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Analysis and design of accounting information system national health insurance acceptance cycle at Fatmawati Central General Hospital

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ABSTRACT

This research aims to analyze and design a client-server-based accounting information system at Fatmawati Central General Hospital. In this current condition, the reporting system is manual or still relies on Excel form, resulting in significant time consumption and inefficiency in presentation. The accounting cycle relevant to this research is the revenue cycle. This study utilized a Research and Development study through the Object-Oriented Analysis Design (OOAD) method, which focuses on model development using the Unified Modeling Language (UML). Data collection was conducted through interviews, observations, and documentation in order to obtain the necessary data. It is expected that this research could produce a design of a client-server-based accounting information system for the National Health Insurance claims acceptance cycle that aligns with the hospital's business processes.

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1. INTRODUCTION

The development of Information and Communication Technology is currently very important in providing effective solutions, where the existence of a computer-based electronic information system is very strategic in nature and can be useful in the development of science & technology in the era of globalization and computerization (Cahyo & Suryawinata, 2022; Simsir & Mete, 2022). Thus, information and communication systems do not only play a role in forming human resources but also in various elements of development (Samofalov, 2021; Wijayanti & Chamdani, 2022). The revolution in the field of technology, especially information technology, will have an impact on the accounting information systems used by various organizations (Drakic-Grgur, 2020; Wulandari & Irwanto, 2020).

Accounting information systems can be implemented manually (without computer tools). Besides, it also fully utilizes the latest computer technology and information technology, or can be a combination of the two. With a manual accounting information system, data processing becomes slow and the information system presented is less accurate (Fullana & Ruiz, 2021; Monteiro & Cepêda, 2021). On the other hand, a computer-based accounting information system (computerized system) will speed up data processing so that it will be able to add value to the business, which can improve quality, reduce costs, increase efficiency, provide timely and reliable

information to improve decision making, as well as increase the hospital's competitive advantage (Baker El-Ebiary & Alawi, 2020; Kurniati & Suryanto, 2021).

The accounting system most needed by hospitals is the implementation of an information system or revenue and receipt cycle accounting (ALSaqa et al., 2019; Fitrios, 2019). The system is able to control hospital financial activities by controlling every patient and insurance bill. This control can reduce misuse and minimize potential losses that can occur in the income and revenue cycle. The accounting information system in the revenue cycle in a hospital will always be supported by every activity within it . All information needed to manage these activities can be collected easily in process and store historically (Ahmad et al., 2022; Binh et al., 2022).

The most crucial activity in the revenue and receipts cycle is the cash receipts activity, where cash receipts will record patient bills in cash and patient bills on credit or often called receivables (usually insurance bills or office guarantees). In cash receipts, there is the potential for theft, so planning is needed to find steps that can secure or reduce the potential for theft that can occur in the cash receipt process. Cash flow management is crucial for overall profitability. Therefore, hospitals will use various methods to speed up the receipt of payments from patients or insurance (Ali & Ouda, 2021; DWIRANDRA & ASTIKA, 2020).

Fatmawati Central General Hospital has cooperative ties with several government and private companies and insurance companies. From the analyzed visitor data, it can be seen that the largest number of visitors at Fatmawati Central General Hospital are patients with the National Health Insurance (JKN) payment method or known as the Health Social Security Organizing Agency (BPJS), from the visitor data period from January to April 2023, with the percentage of the total number of visitors who registered at Fatmawati General Hospital for 4 months, with inpatient visitors was 93,16% and outpatient visitors was 83,26%.

In the process of paying claims to hospitals, BPJS Health does it all at once or in batches so that the payment data must be reprocessed by the claims department and patient visit data can be known whether they have been paid or not (Suharsimi, 2019). However, the data processing pattern carried out by the claims department is not yet systematic, which means it takes quite a long time and is less efficient in the presentation process. If patient visit data is found that has not been paid by BPJS Health, the claims department has difficulty searching for the files and the reasons why they cannot be paid by BPJS Health.

