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Analysis and Design of Customer Service Information Systems at Bersaudara Car Repair Shop Of Pangkalpinang

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ABSTRACT

Bersaudara Car Repair Shop of Pangkalpinang is a business that operates in the field of automotive services, specializing in car maintenance and repair. Currently, customer service data processing still uses a manual system with Microsoft Office tools. In its application, this application cannot support fast and easy work. This can have implications for service providers towards customers, because they often encounter obstacles in the process of handling repairs and making reports. The aim of this research is to provide a solution in forming a needs analysis and documented information system design which will be developed into an information system application at the brothers' car repair shop. Based on the SDLC (Software Development Life Cycle) concept, the initial thing needed to produce an information system is to create a needs analysis and documented system design. The system analysis and design carried out here goes through the stages of data collection, carrying out analysis using the PIECES (Performance, Information, Economic, Control, Efficiency, Service) framework and carrying out system design using an object-oriented approach using UML (Unified Modeling Language) notation. The results of the analysis and design were tested in the form of a design evaluation using the consistency analysis method which was proven to have a consistent percentage value of 100%. The results of this design are included in the correctness category which proves that the system requirements and system design are consistent and correct.

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Bengkel Mobil Bersaudara Pangkalpinang adalah suatu usaha yang bergerak dalam bidang jasa otomotif spesialisis perawatan dan perbaikan mobil. Saat ini dalam pengolahan data pelayanan pelanggan masih menggunakan sistem manual dengan alat bantu Microsoft Office. Dalam penerapanya, aplikasi ini belum bisa menunjang kerja yang cepat dan mudah. Hal ini dapat berimplikasi pada pelayan terhadap pelanggan, karena sering sekali mendapatkan hambatan dalam proses penanganan perbaikan dan pembuatan laporan. Tujuan dari penelitian ini adalah untuk memberikan solusi dalam membentuk sebuah analisis kebutuhan dan perancangan sistem informasi yang terdokumentasi yang akan dikembangkan menjadi sebuah aplikasi sistem informasi pada bangkel mobil bersaudara. Berdasarkan konsep SDLC (Software Development Life Cycle) hal awal yang dibutuhkan dalam menghasilkan sistem informasi adalah membuat sebuah analisis kebutuhan dan perancangan sistem yang terdokumentasi. Analisis dan perancangan sistem yang dilakukan disini melalui tahapan pengumpulan data, melakukan analisa dengan menggunakan kerangka PIECES (Performance, Information, Economic, Control, Efficiency, Service) dan melakukan desain sistem dengan pendekatan berorientasi object dengan memanfaatkan notasi UML (Unified Modelling Language). Hasil dari analisa dan perancangan diuji dalam bentuk evaluasi perancangan menggunakan metode consistency analysis terbukti memiliki nilai presentase 100% konsisten. Hasil perancangan ini termasuk kategori correctness pada uji correctness yang membuktikan bahwa kebutuhan sistem dengan perancangan sistem bersifat konsisten dan benar.

I. Introduction

With business competition and the rapid development of information technology, every company is always required to be able to carry out updates in the management of ongoing business systems and business processes. Pangkalpinang Brothers Workshop is a business that operates in the field of automotive services, specializing in car maintenance and repair. Based on the results of interviews, it is known that there are operational activities that are carried out conventionally. Moreover, it is known that Bengkel Bersaudara does not have an information technology division, which causes the company's operations to only use Microsoft Office to support administrative performance.

So far, the customer service process has been carried out directly between the customer and the workshop manager, represented by administrator staff, by dialogue and providing manual administrative notes to the customer. This is considered less fast and effective because it takes time and money to produce the required information. Bengkel Bersaudara has the desire to improve conventional operational activities to become information system based due to demands from customers to be able to produce information more quickly and effectively. This research aims to provide a solution in forming a needs analysis and documented information system design which will be developed into an information system application at the brothers' car repair shop.

Based on the SDLC concept, the first thing needed is a needs analysis and documented system design. This is done to provide an overview of what kind of system is desired. The system analysis and design carried out here goes through the stages of data collection, carrying out analysis using the PIECES (Performance, Information, Economic, Control, Efficiency, Service) framework and carrying out system design using an object-oriented approach using UML (Unified Modeling Language) notation.

After carrying out the design, it is necessary to evaluate the design so that it can be seen whether something that has been designed meets the needs or not. Consistency Analysis is used to analyze the consistency of system design results by utilizing the relationships between design elements and measuring the percentage of consistency between requirements, business processes, processes and specifications in the system design. Meanwhile, the Correctness Test is used to make improvements to the suitability of the system requirements specifications with the function of the system to be developed. On the basis of the description above, research was prepared entitled " Analysis and Design of a Customer Service Information System at the Bersaudara Car Workshop of Pangkalpinang "..

