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Implementation of the Prototyping Method for a Web-Based BUMDes Appakabaji Management Information System in Maros Regency

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Abstract

Operational management at the SPAM business unit of BUMDes Appakabaji is still carried out manually through visit records in books and has not yet been integrated into a digital system. As a result, data is difficult to trace and team work area distribution is not well organized. The growth in the number of customers, reaching 1,021 records, indicates the need for a more efficient management system. This study aims to develop a web-based management information system to improve the efficiency of customer data management, visit recording, work area mapping, payment management, and recapitulation reporting at BUMDes Appakabaji. The research employed the prototyping method, consisting of needs analysis, design, implementation, and testing stages. System testing using black box testing shows that the developed system functions properly and is feasible to improve operational efficiency.

Keywords: *Management Information System, BUMDes, Prototyping, Website, Blackbox Testing*

1. Introduction

Village-Owned Enterprises (BUMDes) are strategic instruments for utilizing local village economic potential, aiming to improve community welfare and strengthen village original income [1]. BUMDes have a strong legal basis under Law Number 6 of 2014 concerning Villages, which regulates the establishment, management, and utilization of BUMDes business results for village development and community empowerment [2],[3],[4]. This regulation is reinforced by various derivative regulations at the central and regional levels that provide an operational framework for BUMDes management according to local conditions [5]. The Appakabaji BUMDes in Salenrang Village, Maros Regency, is one of the BUMDes that manages a Drinking Water Supply and Sanitation System (SPAM) business unit utilizing local spring water sources. This business unit is growing along with the increasing number of customers, which by 2025 is expected to reach 1,021 customer data. However, SPAM operational management is still carried out manually, particularly in recording visits, managing customer data, and assigning work areas to the documentation team. This situation makes data difficult to trace and operational processes are not yet optimal and organized [6]. The development of information technology encourages the use of information systems as a means to improve the effectiveness and efficiency of organizational management, including at the village level [7],[8]. Therefore, an integrated website-based management information system is needed to support customer data management, visit recording, work area mapping, billing management, and operational report preparation. The prototyping method was chosen because it allows for gradual system development through evaluation and direct feedback from users, allowing the resulting system to be tailored to the operational needs of the Appakabaji Village-Owned Enterprise (BUMDes) [9]. Based on these problems, this study aims to apply the prototyping method to the development of a website-based management information system at the Appakabaji Village-Owned Enterprise (BUMDes) in Maros Regency. The developed system is expected to improve the efficiency and orderliness of operational management, particularly in recording visits and mapping the documentation team's work area [10],[11].

2. Theoretical Foundation

2.1. Prototyping Methods

The Prototyping method is a system design method used in system development by building an initial version that is still simple, but can be evaluated by users and further refined according to needs. This method involves five main stages:

Communication, Quick Plan, Modeling Quick Design, Construction of Prototype, and Deployment, Delivery & Feedback, the process flow of which is shown in Figure 1. [13].

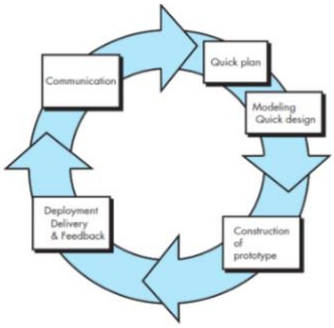

Fig. 1: Prototyping Model

The explanation of the stages of the prototyping method is as follows:

a. Communication
   This stage is carried out by directly involving the client to identify the various needs of the application to be created to ensure that the design results meet the client's expectations.
b. Quick Plan
   In the quick plan stage, the system designer conducts a brief planning phase based on user needs from the communication stage by creating an interface design and other supporting requirements required during this process.
c. Modeling Quick Design
   In this stage, the design team creates a design model, such as UML or another relevant model, to explain the client's needs based on the previous analysis.
d. Construction of Prototype
   This development process focuses more on the main software components so that designers can quickly get feedback from clients about the software being created.
e. Deployment Delivery & Feedback
   At this stage, the prototype that has been created is submitted to the client for feedback. The client's responses are used as a reference to refine the prototype to meet the desired needs.

2.2. Management Information System

A Management Information System (MIS) is an integrated system designed to support managerial functions by processing operational data into useful information for planning, controlling, and decision-making within an organization. MIS utilizes information technology to present accurate, relevant, and timely information, helping management monitor performance, improve operational efficiency, and effectively support the achievement of organizational goals [12].