From the explanation above, several phenomena were found related to the cash receipts cycle, where the use of accounting information systems at Fatmawati Hospital was still manual. When management needs to analyze JKN acceptance data, it takes quite a long time to release the data. Other research shows that some accounting systems have worked well, but there are still several weaknesses that can cause losses. To overcome these weaknesses, an effective and efficient accounting information system was designed. This research is different from previous research, in this research designing an accounting analysis system that can overcome the problems of previous research.(Rekno Sawiji Lestari & Saiful Anwar, 2021; Sodikin, 2014; Wanialisa, 2020). In addition, other case is related to the INA CBF'S tariff, where it is paid based on diagnosis, not based on the tariff per patient action. According to this situation, this study aims to analyze the design of the accounting information system for the national health insurance revenue cycle at Fatmawati Central General Hospital.

2. RESEARCH METHOD

This type of research is qualitative descriptive research. This research was conducted at Fatmawati General Hospital. The data sources for this research are from primary data and secondary data. Primary data were obtained directly from the hospital, while secondary data sourced from library sources. Data collection techniques included interviews, observation, and documentation to obtain the required data. After the data were obtained, then analyzed using descriptive analysis methods.

The data analysis technique used a qualitative descriptive analysis technique based on research instruments through unstructured interviews and documentation, namely running system analysis and document analysis.

3. RESULTS AND DISCUSSIONS

This accounting information system is designed to be built on a client server, so the deployment diagram for this application is depicted in Figure 1. The client is connected to the server and database located at Fatmawati Central General Hospital by using intranet and internet network connections. The users simply open the application using a browser from the client PC.

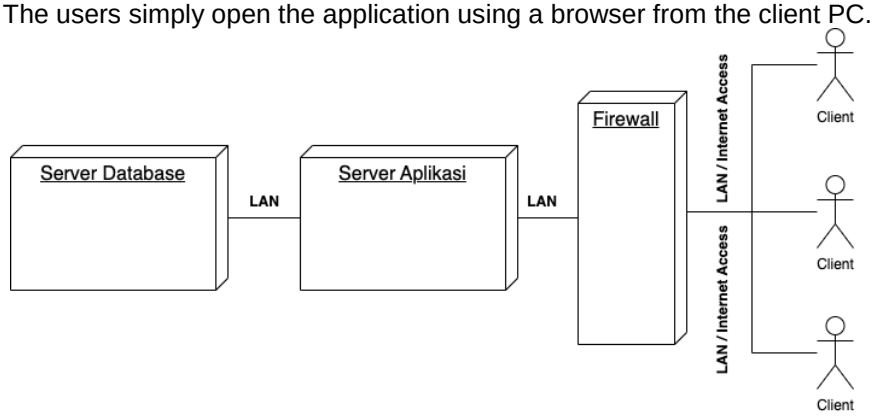

Figure 1. Client Server Deployment Diagram

Design of the application interface by paying attention to user experience or the user's experience in using the application. The application interface design is created into three main modules, namely the master module which contains the user master, the reconciliation module which is the claims data processing module, the dashboard module which displays the results of the reconciliation process, and the report module which produces the required reports. Furthermore, the author also designed an interface for the sign up & login process. The interface design for this application using the Figma tool is carried out as follows:

The first page that appears if the Login page, which displays a login form that requires the user to enter the registered email and password, then click the Login button. For the new user sign up process by clicking the Sign Up link here *(Sign Up disini)* in red color under the Login button.

