Design of Maintenance Service System With Helpdesk It Support Case Smk Bina Am Ma'mur

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Abstract - SMK Bina Amma'mur has a section in charge of taking care of computers ranging from computer hardware repair and computer software repair, namely the IT helpdesk section. Currently, the process of informing computer repairs that are currently running is still carried out by means of teachers or staff asking for help from the Information Technology department by meeting directly to check problems that occur on computers or laptops, then the IT helpdesk will send a team of technicians to solve the reported problems, if it has been completed, it will be reported back to the IT helpdesk to note that computer repair requests have been made. After checking the problem that occurs on the computer or laptop then the IT department will record the problem in the general ledger and will notify the teacher or staff when it has been resolved via whatsapp media. However, the handling of problems that are running is still not good because the process of recording repair results is still manual so that it affects the performance of the IT department. This can have a negative impact, namely there are problems recording data repeatedly, the process of searching for computer repair data takes a long time because you have to search one by one for repair request data in books, there are often errors in making reports so that the reports made are not the same as the computer repair process. This research resulted in an IT helpdesk system that aims to help the IT department manage IT helpdesk data better. This research uses the PIECES analysis method, design using UML and blackbox testing system. The IT Helpdesk system is created using PHP programming language and MySQL database.

1. INTRODUCTION

The rapid development of computer, electronic, telecommunication, and mechanical technologies has resulted in a variety of sophisticated and intelligent applications that are changing human life today and in the future. Along with the times, the role of information and communication technology has a very positive impact in improving the quality of human life, and technological developments can also accelerate the completion of various jobs. SMK Bina Amma'mur, located in Cikupa, is one of the vocational schools that offers three majors, namely Multimedia, Hospitality, and Tata Boga. The school has 40 active teachers and 25 staff, where each teacher and staff is given a computer or laptop facility to support performance. Currently, SMK Bina Ma'mur has 70 computers and 35 laptops for staff.

However, in the implementation of work activities, there are often problems with the computers or laptops used, such as damage or unusable. When problems occur, teachers or staff usually ask for help from the Information Technology department by meeting directly to check the problems that occur. After checking the problem on the computer or laptop, the IT department then records the

problem in the ledger and will notify the teacher or staff through WhatsApp media after the repair is complete. This process causes the computer or laptop repair report to not be well documented because the repair data is only recorded manually using a book.

Based on these problems, SMK Bina Amma'mur needs an IT support helpdesk information system that aims to improve services to teachers and staff and facilitate the Information Technology department in storing data on the results of computer and laptop repairs. Therefore, it is necessary to develop an IT support helpdesk maintenance service system at SMK Bina Amma'mur. The helpdesk will record the problem on the repair request form, then send a team of technicians to solve the reported problem. After completion, the repair report will be recorded again by the helpdesk. However, the handling of problems that often occur at SMK Bina ma'mur is still less than optimal because the helpdesk recording process is still manual, thus affecting overall performance.

The main problem currently faced is how to analyze the current IT helpdesk system at SMK Bina Amma'mur, what obstacles are faced in the IT helpdesk system being analyzed, and how to make an IT helpdesk system application that can reduce human error in managing IT

helpdesk data and speed up the reporting process so that it can be monitored accurately. This research focuses on creating an IT helpdesk application at SMK Bina Amma'mur which will be developed using the PHP programming language and MySQL database. This application will include employee data, computer repair requests, technician data, computer repair results, and computer repair reports.

The purpose of this research is to create an IT helpdesk application at SMK Bina Amma'mur, understand the conditions that occur in the process of handling IT helpdesk complaints, and produce fast information to help and facilitate the IT helpdesk process. The expected benefits of developing this helpdesk application include simplifying and speeding up IT helpdesk data processing, reducing human error in IT helpdesk management, and accelerating the preparation of IT helpdesk data reports.

The research methods used include observation, interview, and literature study. Observations were made by direct observation of the flow of documents and procedures of the current system, while interviews were conducted with the IT helpdesk to obtain data on the shortcomings of the current system and unmet needs. Literature study was conducted to collect theoretical data from various sources to strengthen the theoretical basis for this research. System analysis uses the PIECES method which includes six assessment indicators, namely performance, information, economy, control, efficiency, and service, to identify the main problems and provide the right solution.

System design is carried out using the Unified Modeling Language (UML) which includes use case diagrams, sequence diagrams, activity diagrams, and class diagrams made with Visual Paradigm. System development uses the XAMPP web server, PHP programming language, and MySQL database. System testing is carried out using the Black Box Testing method which focuses on meeting software requirements with the aim of finding errors in function, interface, data structure, performance, initialization, and termination.

2. CONCEPTUAL STAGE

2.1 General Theory

System design is an important process in technology development, where Darmawan and Kunkun (2018) explain that system design is a process that determines how a system will complete the tasks that must be completed. A similar opinion was conveyed by Rusdi et al. (2018), who stated that design is the process of creating and designing a new system. From these definitions, it can be concluded that system

design is a clear action to produce a new, well-designed system.

In the context of information, Bella (cited by Maulani, 2018) states that information is not just facts or reality, but also includes the process and use of information itself. The quality of information depends on three main things:

Accurate
Information should be free from errors and not biased or misleading. Accurate also means that the information should clearly reflect its intent.

Timelines
Information that reaches the recipient must not be late, outdated information has no value anymore. Because information is the basis for decision making.

Relevance
The information has benefits for the user. Relevant for each person, one with the other is different. Based on the opinions expressed above, it can be concluded that information can be said to be of quality if it meets the requirements of being accurate, timely, and relevant.

An information system is a system that integrates various elements to support data collection, storage, and processing. Maesaroh and Mulyati (2021) define information system design as describing, planning, and sketching or organizing separate elements into a functioning whole. This is in line with the opinion of Muhamad Son Muarie (in Maulani et al., 2018) who states that information systems are related to data collection and processing, either manually or using computers, to support decision making.

