Implementation of the V-Model in The Design of an Incomplete Medical Record Information System to Support Electronic Medical Records at The Occupational Health Public Hospital

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Abstract : The purpose of this study is to learn more about the V-Model approach to inpatient medical record information system architecture. This study makes use of a qualitative research strategy. At West Java Province's Occupational Health Public Hospital, researchers used observation and interviews to compile their data. The V-Model is the procedure that must be followed while creating software. Inadequate data entry, human error, and lengthy report delivery times are among the issues highlighted by the study's results. Incomplete inpatient medical records are another major concern. Some potential solutions to these problems include raising awareness about the significance of filling out medical records and creating an inpatient medical record information system that can quickly verify for completeness and provide reliable results.

Keywords – **Designing, Information System, Incomplete Medical Records, V-Model**

INTRODUCTION

In this age of globalization, the hospital must be ready to compete. Because of new technologies, hospitals now need to have reliable medical information services that can respond quickly. Improving healthcare quality is the goal of health information systems, which use data processing. According to Frirjatullah and Ade Irma Suryani (2023), medical records are one of numerous elements that may make patients' healthcare experiences easier. According to Muhammad Naufal Fernanda and Ade Irma Suryani (2023), WHO states that investing in health information systems will help decision-makers detect and control health issues, monitor and improve them, and boost the well-being of individuals and communities quickly and comprehensively. According to WIDDI SUKMA RAMADHANI et al. (2022), information technology plays a crucial role in management, and organizations and institutions need data that is easy to handle. By instituting standardization across the board, this approach aims to improve healthcare delivery in terms of both efficiency and efficacy (Putu & Widana, 2019).

Maintaining accurate patient records is the responsibility of medical records, which are an essential component of every hospital's infrastructure for patient care (Amran et al., 2022). Every member of a patient's healthcare team may access the patient's medical history from the patient's medical record. According to the Republic of Indonesia's Minister of Health's Regulation No. 24 of 2022, "Electronic Medical Records are medical records made using an electronic system intended for medical record keeping."

Many different kinds of information may be gleaned from a comprehensive medical record. Among these functions are those of providing evidence in court proceedings, facilitating study and instruction, and assessing the efficacy of healthcare facilities (Indonesia, 2006). The investigation of medical record completeness as a technique to measure hospital service quality is an essential component. Indicators of good medical record quality include medical record fillers' support for correctness, timeliness, completeness, and compliance with legal requirements; these factors have a substantial influence on the enhancement of service quality (Fauzan Alfarizi et al., 2023). Research and instructional materials, evidence in legal disputes, and tools for evaluating and rating hospital service quality may all benefit from this requirement. Rangga et al. (2021) note that analyzing the completeness of medical records is an essential factor for assessing the quality of hospital services. Common issues with medical record filling include physicians making incorrect diagnoses and inadequate filing procedures. Since reports are dependent on the outcomes of data processing, this may have both internal and external effects on the hospital (MILENI ASTRI LINDA BITJARA et al., 2022). In order to find certain mistakes in medical record keeping, qualitative analysis entails looking at particular sections of the material (Setyadi, 2021). The goal of an integrity analysis is to find glaring mistakes in hospital protocols that are easy to fix. In order to

fulfill licensure, accreditation, and certification standards, this approach ensures that hospitals, physicians, and patients all have their legitimate interests protected while also providing a more thorough medical record for care transitions.

Earlier studies on the topic of medical record information systems have demonstrated that these systems can aid in resolving issues like storage security and system integration (Setyadi, 2021). One such study was the Research on the Design of a Quantitative Analysis Information System as Supervision of the Completeness of DRM Medical Records in the Assembling Section. One of the software development life cycle (SDLC) models that evolved from variants of the Waterfall model, the V-Model, was described in a research by Balaji and Murugaiyan (2012). Quality assurance, modeling, communication, and the first stages of building are all shown in the V-Model (Herlambang et al., 2020).

Because standard operating procedures (SOPs) have been well-implemented and the medical records department collaborates to fill out inpatient medical record forms completely during this arrangement process, the assembly staff can use this information system to fill out inpatient completeness examination files more systematically. The development of a more effective information system is another objective of this study.