II. Methodology

Research methodology is a mechanism for solving research problems and explains the methods used during this research. The stages used in this research are:

A. Data collection

Data collection is carried out by conducting interviews and observations to determine problems that can be resolved.

B. Need Analysis

Needs analysis was carried out using the PIECES framework to identify problems in the old system and map existing problems based on the categories mentioned in each letter: Performance, Information, Economic, Control, Efficiency, Service. which is continued by

defining the functional requirements and non-functional requirements of the system to be built. The PIECES method is a framework used to classify existing problems based on the categories mentioned in each letter: Performance, Information, Economic, Control, Efficiency, Service [1].

C. System Design

System design is a follow-up to the results of the needs analysis carried out by modeling the system using the Unified Modeling Language, which is a language standard that is widely used in the industrial world to define needs, analyze, design and model architecture in object-oriented programming. UML is a notation in visual form for modeling and communicating a system using diagrams and supporting text. The modeling used in this research includes usecase, activity diagram, sequence diagram and class diagram [2].

D. Design Evaluation

Evaluation of the design for the system created using consistency analysis and correctness testing. Consistency analysis is used to carry out consistency analysis on system design results by utilizing the relationships between design elements and measuring the suitability of existing business process needs with system design. Meanwhile, the correctness test is used to make corrections to the suitability of the system requirements specifications with the system functions to be developed.

Requirement consistency analysis is a method for conducting consistency analysis on system design results by utilizing relationships between design elements [3]. To implement it, 4 work steps are required, namely:

- Layers and Configuration Items

  This stage describes the 4 layers that will be analyzed. These layers are:

  a) Business layer which contains organizational goals for processes that are already running in an organization.
  b) Process layer which contains existing processes and sub-processes to achieve organizational goals.
  c) Requirements layer which contains key system requirements based on processes and sub-processes.
  d) Specification layer which contains needs analysis in the form of specific requirements.

- Configuration Structure

  This stage provides guidelines for identifying layers and connecting the 4 layers in the first component.

- Consistency Analysis

  This stage provides validation of the second stage by describing the relationship between the 4 layers that have been defined in the form of a consistency analysis diagram.

- Requirement Consistency Index

  Requirement Consistency Index calculates the percentage of consistency in defining requirements. The RCI calculation is written with the following equation:

$\mathrm{RCI} = A/(B + C)$

A= Consistent number of required elements.

B= Total number of requirement elements.

C=Number of requirements elements that are defined incorrectly.

This test is a conformity test that focuses on the needs and design of the system that will be developed by checking each functional component of the system that has been designed in accordance with its specifications. The categories in this evaluation are:

- Fulfillment of correctness requirements if the candidate element has a correlation with each user's needs.
- Fulfillment of partially correctness requirements if the candidate element has most of the correlation to each user's needs.
- Fulfillment of the requirement to terminate normally if most or all of the candidate elements do not correlate with the user's needs.

III. Results

Consistency analysis is used to carry out consistency analysis on system design results by utilizing the relationships between design elements and measuring the suitability of existing business process needs with system design. In the design evaluation carried out using a consistency analysis test to define requirements using the requirements configuration structure. The first step is to determine components to fulfill the business layer, process layer, requirements layer, and specification layer. Next, a mapping step is carried out to provide relationships between layers to measure the level of consistency. Calculating the RCI (Requirement Consistency Index) is done to calculate the percentage of consistency of the system to be built. The layer mapping results explain that:

- The total requirement (A) is consistent with the number 23
- Total requirement items (B) with a total of 23 included in the B value, namely 4 business layer items, 3 process layer items, 5 requirement layer items, and 11 specification layer items)
- Total undefined requirements (C) with a total of 0

Each variable that has been identified will be included in the RCI assessment to produce a value of 100%. This proves that the consistency of requirements in the system is proven to be consistent.

The Correctness test is used to make corrections to the suitability of the system requirements specifications with the system functions to be developed. Evaluation to ensure that every requirement in the system is in accordance with the needs and design. The results of system requirements and system design will be identified as certain categories where there is a relationship between the two. For example, system requirements are a set R which has 5 types of requirements and system functions have 11 types of functions which are likened to a set P. By identifying the requirements R and P it is known to produce the value dom (R ∩ P) = dom (R). This proves that the function of the designed system is appropriate in accordance with each requirement from the requirements specifications.

