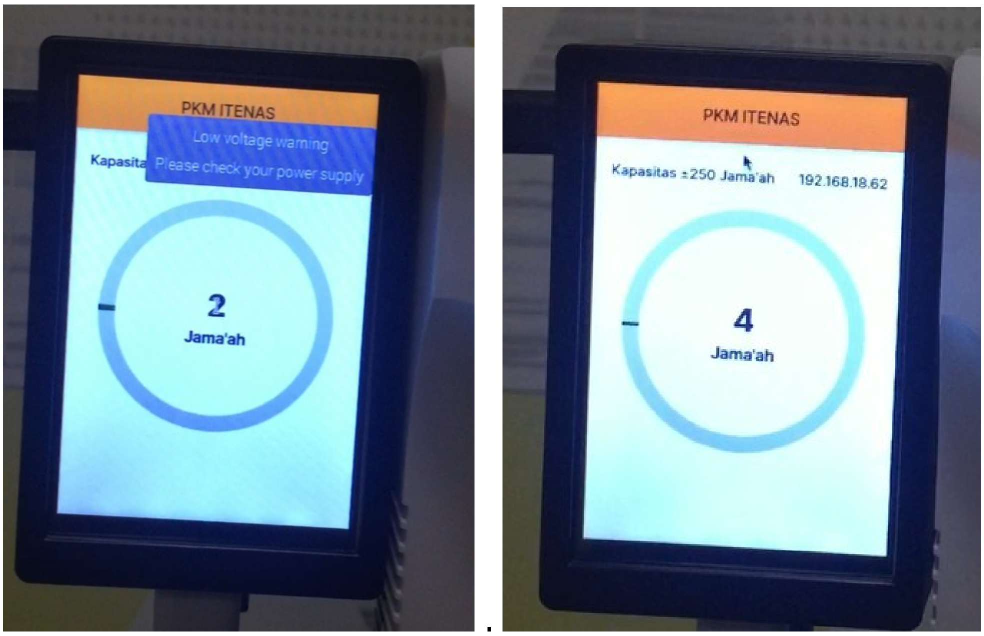

Figure 8. The Final TEMAN app

When the counter approaches the mosque's capacity limit, there will be a red indicator and a notification that the mosque's capacity is full, so that the congregants should use the mosque's courtyard area. After conducting periodic testing and improvements, the TEMAN system was implemented properly. This is because the testing was carried out during Friday prayers so that the congregation had started to get used to the TEMAN system that was applied. In addition, since the Sabilussalam mosque is one of the mosques that is monitored directly by the COVID-19 Task Force, the system is very helpful for mosque administrators in controlling the health protocol implementation of congregational Friday prayers.

According to the Sabilussalam mosque DKM, through direct interviews, the presence of the TEMAN system in the implementation of Friday prayers can increase the effectiveness of health protocols efforts. Apart from reducing physical contact between the temperature check operator and the congregation, the TEMAN system also helps bring order to the congregation so that the one-meter distance rule in the mosque can be implemented.

4. CONCLUSIONS

Low-code platforms can help developer to build the application development process easy and fast. In developing the TEMAN application on this PKM, the Node-Red platform is used to manage logical flows, functions and connects to hardware, in this case K3 Pro as a tool for body temperature scanners. The application of the FRIENDS application in the implementation of Friday prayers went well and the number of worshipers in the mosque could be controlled according to the health protocol, which was 50%. In its application there are several obstacles, especially when sending data to the cloud when the internet connection is inadequate.

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