Database or database is an important component in information management. According to Hayat et al. (2019), a database is a system used to store structured information that can be accessed easily and efficiently. Alfeno et al. (2019) add that a database is an organization of data that allows quick and easy access through computer assistance. From these various definitions, it can be concluded that a database is a collection of data that is organized and generally stored electronically to facilitate access and utilization.

2.2 Specialized Theory

2.2.1 Definition of Service and Helpdesk
Services are activities offered by organizations or individuals to consumers that are intangible and cannot be owned in direct interaction, and provide customer satisfaction (Nurdin et al., 2020). Setiani et al. (2021) added that service is a series of continuous activities. Meanwhile, Helpdesk is an application that is responsible for providing services for damage reports and is equipped with knowledge management features to share solutions among technicians (Irawan and Krisna in Setiani et al., 2021).

2.2.2 Definition of Employee and Data
Employees are supporting factors in a company that help maintain and increase company productivity (Hayat, 2019). Meanwhile, data are facts that describe events at a certain time (Lubis in Rahayu et al., 2019).

2.2.3 Definition of PHP, Website, and MySQL
PHP (Personal Home Page) is an interpreter programming language used for creating web applications and is often used with HTML (Yuliana, 2019; Rochman et al., 2018; Christian et al., 2018). Website is an internet resource for obtaining information (Rosyadi and Sari, 2018), while MySQL is open-source software for creating and managing databases (Wahyuni, 2020; Setyowati and Kurniawan, 2019).

2.2.4 Definition of UML and XAMPP

UML (Unified Modeling Language) is a visual modeling method for object-oriented system design (Warsito et al., 2019; Estriyani et al., 2019). XAMPP is software that combines Apache HTTP Server, MySQL, PHP, and Perl to facilitate web development (Putra and Nita, 2019; Nurninawati and Wulandari, 2021).

2.2.5 Definition of Visual Paradigm and PIECES
Visual Paradigm is an application for designing software applications with the support of various UML diagrams (Pressman in Musrifah and Ega, 2018). PIECES is a method to identify system weaknesses and recommend improvements based on variables such as Performance, Information / Data, Economic, Control / Security, Efficiency, and Service (Astriyani et al., 2020; Sintawati and Hartati, 2020).

2.2.6 Definition of Blackbox Testing
Blackbox Testing is a functional testing method that focuses on software input and output without knowing the code structure (Nurkholis et al., 2021; Martono et al., 2018).

2.2.7 Basic Concepts of Elicitation
Elicitation is the design of a new system that management wants and is willing to execute, through several stages such as identification of needs and grouping (Fuad et al., 2018; Luhur Prandawa and Muliawati, 2020; Azizah et al., 2018).

2.2.8 Basic Concepts of Literature Review
Literature review is a review, summary, and author's thoughts on various literature sources that form the basis of research (Rahardja et al., 2018). Related research includes complaint service applications, gender differences in the health status of the elderly, and analysis of public complaint patterns during the COVID-19 pandemic.

Identification of Problems and System Needs
SMK Bina Am Ma'Mur was established in 2006 as a school-track educational institution responsible for the organization of education, teaching, guidance, and administration. As part of the SMK Bina Am Ma'Mur Foundation, the school has goals in the labor, social, religious, and humanitarian fields, and is involved in various cross-sectoral activities including education and social. The school has a vision to excel in the field of Information and Communication Technology (ICT) and a mission to form honest, intelligent, communicative, and professional students in the field of Multimedia and Computer Network Engineering, with Islamic and national values.

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Figure 1. Organization Structure
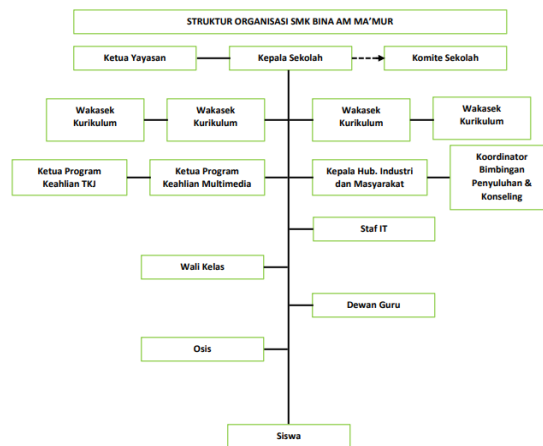
In the school's organizational structure, various tasks and responsibilities are divided among the school committee, the principal, the vice principals for curriculum, student affairs, and infrastructure, and the head of administration. The school committee functions in planning and coordination, while the principal leads the planning, organizing and evaluating of activities. The vice-principals handle curriculum, student activities and infrastructure, while the head of administration manages school administration.

Teachers and homeroom teachers have an important role in carrying out the teaching and learning process, assessment and classroom administration. The school administration organizes administration, finance and data management. The system implemented at SMK Bina Am Ma'Mur covers various aspects from educational planning to administrative management, which serves to ensure effectiveness and efficiency in school operations.

Figure 2. Use Case Diagram
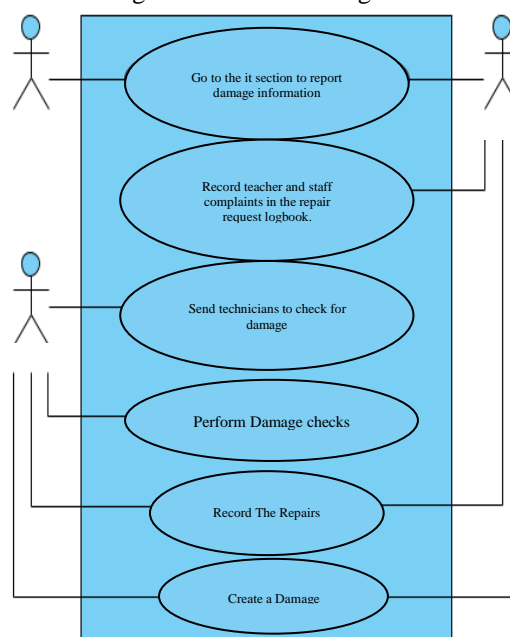
A. Definition of Use Cases for the Running System:
  1. Use Case Name: Visit the IT Department to Submit a Complaint

Actors: Teachers/Employees, Head of IT
Description: Teachers/Employees visit the IT department to convey complaint information to the Head of IT.