IV. Discussion

A. Data Collection

Data collection is carried out by conducting interviews and observations to determine the problems to be resolved. The data collected is in the form of ongoing service process flows that have problems that need to be resolved, including:

- Customer requests to carry out maintenance and repair processes,
- The process of distributing work to technicians,
- The process of handling maintenance and repairs carried out by technicians
- Payment process after completion of maintenance and repairs.

B. Needs Analysis

Requirements analysis is carried out using the PIECES framework to identify problems in the old system by mapping existing problems based on the categories mentioned in each letter: Performance, Information, Economic, Control, Efficiency, Service, followed by defining the functional requirements and non-functional requirements of the system. will be built.

1. Problem Identification

a) Performance

Table 1. Performance Identification

Factor	Current System
Throughput	The number of workers responsible causes a high risk of human error.
Response Time	• The existing administrative process is still manual, affecting requests for information that take longer • The large amount of data that is managed cannot be accommodated by easy searches

b) Information

Table 2. Information Identification

Faktor	Current System
Output	Lack of necessary and relevant information Inaccurate information
Input	Data is not captured as required
Saved data	• Data is not well organized • Data cannot be accessed • Data is not flexible, it is not easy to meet new information needs

c) Economic

Table 3. Economic Identification

Faktor	Current System
Costs and benefits	High costs for several manual processes from an operational perspective where admins still use paper for excessive documentation processes for data recaps.

d) Control

Table 4. Control Identification

Faktor	Current System

Control	• Several operational processes have not been accommodated in the system • The system used by the admin to process large amounts of data every month can cause errors in input. • Data privacy regulations or guidelines are (or could be) violated • Managing large amounts of files in the workshop results in accumulation
Security	Storing files in the form of documents can cause loss and damage to documents if they are not stored in the system.

e) Efficiency

Table 5. Efficiency Identification

Faktor	Current System
Time, energy and cost efficiency	• Data search processes that are still manual can require more time, causing a decrease in the quality of operational processes • Excessive use of paper can affect expenses

f) Service

Table 6. Service Identification

Faktor	Current System
Service	• The recap process carried out by the admin with high file transactions can reduce the quality of system services. • Operational processes have not been fully integrated and automated

2. Identification of Functional Needs

Functional requirements identification defines the specifications of the things that a system must do. From the system to be created, the form of functional requirements is defined as follows:

a) The system provides a customer request form to carry out the maintenance and repair process (RL-1).

b) The system provides work distribution information to technicians (RL-2)

c) The system provides information on the progress of maintenance and repair handling carried out by technicians (RL-3).

d) The system provides payment information after completion of maintenance and repair handling (RL-4)

e) The system provides user authentication facilities (RL-5)

3. Identification of Non-Functional Needs

Identification of non-functional requirements defines the properties or qualities that a system must have. Identification of non-functional needs is prepared by reducing the framework to problem identification.

a) Performance

- The system has a fast response time

b) Information

- The information displayed is accurate and as needed
- Information can be updated as needed

c) Economy

- The system can reduce costs
- The system can be accessed anytime and anywhere via a computer connected to the network.

d) Control and Security

- The system must be able to authenticate users to control access through the login facility.

e) Efficiency

- Use of the system can encourage efficient use of paper

f) Service

- Network based system
- The system must be easy to use (user friendly)
- Neat and structured system creation documentation
- The system must be able to minimize human error

4. System User Identification

System users who will be involved in business processes are Customers (PL-1), Technicians (PL-2) and Admin (Pl-3). From the identification of the specified system users, the business processes that will be analyzed in this system will occur, namely:

a) The customer makes a request to the repair shop, in this case represented by the admin, to carry out the vehicle maintenance and repair process (BL-1)

b) Admin accepts requests and distributes work to technicians (BL-2)

c) Technicians handle maintenance and repairs and provide work results reports (BL-3).

d) The customer carries out the payment process to the repair shop represented by the admin after completing maintenance and repairs by the technician and picking up the vehicle (BL-4).

C. System Planning

System design is a follow-up to the results of the needs analysis carried out by modeling the system using the form of Unified Modeling Language, which is a visual notation for modeling and communicating a system using diagrams and supporting text.

