

# The design of mobile push notification for improving queuing system in electronic health services

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**ABSTRACT** – The rapid use of mobile application in daily task has become a current trending together with the wide use of Internet-of-Thing. The current queuing system is still base on printer and stand-alone machine which user will press a button on the machine to generate the queueing number which will be printed on a small paper slip. Hence the user needs to keep or memorize the queueing number in case they lost the paper slip. This would become a hindrance if they don't remember neither keep it for themselves. Thus, this research paper proposed an implementation of mobile application with push notification for alerting users through mobile device when their number is being called.

## 1. INTRODUCTION

The use of queuing system is crucial in any customer-related services especially in health sectors such as clinics and health centres where there could be hundreds of patients awaiting to be treated. Regardless of their level of health conditions; critical, severe, or not serious, they will be gathered in specific area together with a printed slip paper, which will be their calling numbers. Medical personnel will call the numbers where the numbers will be displayed and voiced out. Even in the Malaysian Healthcare System where there are nine public hospitals [1], which are using this common way for calling up patients. Thus patients would need to keep the paper slip and always be alert when their number show up. This is most common and widely used in any customer service counter.

Most implementation of healthcare system including queuing system that is being practiced in health centres is via a middleware where communication between devices are connected to the same network and database [2]. Thus, in this research, the implementation of the push notification to improve the queuing system is explained in the coming section.

According to [3], the push notification is the most implemented brief message for a mobile application regardless any type of operating system. The brief message is displayed on top most of mobile screen, which will be triggered in a specific event such as notification from backend services in case of data changes or being invoke from web service implemented

by the application. The brief message will eventually notify the user according to the specific message that is programmed in the application. This would help the health care providers such as doctors, pharmacists or registrars to notify the patient that their turn has come to be treated. Also, the target users for the application is broaden to any Android phone users regardless of age as long as they are capable of using the smartphone.

## 2. METHODOLOGY

As mentioned by [3], the push notification able to encourage users to keep alert and pay attention for the message given by push notification where the message is able to blast custom message.

In order to implement the push notification, the proposed method is visualized in general as shown in Figure 1 below. First, the newly entered patient will arrive at the registration counter where they will get their queue number by pressing the queuing device provided. The queue number is printed on a paper where it also contains QR code. Using the proposed mobile application, they would need to scan the QR code which will then trigger the backend services for storing the queue number in the Firebase. The medical personnel such as registrar or doctor may view the queue number from another application where they can invoke the queue number and later the patient will receive the notification.

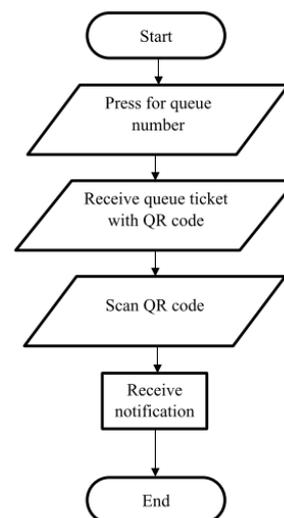


Figure 1 The overall flow of proposed method

Figure 2 depicts the general architecture of the proposed method on how the user may get push notification based on their called queuing number. The user would need to install the proposed application on their phone where the user is required to register their information. All the information will be stored in Firebase storage. Upon scanning the QR code, the information of the queue number will also be stored. Thus, when the medical personnel would call the queue number, it will trigger to Firebase push notification sending the notification direct to the user's mobile application.

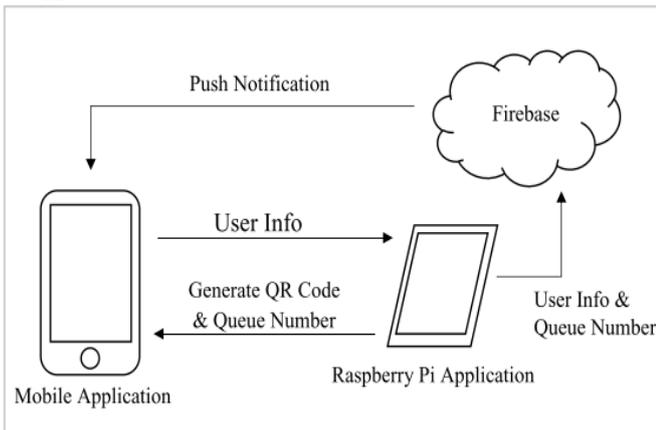


Figure 2 Overall architecture of the proposed queuing system

### 3. RESULT AND DISCUSSION

Upon completing the proposed implementation, the printed QR Code together with the queue number is produces as shown in Figure 3 where it will be used as a usual queuing number. The QR code is actually containing the queue number together with some data such as date and time which will be send and save to the Firebase.



Figure 3 The printed QR Code

When the queue number is being called, the notification at the user's mobile phone will be displayed at their home screen similar to the Figure 4. The push notification is triggered by the web application and Firebase notification which is implemented in this research. Even though the proposed solution is for any Android users, it is limited for those without vision impairment as the proposed application as for now does not have any disabled accessibility features.

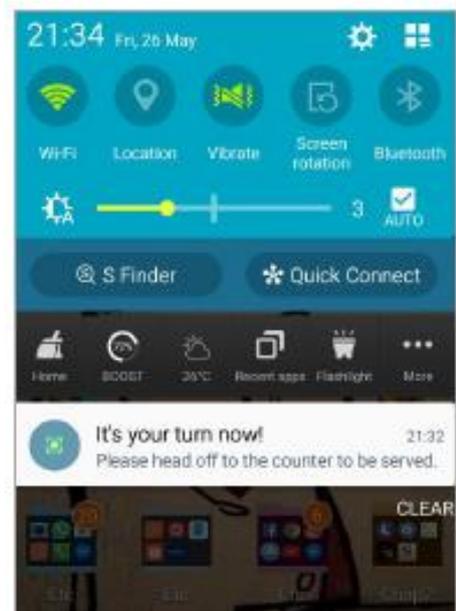


Figure 4 Push Notification triggered at User Phone

### 4. CONCLUSION

It is concluded that the proposed implementation is possible and the user may get more alert when they get notification from their mobile phone. The only restrictions of the proposed implementation is if the user's phone is out of battery or if the user does not have smart phone together with internet connectivity for using the proposed implementation. As for the reason, user would be need to keep the printed queue number and the queue number must be displayed on a monitor to overcome this problem.

As for future enhancement may be done for helping users with disabled condition where it supports voice alert for calling the queuing number.

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