



Designing a Desktop-based Intelligent Information System on National Health Insurance (BPJS)

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ABSTRACT

The hospital is a referral place for BPJS patients to get health services. The problem after the stipulation of digital claim verification (Vedika) by BPJS on January 1, 2018 is the submission of non-current BPJS claims caused by changes in BPJS claim regulations every year and verification of claims carried out conventionally. The purpose of this study is to develop a smart claim information system for internal verifiers in hospitals.

This research is an action research study with the FAST method system development approach. Development of smart claims information system with the FAST method, namely (1) a preliminary study, (2) problem analysis, (3) needs analysis, (4) logical design, (5) decision analysis, (6) physical design and integration, (7) construction and testing, (8) Distribution and Installation. The system implementation is

implemented on a Windows-based operating system of at least version 7.0, the server uses OLEDB connection. The programming language uses Visual Studio 2008 with MySQL version 2.0, while for the database using Access database files (ACCDB).

The results of this study are the formation of a claim verification information system for internal desktop-based hospital verifiers with verification codesfication verification features, operation verification codesfication, complete diagnostic support examination requirements with an output in the form of a claim verification report sheet that is ready to be used as a verification tool for completing claims for BPJS files. The use of the smart claims system in claim file verification takes 1-2 minutes for all cases. These results are compared with before the smart claims application takes 1-2 minutes for non-surgery cases and 5-6 minutes for surgery cases. The smart claims application can update the BPJS claim rules change into the smart claims database if there are BPJS claim rules that change every time.

Keywords: Design, Information Systems, Smart Claims, Verification; FAST, Desktop-Based



Introduction

Hospital is one of the health service facilities that must receive and serve Social Security Administrator (BPJS) patient health (Kementerian Kesehatan RI, 2013, 2013). BPJS as an institution that organizes national health insurance (*Jaminan Kesehatan Nasional* -JKN) will now enter new changes made throughout Indonesia, starting on January 1, 2018 BPJS Health will uniformize the entire text of the Cooperation Agreement for Hospitals. The amendment to the Cooperation Agreement will be the application of the Vklaim application, the System “*Verifikasi Digital Klaim* (VEDIKA)” which helps the verification from the hospital to the BPJS. In 2018, in the last three months, there were several main hospitals and clinics in several regions that have implemented the BPJS Health application claim (BPJS Kesehatan, 2014).

The problem that occurred after the enactment of VEDIKA was the submission of BPJS claims from the hospital did not go well. That is caused by changes in BPJS claim regulations every year and verification of claims is still carried out manually. The process of claim verification activities by an internal verifier of a private hospital in Malang using ICD-10 and ICD-9-CM books that are used to code disease and actions / operations, while the completeness of diagnostic requirements is based on BPJS claim regulation, the manual method is not effective and efficient because it takes a long time to complete a verified claim file and is required to open a guidebook every time a diagnosis is codified, so that a system capable of supporting the BPJS claim verification process is needed. Thus the aim of this research is to develop a smart claim system for BPJS file claims for internal verifiers at the Hospital.

Literature Review

Claim verification process at the hospital is still done manually, but the claim process to BPJS has been carried out with the INA-CBG system. The design of a smart system for verifying claims of BPJS internal verifiers in hospitals has never been investigated before. This system was built to allow verifiers to no longer open the codification manual every time they wanted to submit a claim file per patient. The related research to support this research include:

1. Ibrahim Chandra (2006) who examined the Development of Information Systems for Inpatient Payments for Poor Family Patients Based on INA-DRG Casemix to Monitor Health Financing at Soedarso Regional General Hospital, West Kalimantan. In the research the researcher emphasized the inpatient payment process of patients from poor families based on INA-DRG casemix which is useful for monitoring health financing (Chandra, 2009).
2. Elsa Febrie Alvianitasari (2017) who examined the evaluation of the implementation of the verification system at the BPJS health office (VEDIKA) at the William Booth public hospital in Semarang. In this study only emphasizes the process of evaluating the strategy of RSU William Booth Semarang in dealing with the verification system at the BPJS Health (VEDIKA) office (Elsa Febrie Alvianitasari, Sutopo Patria Teak, 2018).