RESEARCH METHOD

Methods used in research are the processes and plans that researchers use. According to Waruwu (2023), research methodologies allow for the conduct of research in a way that is organized, scientific, unbiased, and beneficial. Reasoned, empirical, and methodical investigation is at the heart of scientific identity, which is what scientific techniques are alluding to. Research that is reasonable is one that can be carried out using just human reason. To experiment, one must be perceptive enough to identify the strategies used by others (Gumilar et al., 2021). Research techniques are a way to gather information and come up with evidence-based answers to problems. Techniques used to carry out research are sometimes referred to as research methodologies.

2.1 Data Collection Method

A descriptive research strategy is used by the researcher in their selection of a qualitative analysis technique. S. Nasution (n.d.) states that qualitative research relies on first-hand accounts from participants or respondents.

2.1.1 Observation

Direct observation of the topic and study setting is the essence of observation as a data gathering approach. According to Ardiansyah et al. (2023), researchers may conduct qualitative observations in either natural settings or simulated ones. Scientists may learn a lot about the phenomena they're studying by just watching people and the situations in which they behave.

2.1.2 Interview

Interviews are a way for researchers to get information by talking to the people they're studying. According to Ardiansyah et al. (2023), the amount of framework that is specified before an interview determines whether the interview will be structured, semi-structured, or unstructured.

2.1.3 Literature Review

As a method of gathering information, literature reviews include familiarizing oneself with and analyzing the ideas presented in a variety of sources that are pertinent to the topic (Adlini et al., 2022). Journal articles and data from earlier studies are valuable resources for researchers.

2.2 Development Method

One of the SDLC (Systems Development Life Cycle) models, the V-Model is an expanded version of the Waterfall model (Herlambang et al., 2020), according to study by Rangga (2021). An improvement upon the waterfall approach, the V model incorporates several layers of testing into each phase of development (Fitriany, 2023).
The stages in the V model are as follows:
1. Requirement Analysis & Acceptance Testing
2. System Design & System Testing
3. Architecture Design & integration testing
4. Module Design & Unit Testing
5. Coding
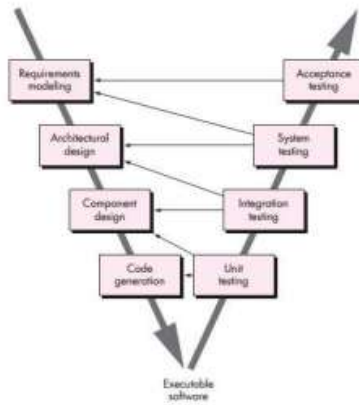
Figure 1. V-Model

1. Requirement Analysis
The most important stage of the SDLC is the data gathering phase.

2. System Design
Creating the design of the application or program is the next stage. The goal of this stage is to provide a complete overview of what needs to be done and how the desired system will be built.

3. Architecture Design
This is part of the planning process at a more detailed level.

4. Module Design
Afterward, the entire system will be divided into smaller modules, and the design of each component will be further elaborated.

5. Unit Testing
This is the first step in testing each developed unit. The purpose of this testing is to determine if there are any bugs or errors in the program.

6. Integration Testing
Integration testing is conducted after the previous unit testing is completed. It tests the previously developed modules in the system.

7. System Testing
Combining all modules into one unit is the system testing phase.

8. Acceptance Testing
Before being released or updated, the final stage of software testing is user acceptance testing (Fitriany, 2023).

2.2.1 Flowmap
A flowmap diagram illustrates the circulation of data and information between affiliated components of a system (Zulkarnain et al., 2023). It also serves as a visual aid depicting the processes occurring within the system.
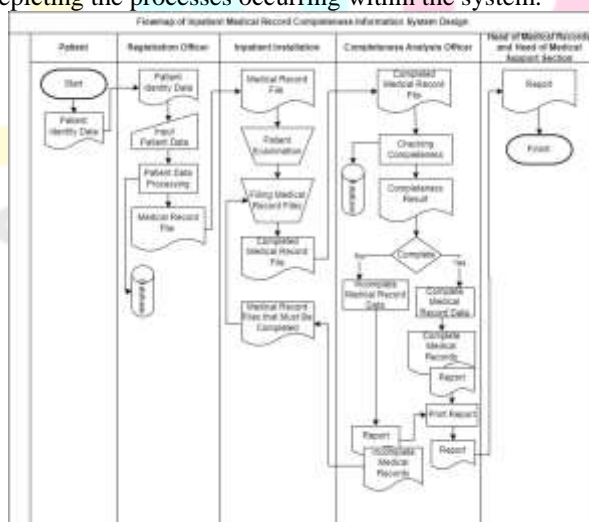
Figure 2. *Flowmap* that was designed