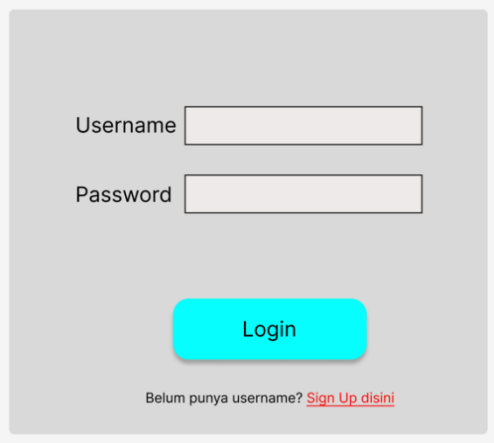

Figure 2. Login Page

After clicking the Sign Up link here, the user will be directed to the Create Account form shown in Figure 3. Here a form is provided to fill in user data information, such as full name, employee ID Number/*NIP*, work unit, username, password, and confirm password. After the form is completely filled in, the user clicks the Save button to end the sign up process and save the data that has been input.

Figure 3. Sign Up Page

For users who have admin access, they will be able to see all menus, while for user access there is one menu that does not appear, namely the user master menu. After Login or enter the application, the system will display the start page as shown in Figure 4, where the menus visible on the left are the user master menu, dashboard menu, reconciliation menu, and report menu.

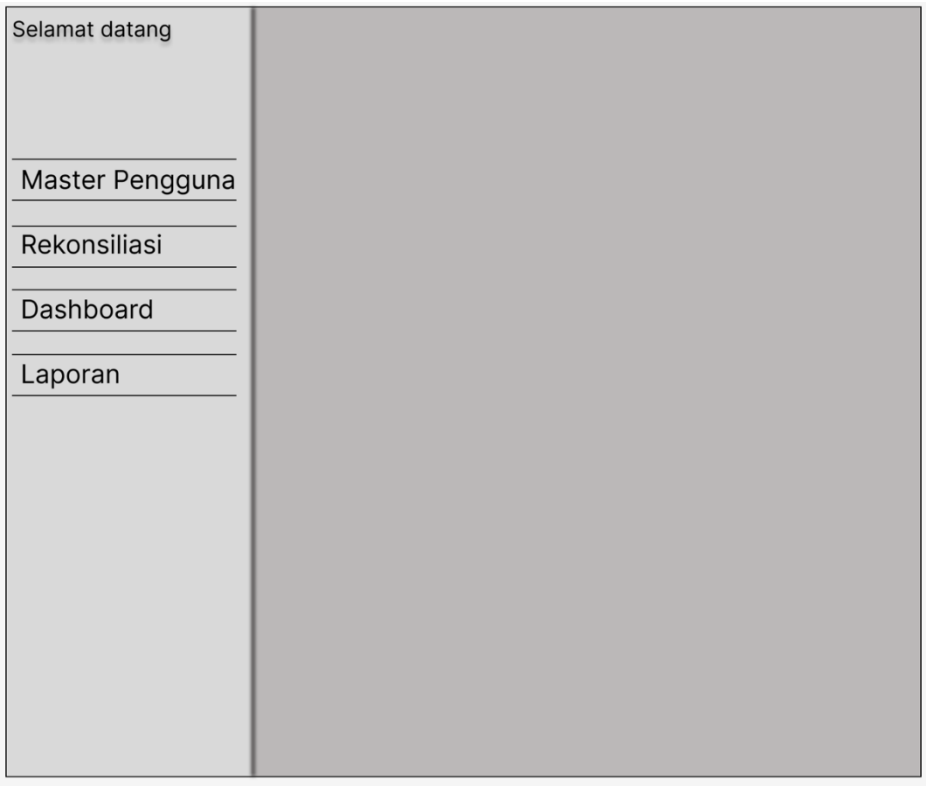

Figure 4. Home page

The user master menu can only be accessed by the admin. Where in this menu, it is the user management menu, managing users includes giving access levels, deactivating users, changing passwords, and the user data as shown in Figure 5.