2. Use Case Name: Record Teacher/Employee Complaints in the Repair Request Book
Actor: Head of IT
Description: The Head of IT records teacher/employee complaints in the repair request book.

3. Use Case Name: Send Technician to Check the Damage
Actors: Head of IT, Technician
Description: The Head of IT sends technicians to check the reported damage.

4. Use Case Name: Check for Damage and Make Repairs
Actor: Technician
Description: Technicians check for damage and perform necessary repairs.

5. Use Case Name: Record Repair Results
Actors: Technician, Head of IT
Description: Technicians record the results of repairs and submit them to the Head of IT.

6. Use Case Name: Create a Damage Report
Actors: Technician, Head of IT
Description: The technician creates a damage report and submits it to the Head of IT.

B. Definition of Running System Actors

Table 1. Current System Actor Definition

No	Actor Name	Description
1.	Teacher/Staff	Teachers/employees who inform of damage.
2.	IT Chief	Staff who receive the report
3.	Technician	The person who checks and repairs.

3.2 Current System Analysis

The following is a comparison table between the current system and the proposed system for the Helpdesk System using the PIECES (Performance, Information, Economics, Control, Efficiency, and Service) Analysis Method. PIECES analysis is used to evaluate the performance and effectiveness of the current system and identify areas that need to be improved in the proposed system. This method helps in assessing how well the system can meet user needs, including in terms of performance, information accuracy, operational costs, control, efficiency, and quality of services provided. Thus, this analysis becomes the basis for decision making to implement significant improvements to the Helpdesk System.

No	Analysis Type	Current System Weakness	Proposed System
1	Performance	Submission of damage information meets directly with the head of IT so that there is no place to store damage information data.	Damage information delivery already uses the system and has a database for data storage.
2	Information	Errors still occur when conveying information	Damage service features are available using the system so as to reduce errors in the delivery of information.
3	Economics	Requires spending funds to purchase stationery to record damage information.	Does not require spending funds to buy stationery so that it can reduce stationery purchase expenses
4	Control	System security is still not optimal because the data can be seen by everyone.	Security in the proposed system already uses a database and only registered users can view data.

Table 2. PIECES Analytics Method

The hardware specifications used are:
a.   Processor : Intel ® Core ™ i3-5005U Processor (2.00 GHz, 3M cache)
b.   RAM : 4,00 GB
c.   Hardisk : 1 TB
d.   Mouse : Logitech M100r

2.   Software Specification
a.   Windows 7-64 bit
b.   Google Chrome dan Mozilla Firefox

3.   Access Rights Brainware
a.   IT Chief
b.   Teacher/Staff
c.   Technician

3.3 Analysis Result

A. Problems Encountered

Based on the research analysis at SMK Bina Amma'mur, the current helpdesk service system has several shortcomings. Currently, the system involves reporting computer damage by directly meeting with the IT helpdesk to inform them of the issue. The Head of IT then records the problem in a repair request form, after which a technician team is dispatched to address the reported problem. Upon completion, the repair is reported back to the Head of IT, who updates the repair request status. However, the problem-handling process at SMK Bina Amma'mur remains inefficient due to the manual nature of damage recording, which negatively impacts performance. Issues such as redundant data entry, lengthy data retrieval times from repair request logs, frequent errors in report generation, and discrepancies between the reported data and the actual computer repair process are common, highlighting the need for an improved system.

B. Identification of Problem Solving

Based on observations at SMK Bina Amma'mur, it was identified that the Helpdesk management system requires further development to prevent delays in submitting damage complaint information and to facilitate the IT department in managing computer repair data. Based on the analysis of the issues, the researcher chose the alternative of enhancing the existing application due to its various advantages, such as simplifying the process for teachers and staff to report damage complaints, thereby minimizing errors in information delivery, and aiding the IT department in managing damage reports, ensuring that reports are completed in a timely manner. This development represents the final stage of the elicitation process, serving as a reference for further enhancement of the IT Helpdesk system, with the goal of streamlining data processing within the Helpdesk system.

The final draft elicitation identifies several functional requirements of the system, including login menus for staff, head technicians, and technicians, login verification, dashboards, input and management of damage data, and damage report features. The non-functional requirements encompass displaying the school logo, utilizing MySQL as the database, employing PHP as the programming language, using Apache as the web server, restricting access rights to specific users, and ensuring data security. This system development is expected to improve the efficiency and effectiveness of computer repair data management at SMK Bina Am Ma'mur.

4. System Implementation and Process

After evaluating the current system, a new system has been designed to address the shortcomings of the existing one and to reduce common issues frequently encountered. The proposed system aims to enhance the user experience by introducing several new features, such as displaying login menus for employees, verification for correct and incorrect logins, and dashboards. Additionally, the system will include request management functionalities, including adding, modifying, deleting, and searching requests, as well as history management with similar features.

Technician-specific functionalities will include work acceptance forms, job data management (input, update, delete, search), and job history tracking. The system will also provide dedicated access for head technicians, including login verification, dashboard views, request forms, detailed request information, department management (add, edit, delete, search), and user management features. Report generation and logout functionalities are also integrated into the system to enhance usability and efficiency. The proposed system design is developed using Unified Modeling Language (UML) diagrams to ensure a clear and structured representation of the system's workflow. The web-based application is developed using PHP as the programming language and MySQL as the database system. The implementation includes four key UML diagrams: use case diagrams, activity diagrams, sequence diagrams, class diagrams, and state chart diagrams, which collectively serve to outline the system's architecture and operational processes. This new system aims to significantly improve the management of IT Helpdesk services by addressing the existing issues and enhancing overall system performance.