Management Information Systems (MIS) are an essential component used by various organizations, including educational institutions, to support information management and managerial activities. MIS functions to process and organize data into an integrated database so that the resulting information can be distributed to all relevant parties (stakeholders). The concept of Management Information Systems encompasses an understanding of the interrelated elements of systems, information, and management, with a scope that focuses on data management, information flow, and decision-making processes. The implementation of MIS provides benefits in the form of increased operational efficiency, the availability of accurate information to support decision-making, data integration between departments, and more effective management of organizational resources [13].

4.3. Website

A website is a collection of interconnected pages used to present various types of information, such as text, static or animated images, audio, video, or a combination of these elements. Based on their nature, websites can be static or dynamic, with each page connected by hyperlinks that make it easier for users to navigate between pages. Websites can be accessed via the internet or a local area network (LAN) using an address called a Uniform Resource Locator (URL). All publicly accessible websites form a global network known as the World Wide Web (WWW). Websites are accessed through browser software on a computer device, such as Google Chrome, Mozilla Firefox, Opera, and other browsers [14].

4.4. Blackbox Testing

Black Box testing is a testing method that aims to validate system functionality based on user needs by reviewing the suitability between input and output without looking at the internal structure of the system. This testing is carried out from the end user's perspective to identify functions that are running properly and those that are not yet fulfilled, including handling valid and invalid input [15]. In practice, Black Box testing is generally applied at the alpha and beta testing stages to evaluate the performance and level of system acceptance by users. Alpha testing is carried out to ensure the system can run well and is free from errors or bugs, while beta testing is carried out afterwards to assess user acceptance before the system is officially used, as well as to provide a basis for improvements in the next stage [16] .

3. Research Method

3.1. Analysis

The analysis phase in this research is conducted to understand in detail the operational conditions and data management practices currently implemented at BUMDes Appakabaji. This stage focuses on identifying issues related to customer data handling, field documentation activities, billing procedures, and payment recording processes that are still carried out separately using various media. The fragmentation of data storage leads to difficulties in monitoring information, delays in reporting, and potential data inconsistencies. Therefore, this analysis phase serves as the foundation for determining system requirements and defining the scope of a web-based Management Information System that is expected to support integrated data processing and improve operational effectiveness.

3.2. Desaign

The design phase focuses on translating the analysis results into a clear system representation that can describe how the proposed system will operate. At this stage, the system design is illustrated using a Use Case Diagram to show the interactions between users and the system based on their respective roles. In addition, a Database Schema is designed to define the structure of data storage, including tables, attributes, and relationships required to support system functionalities. These design components are intended to provide a comprehensive overview of system behavior and data organization, ensuring that the developed system can operate in an integrated, structured, and consistent manner.

a. Use Case Diagram
A use case diagram explains the relationship between users and the functions available within the system. This diagram shows the roles of Admin, Documentation Team, Customer, and Director/Manager, along with the access rights and activities each user can perform within the system. This diagram provides a general understanding of the flow of user interaction with the system, based on their tasks and authorities, as shown in Figure 2.

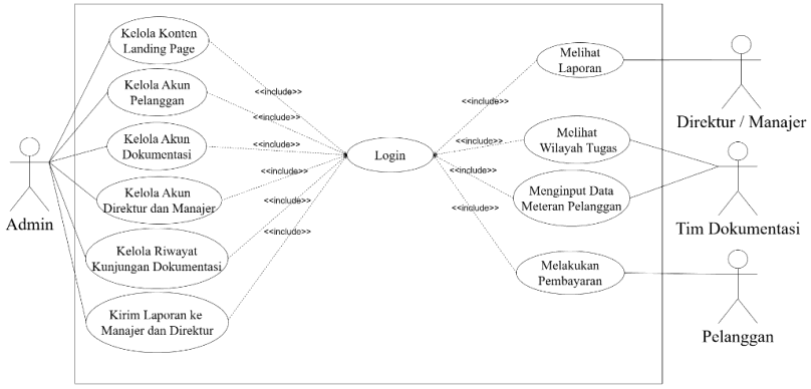

Fig. 2: Use Case Diagram

b. Database Schema
The Appakabaji BUMDes information system database schema is designed to manage customer data, visits, billing, and reporting in an integrated manner through interrelated tables. This structure ensures data integration and supports a systematic system workflow, as shown in Figure 3.