1. Data Design

Data design was formed with the aim of showing the flow of data that occurs in the system by showing the relationship between interrelated data. The design data in this design uses a class diagram in the following form:

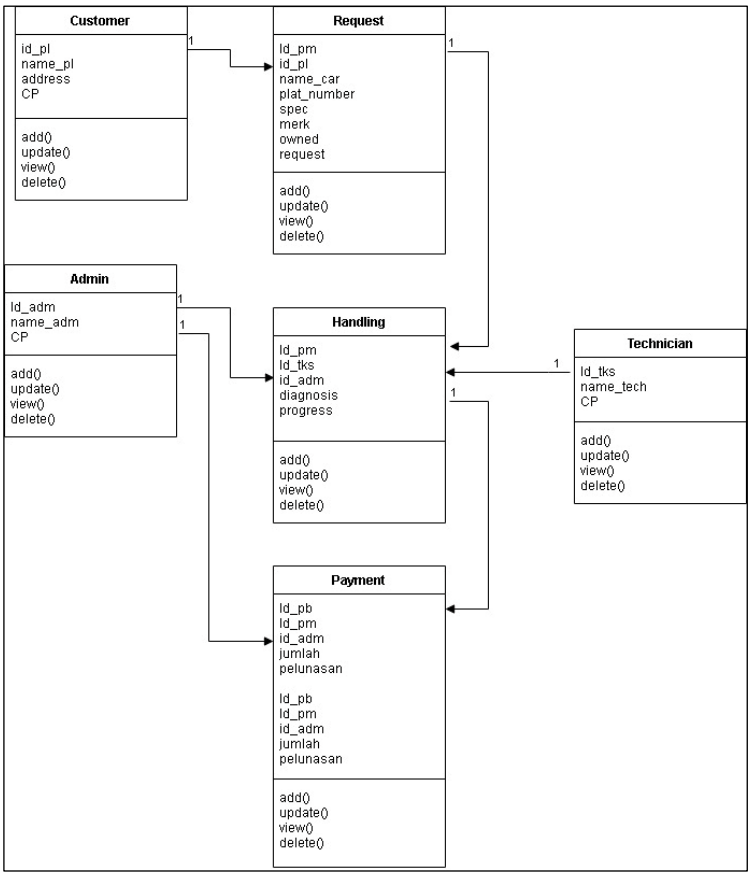

Figure 1. Class Diagram

Figure 1 explains the form of the class diagram that has been created which depicts 6 classes. These classes consist of customer class, request class, handling class, admin class, technician class and payment class. The customer class contains customer data items, the request class contains data on customer requests to car repair shops. The handling class contains the development of the repair and maintenance process. The technician class contains technician data. The admin class contains admin data and the payment class contains payment information from the results of handling car repairs and maintenance.

2. Logical Design

Logical design is formed to describe the process flow that occurs in the system from each input process to produce the required output or information

a) Use Cases

The results of the system's functional requirements will be further described in the form of a use case diagram to determine user behavior towards the system and system towards user behavior. There are 11 use case items that describe the functional requirements of the system to be designed (SL-1 to SL-11)

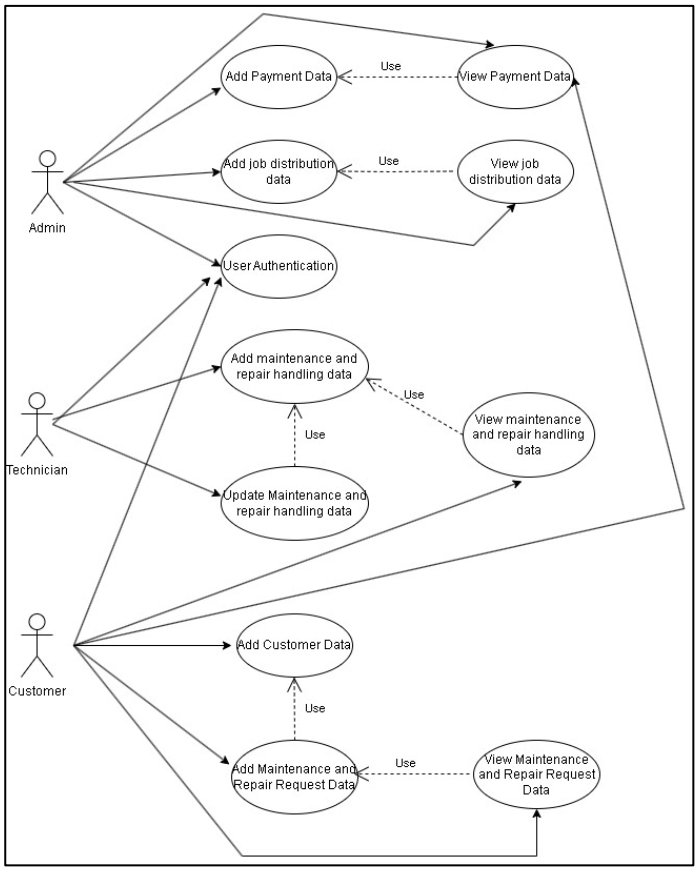

Figure 2. Use Case Diagram

Figure 2 explains the business process of the functional requirements that have been analyzed, which consists of 3 actors, namely admin who has a user authentication use case, filling in job distribution data, filling in payment data, viewing job distribution data and viewing payment distribution data. The technician actor has a user authentication use case, fills in maintenance and repair handling data, updates repair and maintenance handling data. For customer actors, there are use cases for filling in customer data, filling in maintenance and repair request data, viewing repair and maintenance handling data, viewing repair and maintenance request data and viewing payment data.

b) Activity Diagram

Activity diagrams contain the workflow of what is designed in a system. The following is an explanation of one of the use cases of the system in the form of an activity diagram which explains the activity of filling in work distribution data carried out by the admin to the technician.