2.2.2 Diagram Context
It's a context diagram that encompasses processes and describes the scope of the inpatient medical record completeness information system at the Occupational Health Public Hospital.
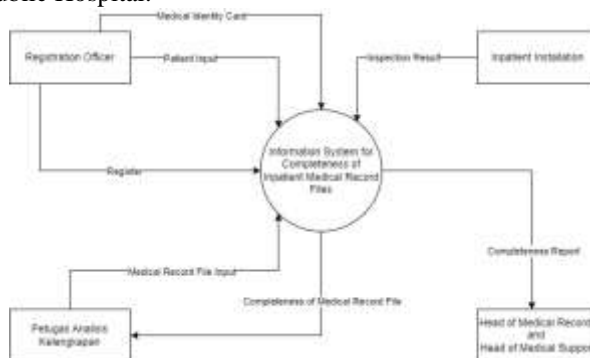
Figure 3. Diagram Context

2.2.3 *Data Flow Diagram* (DFD)
It involves rendering visuals of various interrelated functional processes, which can encompass manual operations, computer-based tasks, or a combination of both.
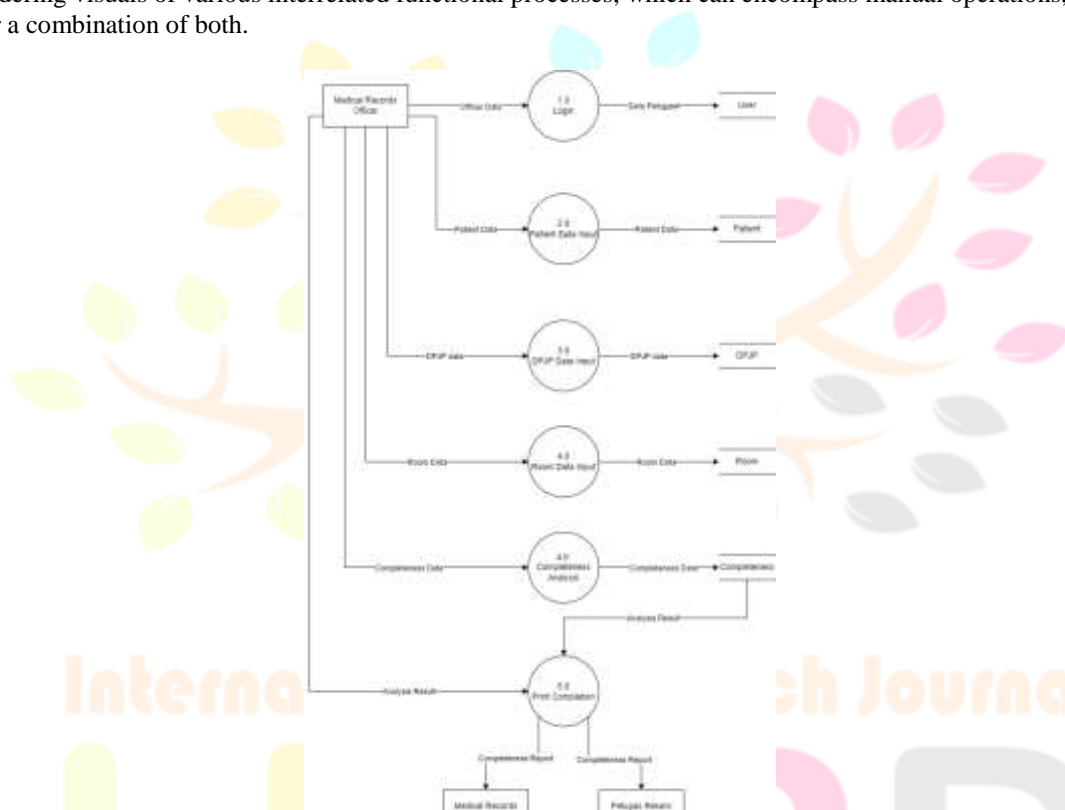
Figure 4. *Data Flow Diagram* that was designed

2.2.4 *Entity Relationship Diagram* (ERD)
ERD (Entity-Relationship Diagram) is a diagram used to design tables that will later be implemented in a database (Kusumah et al., 2023). ERD is formed based on 3 (three) elements: 1. Entities, 2. Attributes, and 3. Relationships.

Figure 5. *Entity Relationship Diagram* that was designed

RESULTS AND DISCUSSION

The result of this research is the development of a medical record completeness information system with accurate and precise data using Microsoft Visual Studio 2012. The following image shows the outcome of the design process of the medical record completeness information system.