3. Adi Supriyatna (2016) who examined the information system for submitting claims for web-based public health maintenance. In this study more emphasis on building information systems to provide benefits from the convenience aspects felt by the insurance service company in carrying out the data processing and recapitulation of claim submission data, so that the information generated has accuracy, speed and accuracy (Supriyatna, 2016).
4. Dino Avinsa Anggara Putra (2016), a research to find out and analyze the completeness of BPJS claim files, the implementation of BPJS claim verification, as well as the causes of incompatibility of BPJS claims implementation at PKU Muhammadiyah Gamping Hospital (Dino Avinsa Anggara Putra, 2016).
5. Estri Aditya Pradani (2017), this research is a qualitative descriptive study, to find the root cause of the delay in verification files to IJP starting from the process of receiving claim files until sending to BPJS (Estri Aditya Pradani, Dewi Lelonowati, 2017).

Research methods

This research is an action research study with a system development approach with the FAST method. The stages of developing a smart claim system with the FAST method are (1) a preliminary study, (2) problem analysis, (3) needs analysis, (4) logical design, (5) decision analysis, (6) physical design and integration, (7)) construction and testing, (8) Distribution and Installation (Jeffery L. Whitten, 2011). In this research study only reached the seventh stage. Furthermore testing on this system uses blackbox testing. This research was conducted at a private hospital type C in Malang, with a bed capacity. A total of 107 beds. The average visit of outpatients per day is 275 people and the average visit of inpatients is 35 per person per day. The object of this research is the smart claim system for internal verifiers in hospitals and the subjects of this study are using five hospital internal verifiers. This study fulfilled the ethical test requirements of the Ethics Committee of the Faculty of Public Health, Diponegoro University, Semarang, number: 29 / EA / KEPK-FKM / 2019.

Results And Discussion

The results of qualitative research with the FAST method system development approach are presented by displaying the stages in each of the FAST methods in the form of pictures, tables and explanations. This research produces a smart claim system for internal hospital verifiers who will be able to accelerate the process of verifying the completeness of claims starting from the coding of disease, actions / operations, completeness of diagnostic requirements according to the regulations / claims rules of the BPJS, thus helping the verification process of BPJS claim requirements.

1. Preliminary studies

The location of this study was conducted in one private hospital in the city of Malang that serves BPJS patients. BPJS claim verification activities at the hospital are still done



manually. To support the claim verification process that can run smoothly and quickly, it is necessary to develop a BPJS smart claim information system. This is in line with the wishes of the hospital's internal verifier so that there are tools that can later be used to support the verification of the BPJS claim requirements. In addition, the development of the smart claims system is in line with the wishes of the hospital management to develop SIMRS. The flow of the claim verification process currently applied is as follows:

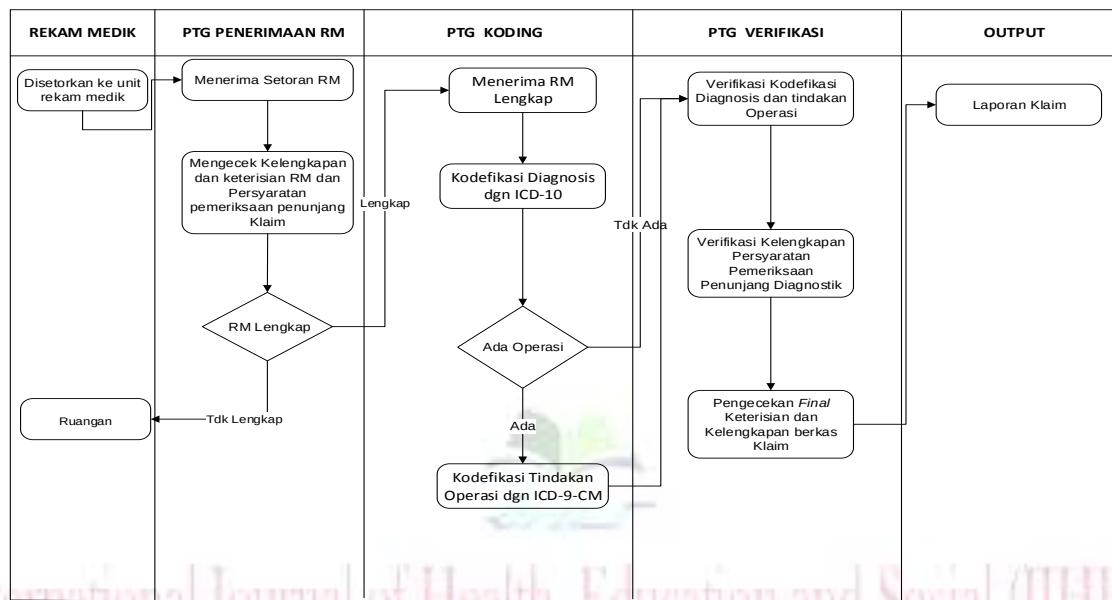


Figure 1. The flow of the Claim

2. Problem analysis

Based on the results of the identification and analysis of the problem, it can be concluded that the verification activities of the completeness of the claim requirements are still carried out manually which still uses the ICD-10 ICD-9-CM book, the claim handbook, and refers to the rules or guidelines for claim verification from the minister of health and the limited company BPJS.

3. Requirements Analysis

The information needed by the hospital's internal verifier on the development of a claim verification information system is information on the coding of the disease, the coding of the actions / operations, the completeness of the diagnostic requirements according to the Minister of Health Regulation or the limited circular letter of the BPJS Health Company.

4. Logical Design

Stages in logical design impose explanations related to functions logically in operating from the information system to the user (user). The context diagram in the claim verification



system with two entities, the entity that provides input is the medical record and internal verification of the hospital. The context diagram of developing a claim verification intelligent system is as follows:

Figure 2. The Context diagram of the development of smart claim system

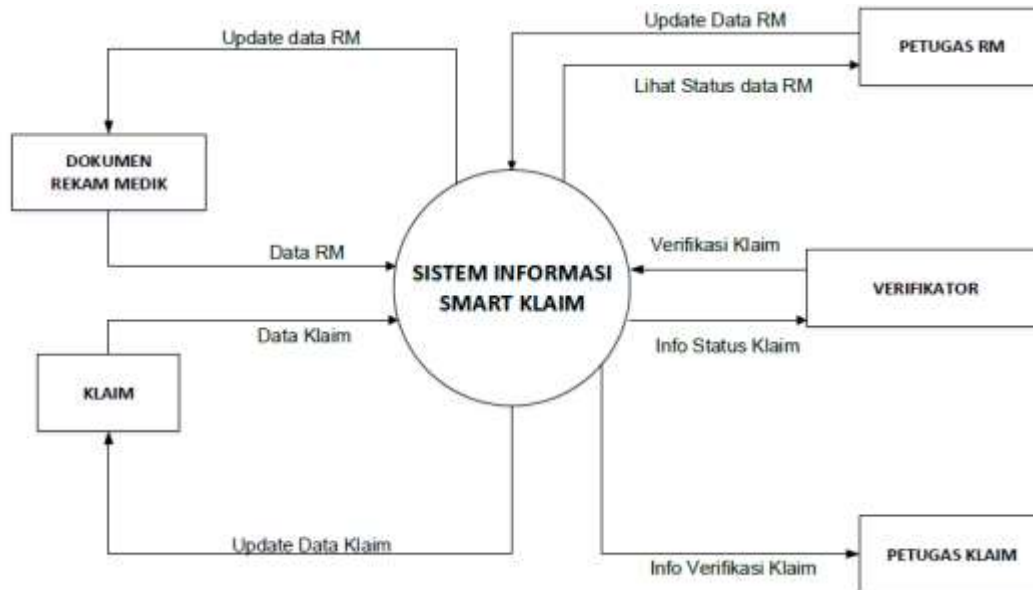


Figure 2. The Context diagram of the development of smart claim system

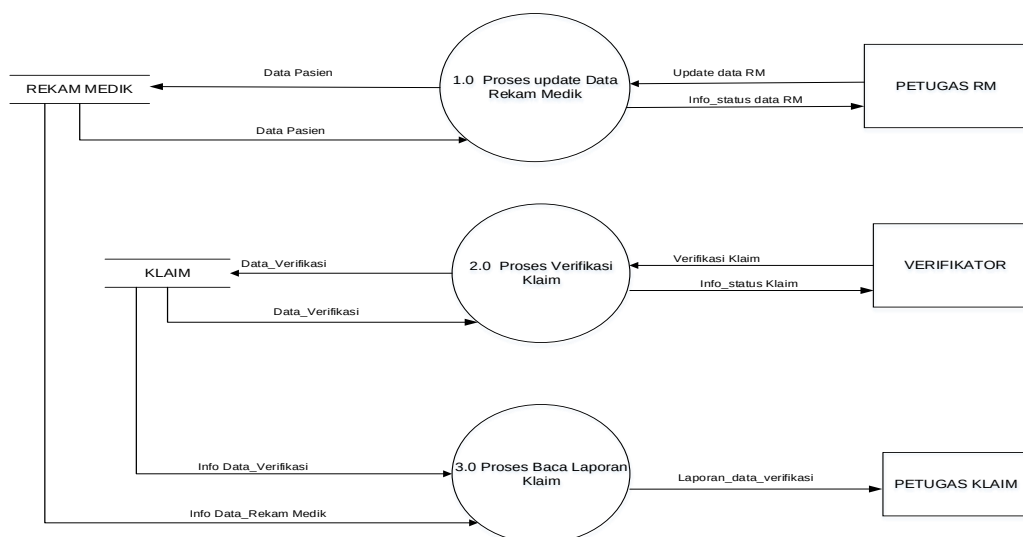


Figure 3. DFD Level 1 Sistem Smart Claim

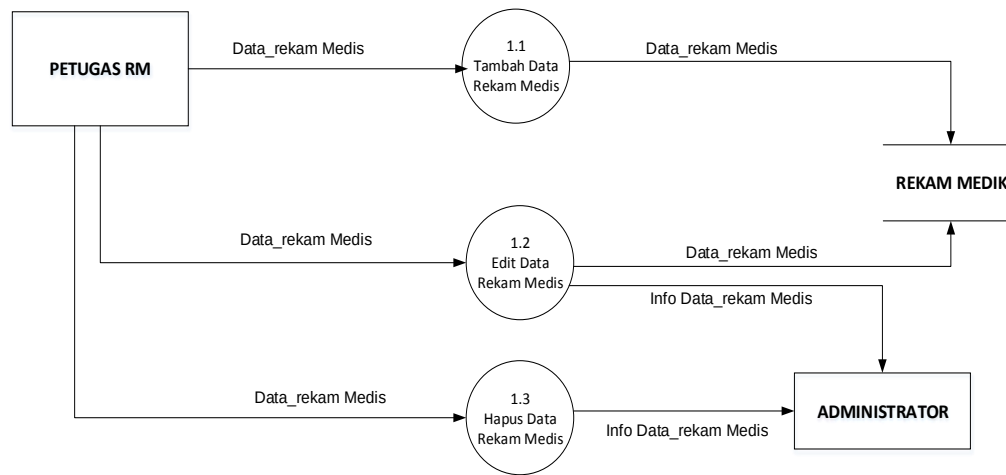


Figure 4. DFD Level 2 Proses Update Data RM

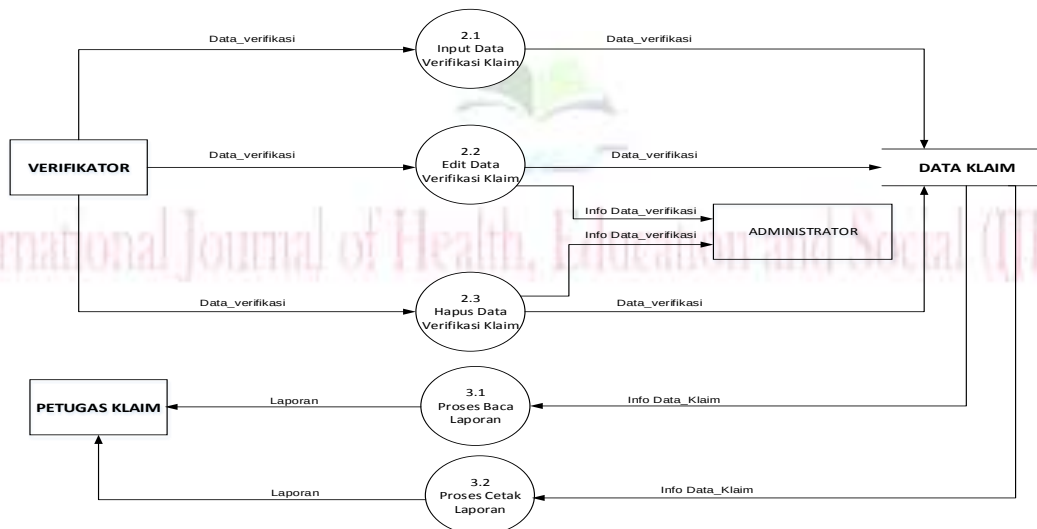


Figure 5. DFD Level 2 Proses Verifikasi dan cetak Laporan

5. Decision Analysis

Alternative choice of problem solving in Smart claim system design is to choose an information system design model with the approach of the internal verification of the hospital to the hospital manager. In choosing the use of software in the design of new information systems, two alternatives can be used, namely buying application programs in the free market and developing their own application programs for smart claims information systems. Selection of a minimum operating system Windows 7. The purpose of the operating system is to provide an environment that allows users to run any program easily (Abdul Kadir, 2004). Tools for the database (database) selected Access database files



(ACCDB). For programming using Visual Studio 2008 with MySQL version 2.0. Selection of network topology using OLEDB connection. Computer network topology is a pattern in the relationship between terminals on a computer network. The topology forms that can be used are bus, star and ring shapes. Whereas for network architecture which in general can use peer to peer, file server, and client server (Indra Riyana Rahadjeng, 2018).

6. Physical Design and Integration

The design of information systems in this study was carried out using stages including database design, input and output design and interface design. The Entity Relationship Diagram (ERD) intelligent verification system claims are as follows:

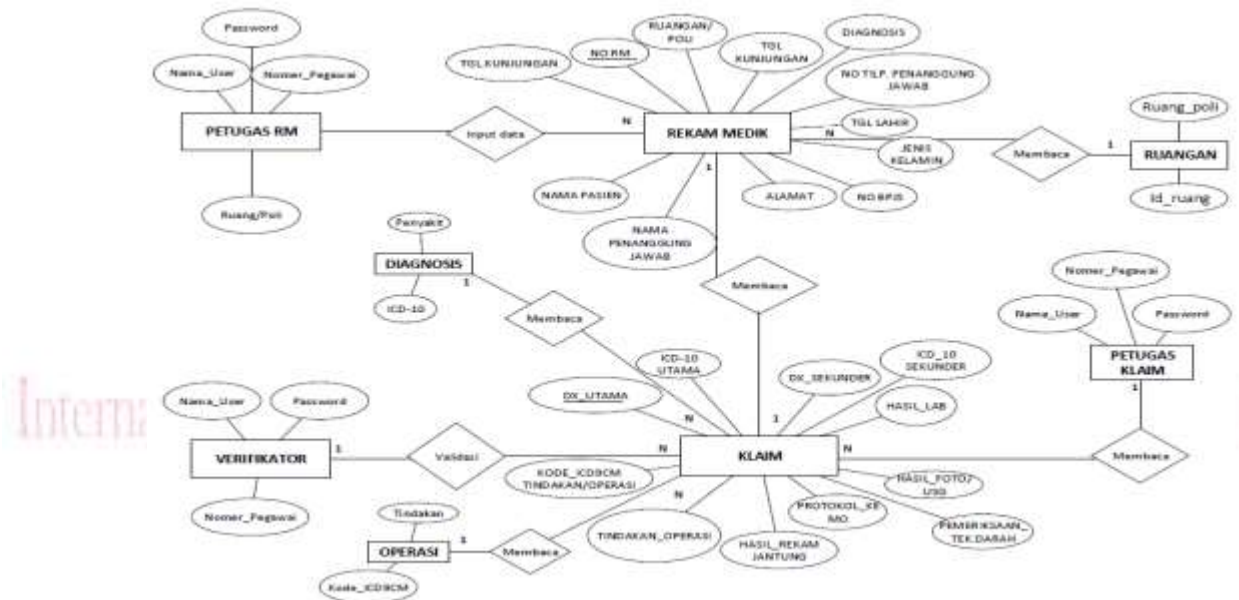


Figure 6. Entity Relationship Diagram sistem smart Claim

The set of related entities, described by attributes that indicate functions as attributes attached to the entity, as follows:

- The verifier entity consists of the attributes: username and password_user.
- The final entry entity consists of the attributes: *no_rm*, *no_Bill*, *ruang_poli*, *tgl_kunjung*, *hp_pedul*, *nama_px*, *nama_awab*, *nama_px*, *no_bpjs*, *tgl_lahir*, *jns_kelamin*
- The verification entity consists of the attributes: *dx_utama*, *dx_sekunder*, *icd_10*, *Hasil_lab*, *foto_foto*, *proto_kemo*, *results_ekg*, *check_darah*, *resum_medis*.
- The room entity consists of attributes: room_name, room_name
- The diagnosis entity consists of the attributes: disease, ICD_10
- Operating entities consist of the attributes: action, code-9-cm



Next design the interface (interface) that is built from communication between the user (user) system with a computer operating system. This communication consists of the process of inputting or entering data into the system, displaying output or updating information to users (users) or can be done together (Dewa Made Andika Dwi Prawiradirjo, 2018). The interface design for the intelligent claim verification system for internal hospital verification will be made with the following appearance:



Figure 7. Display Smart login login menu



Figure 8. Smart Claim Menu Display



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Kode Billing Tanggal Kunjungan

No RM Ruang Dirawat

Nama No Kartu BPJS

Alamat Nama penanggung jawab

Nomor yang bisa dihubungi

Jenis Kelamin

Tanggal Lahir

PROSES VERIFIKASI

Figure 9. Display medical record data updates

No RM Tanggal Kunjungan 28/04/2019 22:51:27 **KEMBALI**

Nama Ruang Dirawat ORCID 1

Diagnosa Utama Central infection, unspecified / CVA
ICD-9 **OK**

Diagnosa Sekunder Pneumonia, unspecified
J12.9 **OK**

Diagnosa Sekunder Tambahan Asidemia, unspecified
E84.9 **OK**

Kode Tindakan **OK**

Kode Tindakan Tambahan **OK**

Value Verifikasi

Hasil Laboratorium Verifikasi PPK/SE

Tinggi Tekanan Darah

Hasil Rolen Jantung

Hasil Foto USG/Rontgen

Respon Medis

Protokol Ners

Anamnesis

Verifikasi PPK/SE

Penelitian Task

1. Pemeriksaan tanda vital
2. Nadi
3. Suhu
4. Tekanan darah tanpa dukungan dan kit
5. Pemeriksaan jantung paru
6. Pemeriksaan bradikardi
7. Pemeriksaan abdomen
8. Pemeriksaan ekstremitas
9. Pemeriksaan neurologi
10. Keseluruhan : skor dari kuantitatif (Glasgow Coma Scale - GCS)
11. Tanda-tanda mengancam jiwa
12. Tanda-tanda mengancam jiwa
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97. Tanda-tanda mengancam jiwa
98. Tanda-tanda mengancam jiwa
99. Tanda-tanda mengancam jiwa
100. Tanda-tanda mengancam jiwa