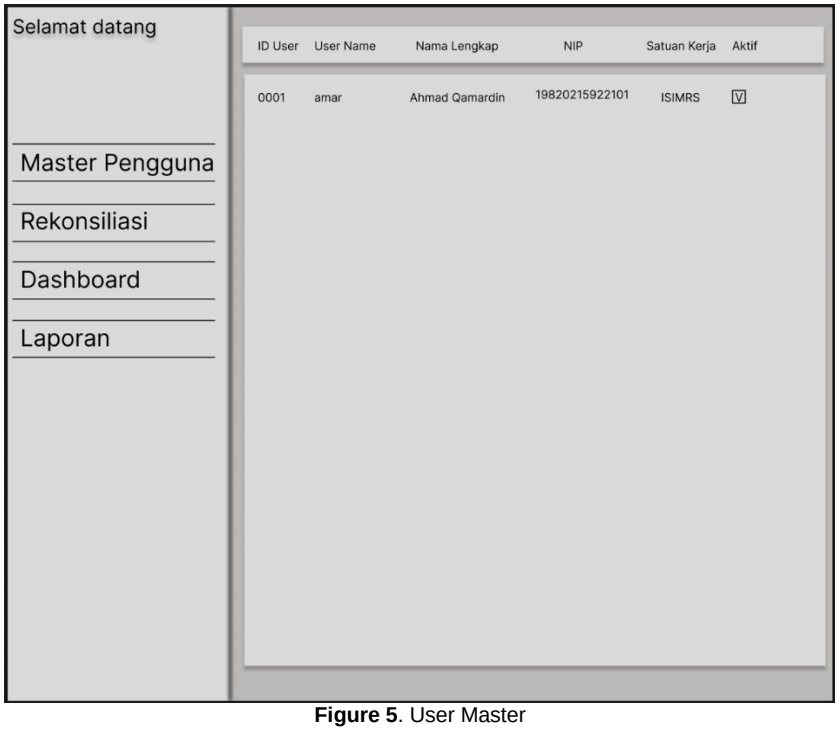

Figure 5. User Master

In the reconciliation menu of claims visit data and BPJS BAV data, a system lookup is carried out, namely the process of looking for visit data that has been paid for by claims by BPJS, where this process was previously carried out manually using Excel by the billing officer. As seen in Figure 6, before importing the BAV file in Excel format, first select the claims visit data in the top menu.

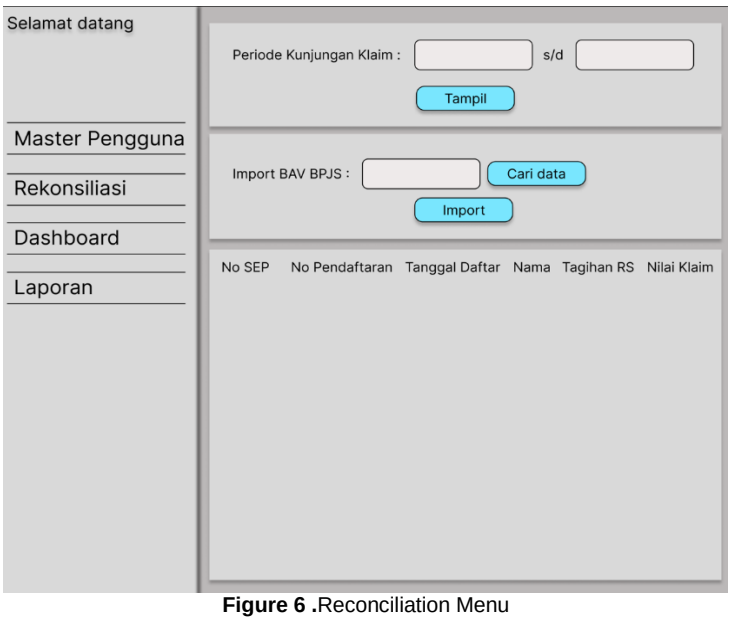

Figure 6 . Reconciliation Menu

The dashboard menu displays data that has been previously processed in the reconciliation menu. As seen in Figure 7, this menu only calls for mature data that has been processed systemically in the previous process for the management's needs. In this display, the users can see the difference in files and rupiah between submitting a claim and what has been paid by BPJS. On the right position, there is a See Details button to display details on the bottom form of the recap data display on the top form.