Figure 6. The result of the report

3.1 Discussion

The results of designing this system indicate that initially, medical record staff manually input patient data. Following the research, the design of the medical record completeness information system is as follows:

1. Login Menu

   The login menu is used to initiate the use of the system application. The image shows the login menu.
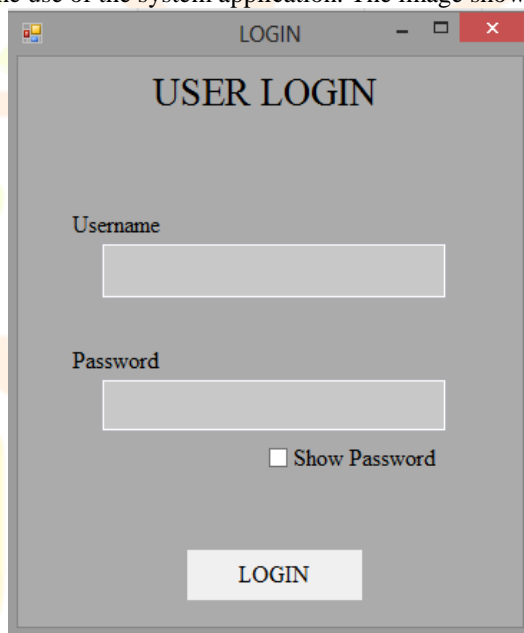
Figure 7. Login Menu

2. Main Menu

   The main menu of the outpatient medical record completeness information system is depicted below. The main menu is used to select the appropriate menu according to the user's needs.

Figure 8. Main Menu

3. Patient Data Form
   The patient data form interface, used to fill in information about patients who have visited the hospital.

Figure 9. Patient Data Form

4. Doctor Data Form
   The doctor data form interface can display doctor information, add doctor data, and view a list of saved doctors.
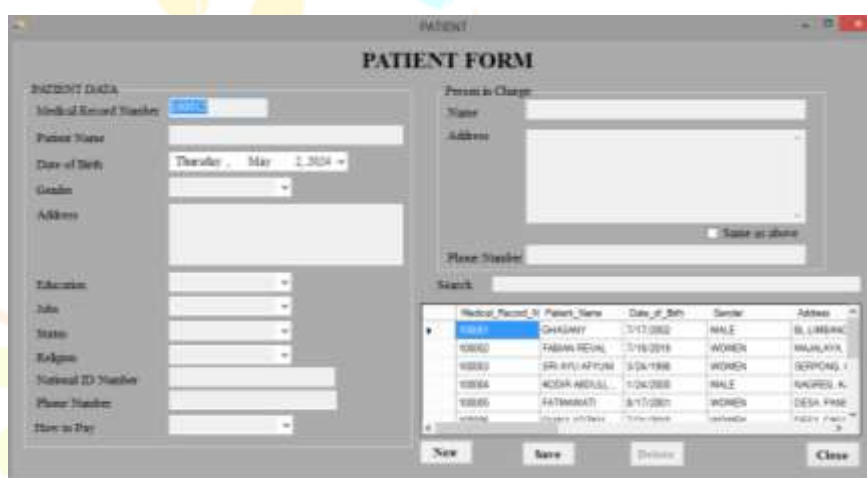

Figure 10. Doctor Data Form

5. Room Form
   The room data form interface can display available inpatient rooms in the hospital.

Figure 11. Room Form

6. Inpatient Medical Record Completeness Form
   The inpatient medical record completeness form is used to fill in indicators of the medical record form that will be checked for completeness of medical record files.

Figure 12. Inpatient Medical Record Completeness Form

CONCLUSION

The hospital's medical record unit does not make the most efficient use of its information technology when it comes to analyzing the completeness of inpatient medical records, according to studies conducted on the topic. This is due to the fact that spreadsheet apps are still used for data entry, which causes a lot of mistakes and slows down data processing. With the use of user-defined access permissions, the author created this service acceptance information system that encompasses the whole gamut of medical record completeness operations, from recording admissions to reporting on medical record completeness. The author built a computerized Medical Record Completeness Information System to solve the problem of making reports on medical record completeness. Recording and reporting on medical record completeness will be made simpler with this system.

RECOMMENDATIONS

We do a system socializing before and after changes to make sure users understand how the system is used and how it performs according to their job. Staff members may benefit from the author's medical record incompleteness information system, which allows for the creation of reports that are both accurate and exact.

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