FAST Method to Design Web-Based Patient Registration System

by Mudafiq Riyan Pratama

Article

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Mudafiq Riyan Pratama[1*], Gamasiano Alfiansyah[2], Selvia Juwita Swari[3]

[1] Health Information Management Study Program, Politeknik Negeri Jember; mudafiq.riyan@polije.ac.id
[2] Health Information Management Study Program, Politeknik Negeri Jember; gamasiano.alfiansyah@polije.ac.id
[3] Health Information Management Study Program, Politeknik Negeri Jember; selvia@polije.ac.id

* Correspondence: mudafiq.riyan@polije.ac.id;

Abstract: Manual patient registration at the Polyclinic of Politeknik Negeri Jember (POLIJE) offers ineffectiveness in the patient services. Long waiting time and uninformed service hours at the polyclinic are two problems that need to solve. This study aimed to design a website-based registration system for the POLIJE Polyclinic. The researcher used the FAST (Framework for the Application of System Thinking) method. This method has detailed stages and is capable of producing more efficient, effective, accurate and timely data and information management. The application was built using PHP programming language with Laravel Framework. The registration system was implemented using RFId on patient cards to make the process of reading and registering patient data faster. The web-based registration system with RFId patient cards functions well with features: new patient registration, registration of patient visits with RFId cards, patient queues, verification of patients who register online, as well as patient, doctor and clinic data management.

Keywords: POLIJE, Polyclinic, Registration System

1. Introduction

Technological developments in the health sector must be accessible at any time. Computers have an important role in information processing. Using a computer or technology will facilitate work in the health sector [1]. The Polyclinic of Politeknik Negeri Jember (POLIJE) was established based on the Decree of the Director of Politeknik Negeri Jember Number 037/K14/KP/SK/2011. The polyclinic is a health service organization that must provide quality services to provide comfort and satisfaction with health services among the users.

Patient registration is the first gate in health care facilities as this service can be a hint to the quality of service [2], [3]. Decision on health services is influenced by the quality of patient registration including the professionalism of the officers [4], [5]. Based on a preliminary study, patients had to queue long in the patient registration section [5]–[7]. Long queue becomes a problem in patient administrative services of health care centers [8]. Thus, the management of patient registration should be improved to avoid such long patient waiting times [9]–[11]. In addition, the risk of disease transmission and health problems swollen during the pandemic. For this reason, healthcare facilities advised patients to come at less busy hours. Using a registration system technology can speed up the patient registration process. Hence, crowds of patients will not gather in the registration room while waiting for the registration [12]. An electronic patient card is one of the digital registration forms using an RFId (Radio Frequency Identification) system. RFId is an automatic identification method that uses radio waves to identify objects and read information from a tag that can be used in the health sector [13]. RFId systems can increase efficiency in patient data collection. RFID Card Tags cards contain

information that can be identified using radio frequencies [14]. With RFID technology, a tag can be used as a patient card that the registration officer can use to find out patient's identity.

This study aimed to design and implement a web-based patient registration system and Radio Frequency Identification (RFId) with the FAST method at the Polyclinic of POLIJE. The FAST (Framework for the Applications of System Thinking) method was performed at some stages i.e., scope definition, problem analysis, requirements analysis, decision analysis, logical design, physical design & integration, construction & testing, and installation & delivery [15]–[17].

2. Materials and Methods

The Framework for the Application of System Thinking (FAST) method was used to create a patient registration system. This method has comprehensive stages and supports the development of a system by producing more efficient, effective, accurate and timely data and information management [18]. The stages of using the FAST method in this study are described in Figure 1.
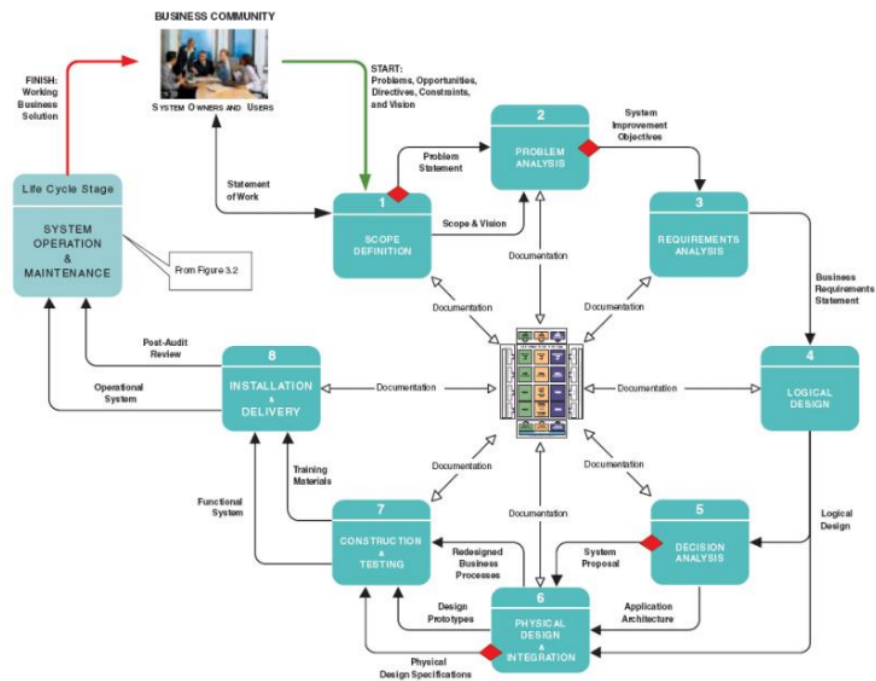