4.1 Use Case

Figure 4. Use Case Diagram of the Proposed System
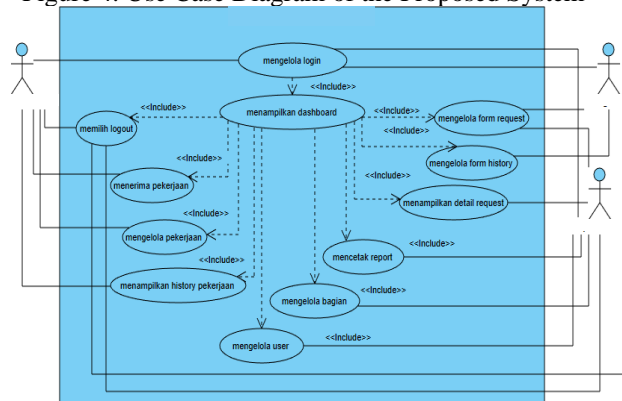
Based on Figure 4, the use case diagram for the proposed system is explained as follows:

1. System Boundary: This boundary illustrates the entirety of activities within the IT helpdesk application.
2. Actors: The system involves three actors: Employees, Technicians, and the Head Technician.
3. Use Cases: There are seven use cases defined as follows:

a. Use Case Name: Manage Login
   Actors: Employees, Technicians, and Head Technician
   Description: Employees, Technicians, and the Head Technician perform login operations to access the system.
b. Use Case Name: Dashboard
   Actors: Employees, Technicians, and Head Technician
   Description: Upon successful login, the system displays the dashboard to the user.
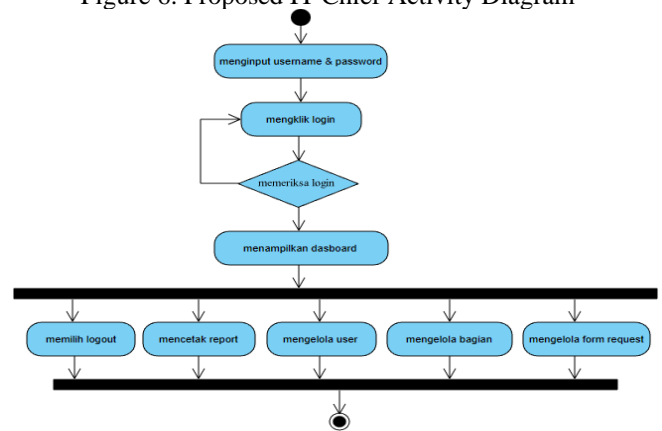
c.   Use Case Name: Request Form
Actors: Employees and Technicians
Description: Employees input request forms, and Technicians review and approve these forms.

d.   Use Case Name: Sections
Actors: Head Technician
Description: The Head Technician inputs data related to sections or departments.

e.   Use Case Name: User Management
Actors: Head Technician
Description: The Head Technician inputs and manages user data.

f.   Use Case Name: Accept Job
Actors: Technicians
Description: Technicians accept assigned jobs or tasks.

g.   Use Case Name: Input Job Data
Actors: Technicians
Description: Technicians input data related to their assigned jobs.

h.   Use Case Name: Job History
Actors: Technicians
Description: Technicians access and review job history records.

i.   Use Case Name: Report
Actors: Head Technician
Description: The Head Technician generates and prints reports.

j.   Use Case Name: Logout
Actors: Technicians and Head Technician
Description: Technicians and the Head Technician select the logout option to exit the system.

4.2 Activity Diagram
1. Staff Activity Diagram

Figure 5. Proposed Staff Activity Diagram

Based on Figure 5, the following explanations can be provided:

1.   Initial Node: There is one initial node that marks the beginning of the process flow.
2.   Actions: The diagram includes seven actions, which are:
     - Username & Password
     - Click Login
     - Dashboard
     - Request Form
     - Request History
     - Request Details
     - Logout
3.   Fork Node: There is one fork node that represents the branching of activities.
4.   Decision Node: One decision node is used for evaluating conditions and directing the flow based on the outcomes.
5.   Join Node: One join node is used to merge activities after the branching and decision-making process.

3.   IT Chief Activity Diagram

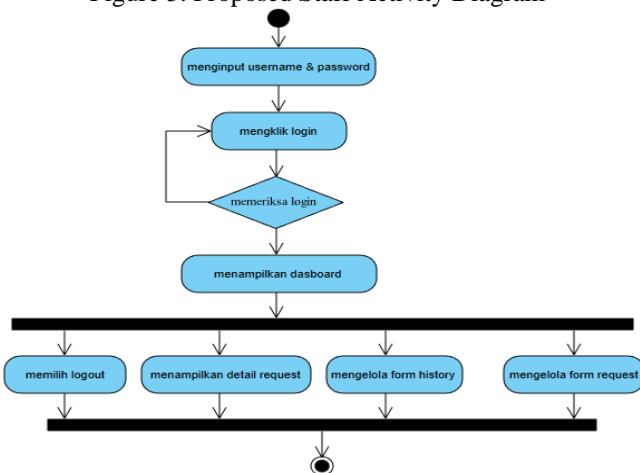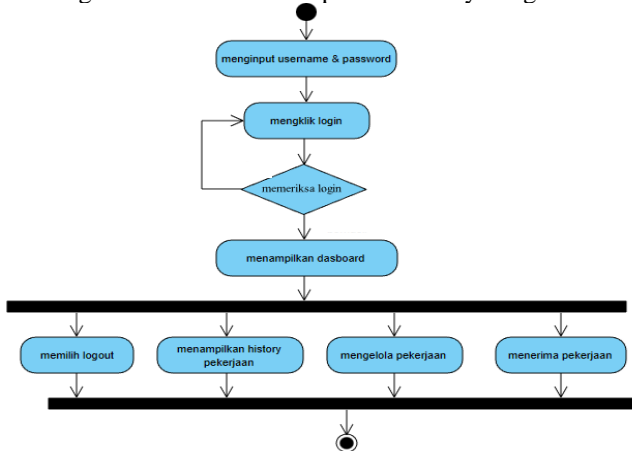Figure 6. Proposed IT Chief Activity Diagram

Based on Figure 6, the following explanations are provided:

1.   Initial Node: There is one initial node that indicates the starting point of the process.
2.   Actions: The diagram includes eight actions:
     - Input Username & Password
     - Click Login
     - Dashboard
     - Request Form
     - Master Data for Sections
     - Master Data for Users
     - Report
     - Logout
3.   Fork Node: One fork node is present to represent the branching of activities.
4.   Decision Node: One decision node is utilized to make conditional choices that direct the process flow.
5.   Join Node: One join node is used to consolidate activities following branching and decision-making processes.