Figure 7 Dashboard Menu

As seen in Figure 8, when the users want to display a report, first select the type of report, namely Outpatient Claims Report in Figure 9, Inpatient Claims Report in Figure 10, Outpatient Income and Receipts Report in Figure 11 and Inpatient Income and Receipts Report in Figure 12. After that, select the reporting period. The data in this report will appear if the reconciliation process has been carried out in the previous process. The output of this report will be used by the accounting department to post to the income and receipts journal in the SIMRS (Hospital Management Information System) application and also used by the finance department as a receipt report to the recipient's treasurer.

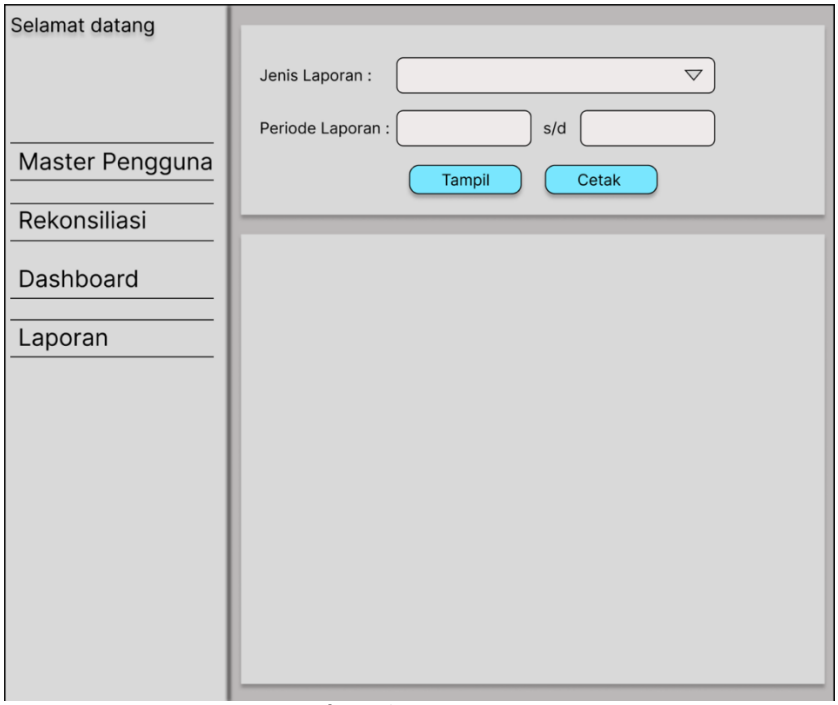

Figure 8 Report Menu

The outpatient claim report, as seen in Figure 9, is a report used as supporting documentation in the submission of claims for medical expenses incurred when a patient undergoes outpatient care. This report is used by the accounting and finance department as one of the foundations for recording outpatient claims received by Fatmawati General Hospital.

LAPORAN KLAIM

RAWAT JALAN

NO	NAMA PASIEN	NO RM	TANGGAL DAFTAR	TANGGAL KELUAR	CARA BAYAR	RUANG RAWAT	PENDAPATAN

Figure 9 Outpatient Claim Report

The inpatient claim report, as seen in Figure 10, is a report used as supporting documentation in the submission of claims for medical expenses incurred when a patient undergoes inpatient care within a single treatment episode. This report is used by the accounting and finance department as one of the foundations for recording inpatient claims received by Fatmawati General Hospital.

LAPORAN KLAIM

RAWAT INAP

NO	NAMA PASIEN	NO RM	TANGGAL DAFTAR	TANGGAL KELUAR	CARA BAYAR	RUANG RAWAT	KELAS RAWAT	PENDAPATAN

Figure 10 Inpatient Claim Report

The outpatient revenue and receipt report, as seen in Figure 11, is a document or summary that describes the amount of revenue received by Fatmawati General Hospital from patients receiving outpatient care. This report contains details about various sources of income received by the hospital, including fees paid by patients, health insurance, as well as other sources of income such as medical support service fees and pharmaceuticals.