Figure 1. Stages of the FAST Method

1. Scope definition
   Based on the results of observations and interviews, the POLIJE Polyclinic conducted patient registration manually. As a result, patient data were not organized. To solve this problem, a web-based registration system was proposed using RFId.
2. Problem analysis
   Since the Polyclinic had a manual patient registration system, it was difficult to organize patient data. The problem analysis proposes to design a web-based patient registration system and Radio Frequency Identification (RFId) with the FAST method.
3. Requirement analysis

The requirement analysis of the system development include user requirements, functional requirements, data requirements, and software and hardware requirements used for system development.

4. Local design

   The system design was conducted using UML (Unified Modeling Language) and flowcharts (flow diagrams).

5. Decision analysis

   The system design was decided after the previous stages were completed. At the decision analysis stage, plans were prepared for the system development. Otherwise, this stage was skipped to the next stage.

6. Physical design & integration

   Designing stage involved the physical structure of the database and the schema of the system reading process.

7. Construction & testing

   After being given a physical design model, a trial or testing of a system was performed to identify the business needs such as the acceptance of its users.

8. Installation & delivery

   At the installation and delivery stage, the system started to be operated. The transition from the old system to the new system was observed, and the users were provided training on the use of the system.

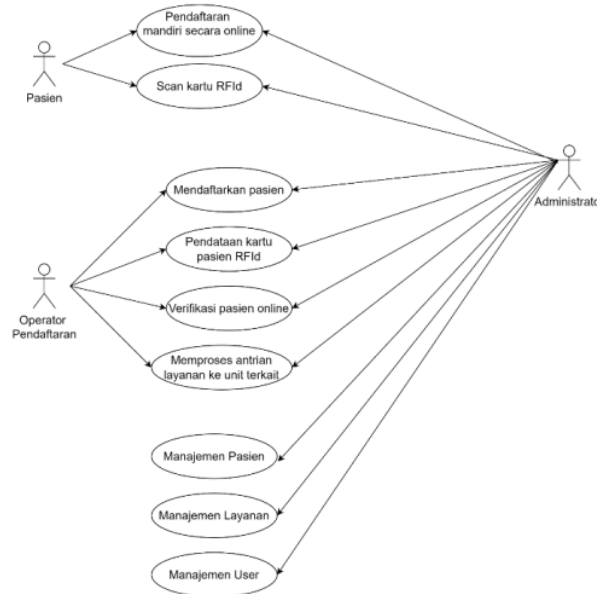## 3. Results and Discussion

3.1 Results

1. Local Design

Figure 2. Use Case Diagram System

Figure 2 describes the features or activities that can be performed by three types of users in the system. Patients showed their cards to scan for registration. The Use Case Diagram illustrates that there are 3 types of users, namely: patients, registration officers, and administrators. Patients have access to register independently online and can scan RFId using the patient card. Meanwhile, registration officer users get access to register

patients, collect patient RFId card data, verify patients who have registered online, and process service queues to the relevant units. The administrator user type gets full access to patient and registration officer access, and also adds access to patient, service and user management.
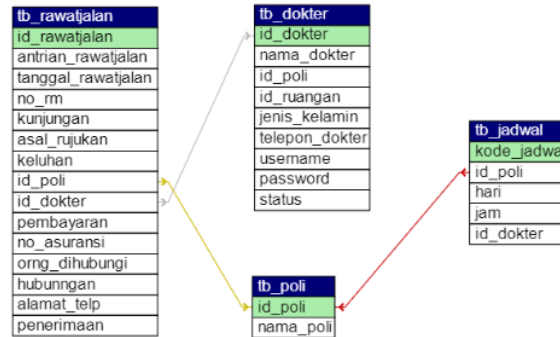
2. Physical Design

Figure 3. Database Structure of Patient Registration System

The system design presents a table consisting of outpatient, doctor, poly, and schedule. The flow scheme of patient registration with RFId is shown in Figure 4. There are 4 tables that are related to each other, namely: **rawatjalan, dokter, jadwal**, and **poli** tables. These tables are centered on the **rawatjalan** table which is connected via the foreign key **id_poli** from the **poli** table and **id_dokter** from the **dokter** table. The **poli** table is also related to the **jadwal** table to link the doctor's schedule at each poly.