DITAMBAH DITAMBAH LAINNYA DITAMBAH

Figure 10. Smart Claim Verification Display



LEMBAR LAPORAN VERIFIKASI KLAIM BPJS

Kode Registrasi :		Tanggal Kunjungan :	
Nomor RM :		Ruang Dirawat :	
Nama :			
Data Verifikasi :			
Kode Diagnosa Utama :		Hasil Lab :	
Diagnosa Utama :		Tinggi Tekanan Darah :	
		Hasil Rekam Jantung :	
		Hasil Foto USG :	
Kode Diagnosa Sekunder :			
Diagnosa Sekunder :		Anamnesa :	
Kode & Nama Tindakan :			

Figure 11. Smart Claim Verification Display

Claimed in the BPJS claim verification smart system has been adjusted to the claim verification flow. Results released from this system are published as proof that the medical record has been approved by verification, then the file will be continued in the process of submitting a claim to BPJS.

7. Application and Testing

This stage is the process of building a new information system and will be tested on newly built information systems. Where at the initial stage is the stage of programming a system that has the purpose of converting logic design into coding operations in the programming language. In developing the claim verification information system using the Visual Studio 2008 programming language with MySQL version 2.0. Operating systems that are used at a minimum use Windows version 7.0. For databases use Access database files (ACCDB). Claim verification information system application for internal verifiers of private hospitals in Malang using a minimum of two Intel Core i3 computers and a printer. The server uses an OLEDB connection. Furthermore, at this stage of testing using Black Box testing. Black Box testing is a testing strategy which only pays attention / focuses on functionality and software specification factors (Pressman, 2014). Black Box testing results are as follows:



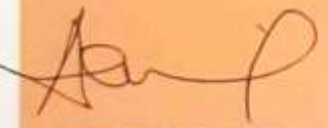
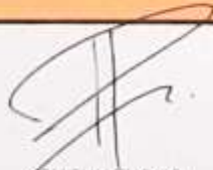
Nama Peneliti	Nama Penguji Perangkat Lunak	Nilai Uji Blackbox General System Characteristics
 FIRSTANTO AGUNG PRIADI Npm. 25000117410006	 PUGUH YUDHO TRISNANTO, S.KOM, MM Nip. 19802250011001	68 Diterima

Figure 12. Black Box Test Results

The results of the blackbox test obtained a value of 68 which means that the system is ready to be implemented because the system that was built did not find fault both in terms of function, interface error, database, performance error that is how much time is needed.

After testing the development of the smart claims system for hospital internal verifiers, it can be concluded that this application found no errors in the test method [1]. Equivalent Partitioning, [2]. Boundry Value and [3]. Error Guessing and declared feasible to do test the Brainware system with a note that there is a HCI test result sheet with a GSC value of $50 > 100 < HCI > 100$ this is done to determine the level of success when done by the user or system user with the application tool used. With information on the value of CC 50 complex and critical procedures. High risk level of repair is 40% probability of repair.

Table 1. System Testing Results

Method Used	Result
Equivalent Partitioning	no errors were found
Boundary Value	no errors were found
Error Guessing	no errors were found

The results of smart claim system design in hospitals are able to overcome the problems faced by hospital internal verifiers. Desktop-based smart claims system with diagnostic verification verification features, verification of operations, completeness of diagnostic support examination requirements with output of claim verification report sheet ready to be used as a tool to accelerate verification of BPJS file completeness claims.