3.   IT Chief Activity Diagram

between different objects within the system.

Figure 7. Technician Proposed Activity Diagram

Based on Figure 7, the following explanations are provided:

1. Initial Node: There is one initial node that marks the beginning of the process.
2. Actions: The diagram features seven actions:
   - Input Username & Password
   - Click Login
   - Dashboard
   - Accept Job
   - Input Job Data
   - Job History
   - Logout
3. Fork Node: One fork node represents the branching of activities.
4. Decision Node: One decision node is used for making conditional choices that influence the process flow.
5. Join Node: One join node consolidates the activities after branching and decision-making.

4. Class Diagram

Figure 8. Proposed Class Diagram

Based on Figure 8, the Class Diagram for the proposed system includes:
1. Four Classes: These represent collections of objects that share common attributes and operations.
2. Three Associations: These denote the relationships

Proposed System Configuration
Hardware Specifications:
- Processor: Intel® Core™ i7-5005U Processor (2.00 GHz, 3M cache)
- RAM: 12.00 GB
- Hard Disk: 1 TB
- Mouse: Logitech M100r
- Monitor: (Not specified in the provided text)

Software Specifications:
- Operating System: Windows 7 (64-bit)
- Browsers: Google Chrome and Mozilla Firefox
- XAMPP Version: 5.6
- MariaDB: Version from October 19, 2015, starting with XAMPP versions 5.5.30 and 5.6.14

User Roles:
1. Employee: Individual who submits repair requests.
2. Technician: Person responsible for inspecting and repairing issues.
3. Head Technician: Person accountable for overseeing maintenance requests.

4.4 Proposed System View

1. Login Form Display
Before using the IT helpdesk service system, technicians, chief technicians and employees must login first to differentiate access rights and to maintain data security.
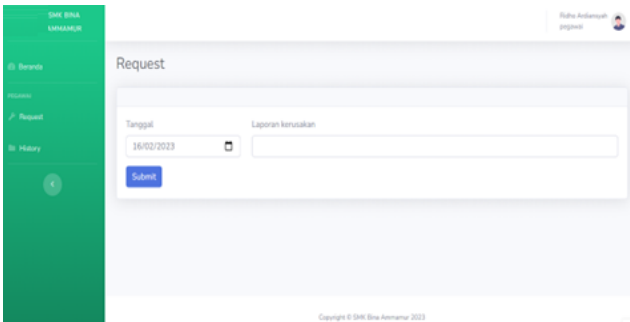
Figure 9. Views Form Login
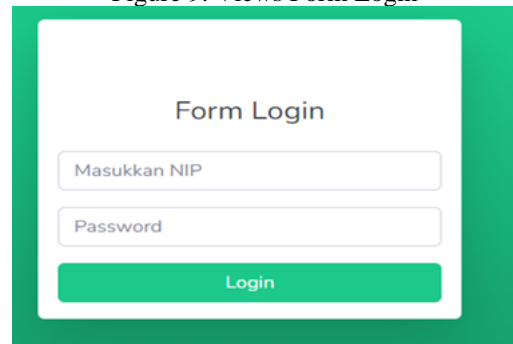
2. Request Form Menu Display
The following image is a display form request that works for officials to submit maintenance requests.

Figure 9. Menu Displays Form Request

3. Request Details Menu Display

The following image is a display form detail request which functions to display maintenance requests in detail

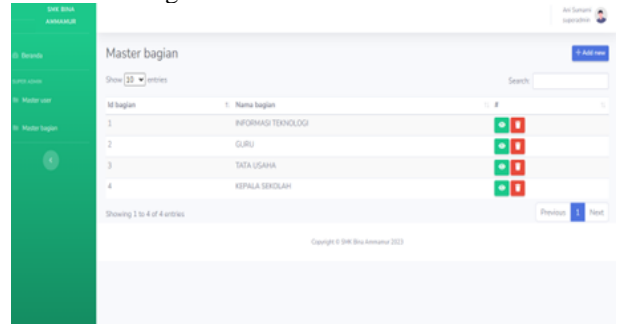Figure 10. Request Details Display

4. Display Form History

The following image is a display form history which functions to display history or maintenance records
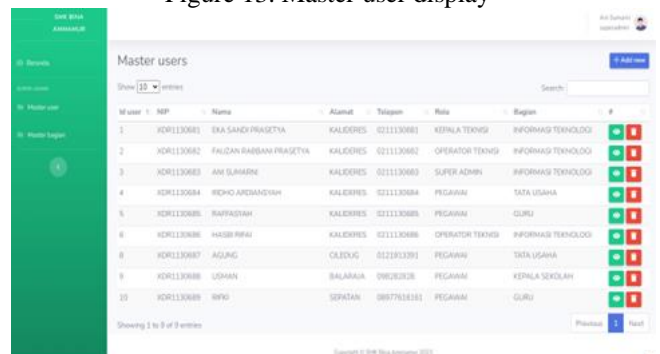
Figure 11. Form History Display
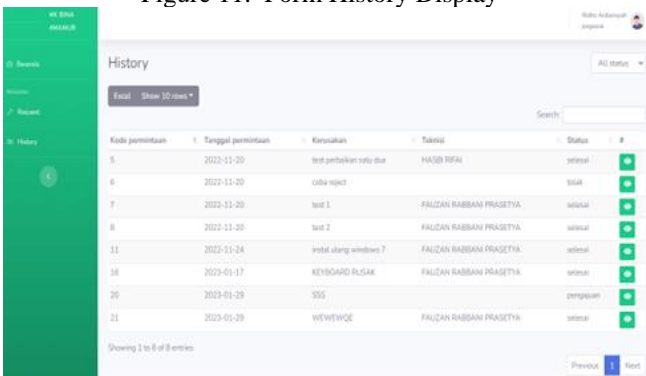
5. Section Master View