Figure 4. Scheme of read RFId

The patient card created is an RFId-based card. When a patient wants to register, the patient simply attaches the RFId-based patient card to the RFId reader. Then the RFId reader reads the ID from the card and translates it into the system that the ID belongs to the patient who registered. Then the registration system displays the patient's data on the registration system web page.

3. Construction

To start the page, users logged in first. They then entered their username and password on this login page.
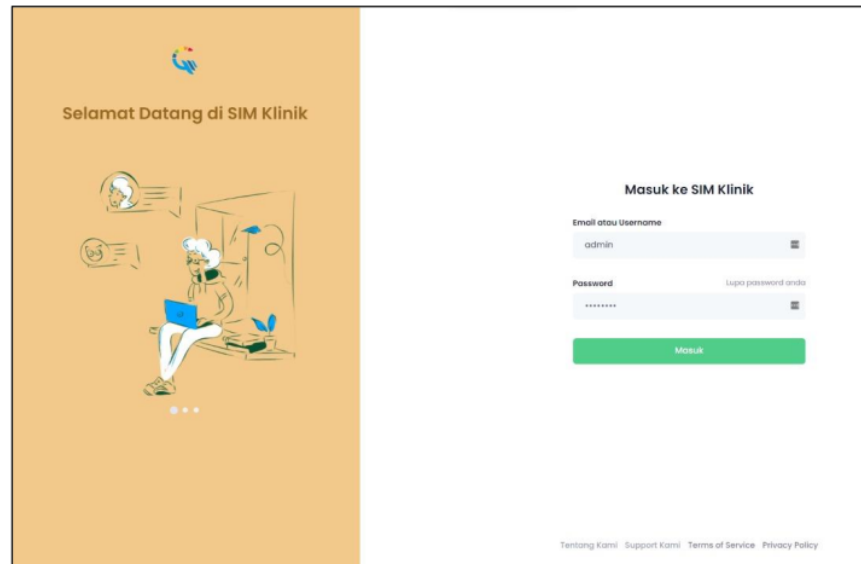
Figure 5. Login Page

Then to register the patient, the officerthe users fills filled in the following a form on the patient registration page:

Figure 6. Patient Registration Page

3.2 Discussion

A patient registration system is important for health care facilities to handle front office activities. It was used to register new patients or returnee for health check at the POLIJE. Currently, the polyclinic had used a website-based registration system and manual patient registration. With a manual registration, patients must queue long before registering for health services.

The website-based patient registration information system produced in this study was able to detect patient cards using Radio Frequency Identification (RFId) technology. RFId uses an automatic identification method with a device called a tag and a reader via

radio waves. The length of the RFID tag is 1 cm to 6 meters to be detected by the RFID reader, depending on the specifications [19]. RFId technology can be used to improve health services in polyclinics through barcode reading of patient cards.

Patient card is a patient identity card that contains medical record files when patients register to receive health services [20]. With RFID technology, a tag can be used as a patient card that can be scanned quickly for patient registration. RFID is able to identify objects using radio frequencies and read information faster and more efficiently [21], [22].

The use of RFID-based patient cards can make it easier to record patient data [13]. Several hospitals in Indonesia have implemented an RFID-based patient card system [23]. The system generally has the ability to read the RFID label card associated with the patient code in the database via radio waves. If the code matches, the system will show the patient's data automatically on the computer monitor [13].

Previous research on the use of RFId technology at hospitals showed that RFId technology can offer intangible benefits [24]. For example, hospitals which use RFId can reduce their operating costs, increase patient safety and improve the quality of medical services [25]. Therefore, the use of a computerized system for patient registration will help run health services.

4. Conclusions

The manual patient registration process at the POLIJE Polyclinic cause long queues and low patient satisfaction. Meanwhile, the use of a website-based registration system with RFId can simplify and speed up the patient registration process. The system was proven to conduct the process of reading and registering patient data faster. The web-based registration system with RFId patient cards functions well with features: new patient registration, registration of patient visits with RFId cards, patient queues, verification of patients who register online, as well as patient, doctor and clinic data management.

5. Acknowledgements

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