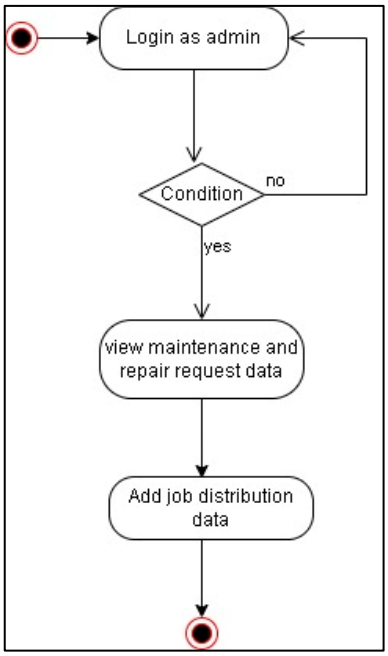

Figure 3. Activity Diagram

Figure 3 explains one form of activity diagram, namely the activity of filling in the distribution of work carried out by the admin. The process starts from logging in as admin. If the login is successful, continue by viewing the maintenance and repair request data. If you look at the maintenance and repair request data, you can proceed to the activity of filling in the work distribution data.

c) Sequence Diagram

Sequence diagrams describe how objects interact with each other through sequential messages, a use case or operation. Below is an explanation of one of the sequence diagrams for admin activities in distributing work to admins.

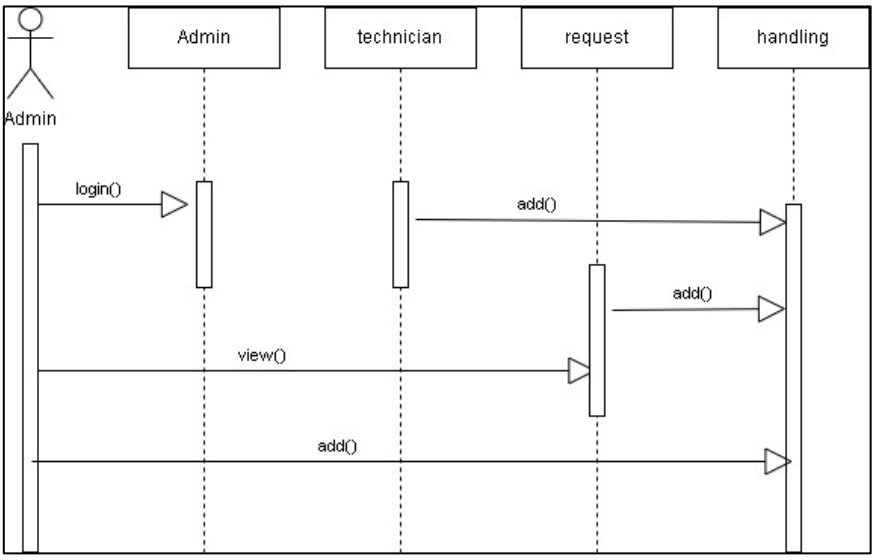

Figure 4. Sequence Diagram

Figure 4 explains one of the actor interactions in a use case between class objects. For admins, when logging in they will interact with admin class objects. Admins can view the request class object as a basis for populating the handling class object. Admin can make edits to the handling class object.

V. Conclusion

From the results of the research stages that have been carried out, conclusions can be drawn: The data collection stage carried out was by conducting interviews and observations to determine problems that could be resolved between the researcher and the sister car repair company. From the data collection, the requirements analysis stage was carried out using the PIECES framework to identify problems in the old system and map existing problems, which was continued by defining the functional and non-functional requirements of the system to be built. The next stage of system design is a follow-up to the results of the needs analysis which was carried out by modeling the system using the Unified Modeling Language. The diagrams used include usecase, activity diagrams, sequence diagrams and class diagrams. The design evaluation results stage using the consistency analysis method was proven to have an RCI value of 100% consistent where each layer in the system is interconnected. The results of this design are included in the correctness category in the correctness test which proves that the system requirements and system design are consistent and correct.

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