The following image is a display form part which functions to record section data

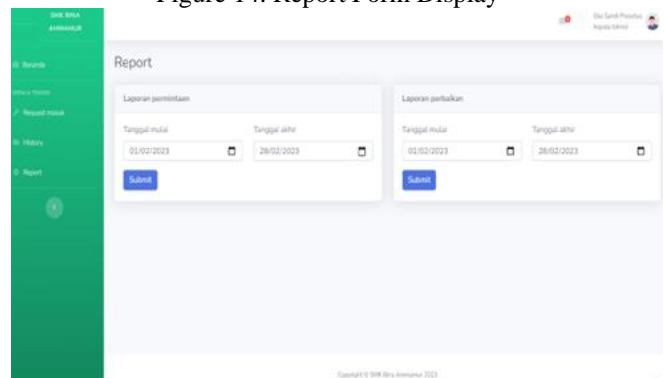Figure 12. Section Master View

6. Master User View

The following image is a display form user whose function is to register users who can use the IT helpdesk application
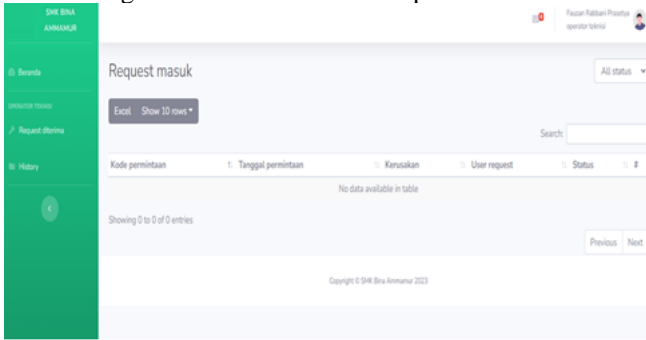
Figure 13. Master user display

7. Report View

The following image is a display form report which functions to display maintenance request report data

Figure 14. Report Form Display

8. View the Job Acceptance Form

The following image is a display form accept job which functions to display jobs accepted by technicians
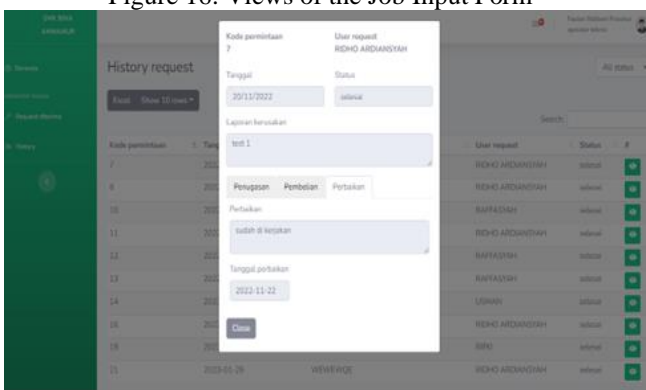
Figure 15. Views of the Accept Job Form

9. Job Input Form Display

The following image is a display form work input which functions to input maintenance work results by technicians
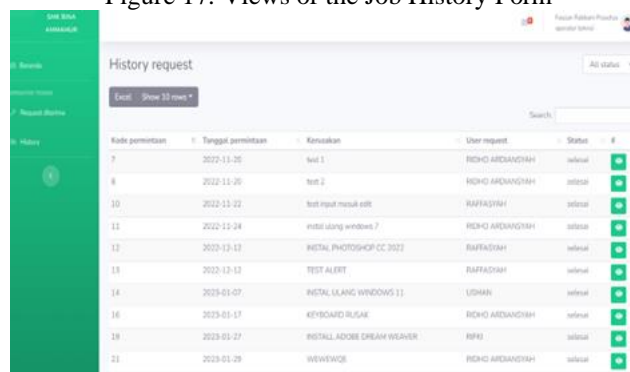
Figure 16. Views of the Job Input Form

10. Display Job History Form

The following image is a display form work history which functions to display the history of work that has been done

Figure 17. Views of the Job History Form

4.4 Blackbox Testing

In this thesis, testing is carried out using the method Black Box Testing, is a trial that focuses on needs software. Because it's a trial Black Box allows development software to find out the input conditions that will train all the functional requirements of a program. Test method Black Box trying to find errors in several categories including: incorrect or missing functions, errors in data structure or access external database, display error, error initialization, and termination.

4. CONCLUSION

Based on the findings presented in the previous chapters and the observations made in relation to the defined problem statements, the following conclusions can be drawn:

1. The current IT helpdesk information system at SMK Bina Am Ma'mur is still operating manually, with employees needing to physically visit the IT department to report issues with their work computers or laptops, due to the absence of an automated IT helpdesk system. The existing system has proven to be ineffective, primarily because it relies on paper-based record-keeping.
2. There is a clear need for an IT helpdesk system that facilitates the easy submission of repair complaints, enabling quicker resolution of issues. Implementing such a system would significantly enhance the efficiency of handling repair requests and improve the overall effectiveness of IT support services within the institution.

5. SUGGESTION

Based on the analysis provided in the preceding chapters and the observations made concerning the research problem statements, the following conclusions can be drawn:

1. The current IT helpdesk service system at SMK Bina Amma'mur operates manually, where employees must visit the IT department in person to report issues with their computers or laptops due to the absence of an automated helpdesk system. This manual process is inefficient as it relies on paper-based record-keeping, which is prone to errors and delays. Consequently, the existing helpdesk service system fails to operate effectively and struggles to address issues in a timely manner.
2. There is a pressing need for an IT helpdesk service system that allows for easier submission of repair complaints, facilitating quicker resolution of reported issues. An automated helpdesk system would significantly enhance the efficiency of complaint management, streamline communication, and improve the overall effectiveness of IT support services at the institution

6. ACKNOWLEDGEMENT

testing and evaluation phases of our operating systems. Their provision of a stable virtual environment has been crucial to the advancement of this research.