PENDAPATAN DAN PENERIMAAN RUMAH SAKIT

RAWAT JALAN

NO	NAMA PASIEN	NO RM	NOMOR SEP	TANGGAL DAFTAR	TANGGAL KELUAR	CARA BAYAR	RUANG RAWAT	PENDAPATAN (TARIF RS)	TARIF PENGAJUAN KLAIM	CRR SEMENTARA	PENERIMAAN SEMENTARA	TARIF BAV	CRR	PENERIMAAN
1	2	3	4	5	6	7	8	9	10	11=10/9	12=9*11	13	14=13/9	15=9*14

Figure 11 Outpatient Income and Receipts Report

The inpatient revenue and receipt report, as seen in Figure 12, is a document or summary that describes the amount of revenue received by Fatmawati General Hospital from patients undergoing inpatient care within a single treatment episode at the hospital. This report contains details about various sources of income received by the hospital, including fees paid by patients, health insurance, as well as other sources of income such as room charges, medical support services, pharmaceuticals, and related services.

PENDAPATAN DAN PENERIMAAN RUMAH SAKIT

RAWAT INAP

NO	NAMA PASIEN	NO RM	NOMOR SEP	TANGGAL DAFTAR	TANGGAL KELUAR	CARABAYAR	RUANG RAWAT	KELAS RAWAT	PENDAPATAN (TARIF RS)	TARIF PENGAJUAN KLAIM	CRR SEMENTARA	PENERIMAAN SEMENTARA	TARIF BAV	CRR	PENERIMAAN
1	2	3	4	5	6	7	8	9	10	11	12=11/10	13=10*12	14	15=14/10	16=10*15

Figure 12 Income and Inpatient Admissions Report

To get a clearer initial picture of the design of the system to be built, the author will first explain the design of the proposed procedure as follows:

a. Proposed outpatient claims procedure:

(a) Design of a file completeness checklist module to facilitate the reconciliation of claims files, which will be used by outpatient data entry officers. *(b)* Placing coders on every floor of the outpatient building to speed up and simplify the distribution of claims files so that the coding process can be more effective and efficient. (c) IT officers provide regular education and reminders to doctors and nurses so that every patient who has completed receiving services can immediately have a control letter written through the SIMRS (Hospital Management Information System) application.

b. Proposed inpatient claim procedure:

(a) Design of a file completeness checklist module to facilitate reconciliation of claims files, which will be used by inpatient billing officers. (b) Placing coders close to inpatient billing will speed up and simplify the distribution of claims files so that the coding process can be more effective and efficient. (c) Placing service point officers close to inpatient registration officers, so that inpatient guarantees or inpatient SEPs can be made in real time.

c. Proposed claims reconciliation procedure:

The minutes of verification that has been approved between Fatmawati Central General Hospital and BPJS is in the form of a PDF file. The file is converted into an excel file, which is then imported into the application so that it produces data in the form of a comparison between hospital income, claim submissions, and BAV automatically in the system.(b) From the comparison data above, the users can see the CRR (Cost Recovery Rate) per each patient with the BAV formula compared to hospital income, which can be released systemically.

The implementation cost design using calculation of processing time, using the PERT (Program Evaluation and Review Technique) method formula (Sharma, 2006).

Table 1 Development Features and Activities

No	Features and Activities
1.	Login Page
2.	Homepage
3.	New User Input Page
4.	User Master Module
5.	Reconciliation Module
6.	Report Module
7.	Report Printout
8.	Application Trial
9.	*Bug Fixing*
10.	*Beta Testing*
11.	*Final Bug Fixing*

Based on the job structure that has been created, the optimistic and pessimistic values for each job are determined. The optimistic value is the value of the fastest time to do a job, while the pessimistic value is the longest time to complete a job. Optimistic and pessimistic values were obtained from interviews with the developer where the author works. The most likely value is added as the time value or duration that is most likely to occur in completing a job. The work structure, optimistic, most likely and pessimistic values can be seen in Table 2, which is calculated in working days.