Table 2. Simulation Results of Smart Claims Information System Quality

No.	Information Quality	Appropriate	Not In Accordance
1.	Accuracy of Information		
	- Data input on the operation of the claim information system is error free	505 (98,63%)	7 (1,37%)
	- Diagnosis and coding data input based on Accurate ICD-10	505 (98,63%)	7 (1,37%)
	- Accurate action / operation data input and	505 (98,63%)	7



codification based on ICD-9-CM		(1,37%)
- Display diagnostic requirements appear accurate and in accordance with the diagnosis	505 (98,63%)	7 (1,37%)
Diagnosis of the disease		
- Display input data on administrative requirements is accurate and in accordance with BPJS Claims Technical Guidelines	505 (98,63%)	7 (1,37%)
2. Completeness of Information		
- Disease Codefication data displayed complete	505 (98,63%)	7 (1,37%)
- Kodifikasi Data Actions / Kodifikasi operations that appear complete	505 (98,63%)	7 (1,37%)
- Diagnostic Requirements Data displayed is complete and in accordance with disease diagnosis	505 (98,63%)	7 (1,37%)
- SE No. HK.03.03 MENKES 518-2016 with a complete diagnosis of the disease	505 (98,63%)	7 (1,37%)
- Disease diagnosis and PPK data are displayed in full	505 (98,63%)	7 (1,37%)
3. Information Availability		
- At the time of disease diagnosis data input, disease coding data based on ICD-10 is available	510 (99,61%)	2 (0,39%)
- When inputting action / operation data, action coding data based on ICD-9-CM is available	510 (99,61%)	2 (0,39%)
- At the time of diagnosis data input, the display of diagnostic requirements according to the PMK / S.E Minister of Health / Technical Manual claims is available	510 (99,61%)	2 (0,39%)
- At the time of input of action / operation data, the display of diagnostic requirements in accordance with the PMK / SE of the Minister of Health / Technical Manual claims is available	510 (99,61%)	2 (0,39%)
- Clinical practice guidance information is available	510 (99,61%)	2 (0,39%)
4. Aksesibilitas Informasi		
- Input data prepared from the information system is easily accessed by those who want to use it.	511 (99,80%)	1 (0,2%)
- Access the information system for Verification of claims using a password	511 (99,80%)	1 (0,2%)
- Claim verification information system can be accessed quickly by the verifier	511 (99,80%)	1 (0,2%)
- Easy access to disease coding (ICD-10) based on disease diagnosis	511 (99,80%)	1 (0,2%)
- Easy access to action coding (ICD-9CM) based on diagnosis of action / operation	511 (99,80%)	1 (0,2%)



Table 2 shows that the average quality of information generated from the April 2019 claim file verification simulation is the accuracy of the information and the completeness of the appropriate information of 98.63% and the non-conformity of 1.37%, the availability of suitable information of 99.61 % and those that are not appropriate is 0.39 and the accessibility of appropriate information is 99.80% and those that are not appropriate is 0.2%. Thus the quality of the information generated is in accordance with the objectives of the users of the information system that is the hospital's internal verifier.

The time generated by the smart claims application during the simulation of claim file verification in April 2019 is 512 claim files with an average of 1 minute is 8.5 hours, while the time required before the smart claim application is 14.2 hours with the following details :

- a. Non-operative cases were 426 claim files with an average time of 1 minute being 7 hours.
- b. Operating cases were 86 claims with an average time of 5 minutes were 7.2 hours. The conclusion of the simulation results using the smart claims application can accelerate verification of 5.7 hours compared to not using SIVERIK.

Conclusion

The smart claims information system has a database of patient data, disease data (ICD 10), surgery action data (ICD 9), and claim data. Features in the smart claim system include verification of the coding of the disease, the coding of the operations, and the completeness of the supporting examination that produces the verification report of the claim.

Testing the system using Black Box is known that the results of testing the final entry and verification section that is on the user's actions and system response has been going well and in accordance with the objectives of the system user. This system has ease of operation and is able to accelerate the BPJS patient claim verification process.

Claim verification system simulation uses an internal hospital verifier with an average use of 1 minute per file with the quality of information generated based on indicators of information accuracy and completeness of information with an appropriate value of 98.63%, while the availability of information produces an appropriate value of 99 , 61%. Indicator of information accessibility produces an appropriate value of 99.80%.

Acknowledgments

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