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REFERENCE

[1] Alfeno, S., Haris, H., & Pamungkas, A. B. (2019). Implementasi E-Learning Sebagai Penunjang Standarisasi K-13 Berbasis Web Dalam Peningkatan Kompetensi Pembelajaran Pada SMAN 8 Kabupaten Tangerang.

[2] Aris, A., Maryanih, M., & Arrianti, S. R. (2019). Aplikasi Pelayanan Pengaduan Maintenance Divisi Teknik Berbasis Android Pada Perguruan Tinggi Raharja. Journal Cerita, 5(1), 68-75.

[3] Astriyani, E., Mulyati, M., & Setiawati, F. Perancangan Sistem Informasi Rekrutmen Karyawan pada Perusahaan Daerah Air Minum (Pdam) Tirta Benteng Kota Tangerang. Journal Sensi, 5(2), 214-224.

[4] Astriyani, E., Putri, F. N., & Widianingsih, N. E. (2020). Desain Sistem Informasi Monitoring Aset Pada PT. Arbunco Wira Pandega. Journal Sensi, 6(1), 87- 99.

[5] Azizah, N., Oktaviani, D., & Safitri, W. L. (2018). Rancang Bangun Sistem Informasi Standar Harga Barangpada Kota Tangerang. CCIT Journal, 8, 78- 90.

[6] Azizah, N., Suryana, E., & Haris, H. (2017). Application of a Customer Based Data Monitoring Facility Online Accounting Software For Effectiveness Leadership at Higher Education. APTISI Transactions on Management (ATM), 1(2), 86-93.

[7] Christian, A., Hesinto, S., & Agustina, A. (2018). Rancang Bangun Website Sekolah Dengan Menggunakan Framework Bootstrap (Studi Kasus SMP Negeri 6 Prabumulih). Jurnal Sisfokom (Sistem Informasi Dan Komputer), 7(1), 22-27.

[8] Fatonah, S., & Palupi, H. (2020). The Effect of Handling Complaint and Hospitas Service Qualiy on Patient Satisfaction and Loyalty. Jurnal Medicoeticolegal Dan Manajemen Rumah Sakit (JMMR), 9(3), 268-276.

[9] Finola, C. F., Nugraha, Y., Suprijono, S. A., Larrantuka, A., Kanggrawan, J. I., & Suherman, A. L. (2020, November). Analysis of public complaint reports during the COVID-19 pandemic: a case study of Jakarta's citizen relations management. In 2020 International Conference on ICT for Smart Society (ICISS) (pp. 1-6). IEEE.

[10] Firmansyah, N., Nurlena, N., & Octaviany, V. (2019). Potensi Pengembangan Sungai Mati Citarum Baleendah Sebagai Daya Tarik Wisata Tirta Di Kabupaten Bandung 2019. eProceedings of Applied Science, 5(3).

[11] Fuad, H., Sutarman, S., & Yayah, Y. (2018). Perancangan Sistem Infomasi Customer Relationship Management Pelayanan Berbasis Web di PT Sahabat Kreasi Muda. Jurnal Sisfotek Global, 8(1).

[12] Handayani, I., Febriyanto, E., & Yudanto, T. A. (2019). Pemanfaatan Indeksasi Mendeley Sebagai Media Pengenalan Jurnal STT Yuppentek. Technomedia Journal, 3(2 Februari), 235-245.

[13] Hayat, A., Hia, E. E., & Tusyadyah, D. H. (2019). Rancang Bangun Aplikasi Petty Cash Berbasis Web Menggunakan Framework Laravel Pada PT Bekasi Asri Pemula Tbk. Innovative Creative and Information Technology, 5(2), 130- 140.

[14] Hidayatulloh, K., MZ, M. K., & Sutanti, A. (2020). Perancangan aplikasi pengolahan data dana sehat pada rumah sakit umum Muhammadiyah Metro. Jurnal Mahasiswa Ilmu Komputer, 1(1), 18-22.

[15] Huda, B. (2018). Sistem Informasi Data Penduduk Berbasis Android Dan Web Monitoring Studi Kasus Pemerintah Kota Karawang (Penelitian dilakukan di Kab. Karawang). Buana Ilmu, 3(1).

[16] Khasanah, K., & Pebruary, S. (2020). Pengaruh Faktor Internal Dan Faktor Eksternal Terhadap Return Saham Pada Perusahaan yang Terdaftar di Jakarta Islamic Index (JII) Periode 2014-2018. Jurnal Rekognisi Akuntansi, 4(2), 131-150.

[17] Ko, H., Park, Y. H., Cho, B., Lim, K. C., Chang, S. J., Yi, Y. M., ... & Ryu, S. I. (2019). Gender differences in health status, quality of life, and community service needs of older adults living alone. Archives of gerontology and geriatrics, 83, 239-245.

[18] Maesaroh, S., Maulani, G., & Asari, N. SISTEM INFORMASI PENILAIAN KINERJA KARYAWAN BERBASIS WEB PADA PT. HYDRORAYA ADHI PERKASA.

[19] Martono, A., Setyawan, E. A., & Pambudi, A. D. (2018). Implementasi Sistem Informasi Kehadiran Siswa Pada SMKN 2 Kabupaten Tangerang. Journal Sensi, 4(1), 9-19.

[20] Maulani, G., Septiani, D., & Sahara, P. N. F. (2018).

Rancang Bangun Sistem Informasi Inventory Fasilitas Maintenance Pada Pt. Pln (Persero) Tangerang. ICIT J, 4(2), 156-167.

[21] Musrifah, A., & Mutia, E. (2018). Pembuatan Aplikasi Pengelolaan Proposal Di Unit Kegiatan Pengelola (Upk) Kecamatan Mande Berbasis Desktop. Media Jurnal Informatika, 9(1).