Table 2 Job Duration

No	Features and Activities	Optimistic (O) (Working days)	Most Likely (M) (Working days)	Pessimistic (P) (Working days)
1.	Login Page	1	2	4
2.	Homepage	2	4	6
3.	New User Input Page	3	5	7
4.	User Master Module	3	5	7
5.	Reconciliation Module	20	30	60
6.	Report Module	10	15	20
7.	Report Printout	5	10	15
8.	Application Trial	1	3	5
9.	Bug Fixing	1	2	3
10.	Beta Testing	1	3	5
11.	Final Bug Fixing	2	3	5
	Total	49	82	137

After getting the optimistic, most likely, and pessimistic values, the expected time is calculated using the PERT formula, namely E=(O+4M+P)/6. Thus, the expected time for application development is as follows:

$$Expected\ Time\ (E) = \left(\frac{49+4\ (\ 82)+137}{6}\right) = 85{,}6 = 86 \text{ working days (rounding)}$$

From these calculations, it is found that the application system development work time is expected to be completed within 86 working days. If 20 working days are counted in one month, then the work takes 4 months and 6 days.

Next, calculate the number and costs of human resources or people needed for the work. For a simulated application development project, one Project Manager is needed to coordinate the team and the progress of the project, one Analyst, two Developers who are Back-end Developers and Front-end Developers, one Database Administrator who is responsible for server maintenance and database management. Finally, one QA/Tester person who is in charge to ensure the application will be launched no bugs, good UI/UX, neat and appropriate, as well as other corrections. The calculation of HR costs with a predetermined time duration can be seen in Table 3. For QA/Tester staff, the calculation is only 20 working days or one month because it starts from testing activities. The estimated cost used is based on the salary amount for human resources according to the position required for the job at Fatmawati Central General Hospital.

Table 3 Simulation of Application Development HR Costs

Position	Amount	Cost/Month	Work Duration (Months)	Total cost
Project Manager	1	11.000.000	4	44.000.000
Analyst	1	9.500.000	4	38.000.000
Front End Developer	1	8.000.000	4	32.000.000
Back End Developer	1	8.000.000	4	32.000.000
Database Administrator	1	8.500.000	4	32.000.000
QA/Tester	1	5.500.000	1	5.500.000
Total				183.500.000

Thus, the total investment to build this application is IDR. 183.50.000 using the IT team's independent work method at Fatmawati Central General Hospital. Another advantage of using the independent work method is that the Fatmawati Central General Hospital does not need to incur infrastructure costs, such as buying a server or installing a LAN network and it can be handled immediately for repairs if some application problems occur.

4. CONCLUSION

The analysis of the accounting information system for the BPJS claims acceptance cycle involved understanding the accounting information system for outpatient and inpatient claims of BPJS patients. It included evaluating and analyzing data related to the accounting information system for outpatient and inpatient claims of BPJS patients, processing, and describing data that has been obtained from the hospital. The design an accounting information system for the BPJS claim acceptance cycle by creating an infrastructure system, package diagram, use case diagram, activity diagram, sequence diagram, class diagram, deployment diagram, and user interface design as a system design document. The implication of the research results is that it can serve as inspiration for users of accounting information systems to develop information systems in order to improve user satisfaction of accounting information systems even better. This research is limited to transforming manual patterns into digitalization in processing claims data into useful information for management. Future research should consider designing a system with other accounting cycles, thus fulfilling the overall needs of the accounting system and generating comprehensive accounting reports. The practical implication of this research is that with this research it is hoped that it can become a discourse for all hospitals to improve the design of the accounting information systems used.

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