[22] Nurdin, N., Musyawarah, I., Nurfitriani, N., & Jalil, A. (2020). Pengaruh Pelayanan Mobile Banking Terhadap Kepuasan Nasabah (Studi Pada Mahasiswa Perbankan Syariah IAIN Palu). Jurnal Ilmu Perbankan dan Keuangan Syariah, 2(1), 87-104.

[23] Nurkholis, A., Susanto, E. R., & Wijaya, S. (2021). Penerapan Extreme Programming dalam Pengembangan Sistem Informasi Manajemen Pelayanan Publik. J-SAKTI (Jurnal Sains Komputer Dan Informatika), 5(1), 124-134.

[24] Nurninawati, E., & Wulandari, A. (2021). IMPLEMENTASI SISTEM PENGOLAHAN PENILAIAN DATA SISWA SMP NEGERI 1 SEPATAN TIMUR. Jurnal Ilmiah MATRIK, 23(1), 100-107.

[25] Pandawa, B. L. (2020). Rancang Bangun Sistem Informasi Pengelolaan Pengaduan Sarana Dan Prasarana Berbasis Web (Studi Kasus Universitas Pembangunan Nasional Veteran Jakarta). Senamika, 1(2), 123-135.

[26] Putra, A. B. (2019, October). Perancangan dan Pembangunan Sistem Informasi E- Learning Berbasis Web (Studi Kasus Pada Madrasah Aliyah Kare Madiun). In Prosiding Seminar Nasional Teknologi Informasi dan Komunikasi (SENATIK) (Vol. 2, No. 1, pp. 81-85).

[27] Rahayu, Sri, Sandro Alfeno & Kartika Novianti Wahyono (2019). Rancang Bangun Aplikasi Sistem Pengolahan Data Pembuatan Akta Tanah Pada Kantor Desa Cengkudu Tangerang. Raharja Open Journal System, Vol.5, No.1.

[28] Rahardja, U., Harahap, E. P., & Pratiwi, S. (2018). Pemanfaatan Mailchimp Sebagai Trend Penyebaran Informasi Pembayaran Bagi Mahasiswa Di Perguruan Tinggi. Technomedia Journal, 2(2 Februari), 41-54.

[29] Rochman, A., Sidik, A., & Nazahah, N. (2018). Perancangan Sistem Informasi Administrasi Pembayaran SPP Siswa Berbasis Web di SMK Al-Amanah. Jurnal Sisfotek Global, 8(1).

[30] Rosyadi, I., & Sari, A. (2018). SISTEM INFORMASI PADA â€ œMAYAâ€ WEDDING ORGANIZER BERBASIS WEBSITE. Jurnal Surya

[31] Informatika: Membangun Informasi dan Profesionalisme, 5(1), 24-33.

[32] Setiani, P., Junaedi, I., Sianipar, A. Z., & Yasin, V. (2021). Perancangan sistem informasi pelayanan penduduk berbasis website di rw 010 Kelurahan Keagungan Kecamatan Tamansari-Jakarta Barat. Jurnal Manajamen Informatika Jayakarta, 1(1), 20-35.

[33] Setyowati, H. K. (2020). Rancang Bangun Aplikasi Kipko Kampung Inggris Pare Kalend Osen Berbasis Website Dengan Framework Laravel. Jurnal Manajemen Informatika, 11(1).

[34] Sintawati, I. D., & Hartati, T. (2020). Analisa Metode PIECES untuk Sistem Penjualan Alat Proteksi Radiasi pada CV. Kashelara Jakarta. Jurnal Akrab Juara, 5(2), 262-271.

[35] Thahir, M. (2022). Tafsir Maqasidi Ayat-Ayat Makanan Halal dan Implementasinya dalam Fatwa MUI (Studi pada Produk Pangan, Obat dan Kosmetika).

[36] Wahyuni, T., & SOPIANDI, I. (2020). Sistem Informasi Geografis Wisata Kuliner Berbasis Android. INFOTECH journal, 6(2), 36-43.

[37] Yuhana, A. N., & Aminy, F. A. (2019). Optimalisasi peran guru pendidikan agama Islam sebagai konselor dalam mengatasi masalah belajar siswa. Jurnal Penelitian Pendidikan Islam,[SL], 7(1), 79-96.

[38] Yuliana, K., Saryani, S., & Azizah, N. (2019). Perancangan rekapitulasi pengiriman barang berbasis web. JURNAL SISFOTEK GLOBAL, 9(1).

[39] VOCATIONAL SCHOOLS IN KULON PROGO DISTRICT. FINAL PROJECT THESIS ON ELECTRONICS ENGINEERING EDUCATIONAL STUDY PROGRAM, 1 - 110.

[40] K. M., H. J., & T. N. (2011). An interactive system for structure-based ASCII art creation. An interactive system for structure-based ASCII art creation, 1 - 6.

[41] A Knowledge-based Operating System G. S. Blair, J. A. Mariani, J. R. Nicol, D. Shepherd The Computer Journal, Volume 30, Issue 3, 1987, Pages 193–200,

[42] S. Elvin., A. Dandi., R. Yasir. (2023). OPERATING SYSTEM INSTALLATION TRAINING COMPUTER WITH VMWARE AT SMK MUHAMMADIYAH 04 MEDAN. Journal Community Service, 24 – 32.

[43] E. C. Rahayu. (2021). UNDERSTANDING THE

STRUCTURE OF THE OPERATING SYSTEM AND THE VARIOUS OPERATING SYSTEM STRUCTURES THAT HAVE BEEN TRIED. Jurnal Fakultas Komputer, 1-8

[44] Adminlp2m (2024). Mengungkap Rahasia Algoritma Fernet dalam Enkripsi – Lembaga Penelitian dan Pengabdian Masyarakat. [online] Lembaga Penelitian dan Pengabdian Masyarakat. Available at: https://lp2m.uma.ac.id/2024/02/05/mengungkap-rahasia-algoritma-fernet-dalam-enkripsi/ [Accessed 19 Jul. 2024].