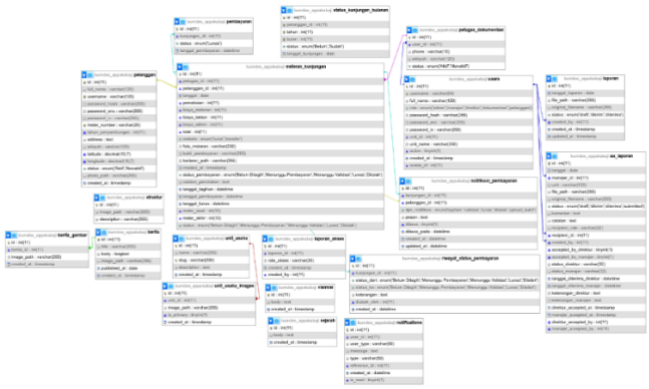

Fig. 3: Database Schema

4. Research Result

At this stage, the results of the design and implementation of the Appakabaji BUMDes information system website are displayed, which has been developed according to user needs. This website can be run online via a server or locally using XAMPP in a localhost environment, so it can be accessed from various devices such as desktop computers and mobile devices. This flexibility of access allows users to use the system without relying on a particular type of device. When the website is accessed, users will be directed to the main page as the initial display, which provides several navigation menus to access system features according to each user's access rights.

1. HomePage View

Fig. 4: Website Homepage View

The homepage view displays the main page of the Appakabaji BUMDes website as the initial display for users. This page serves as a general information resource, providing navigation menus such as About Us, Business Units, News, and a Login button for system access according to user privileges.

2. Login View

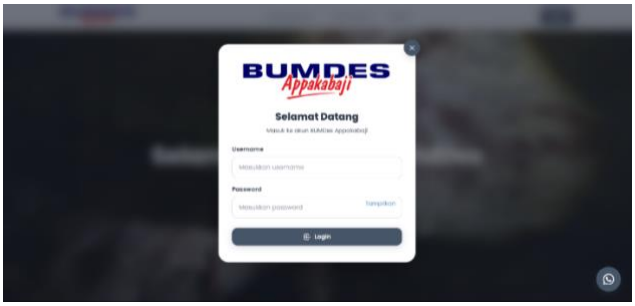

Fig. 5: Website Login View

The login page on the BUMDes Appakabaji website is used as system entry access, where users enter their username and password to be directed to the dashboard according to each user's role.

3. Customer Area Distribution View

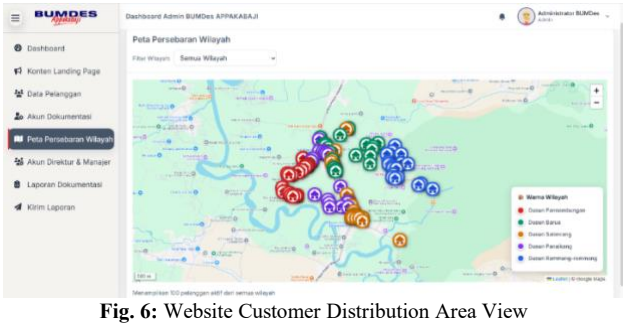

Fig. 6: Website Customer Distribution Area View

The Customer Distribution Area View website displays a map of the customer distribution area on the Appakabaji BUMDes website. This view provides a visualization of customer locations based on their work area in map form, making it easier for admins and documentation teams to monitor customer distribution and plan field visits.

4. Documentation Team Task Area View

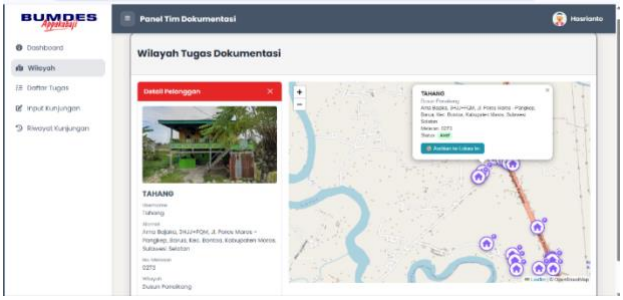

Fig. 7: Documentation Team Task Area Website View

The Documentation Team Task Area Website View displays the Documentation Team's task area page on the Appakabaji BUMDes website. This page displays a list of customer locations, along with detailed information and a map of the areas to be visited, helping the documentation team carry out their recording and documentation tasks in a focused manner.

5. Customer Payment View

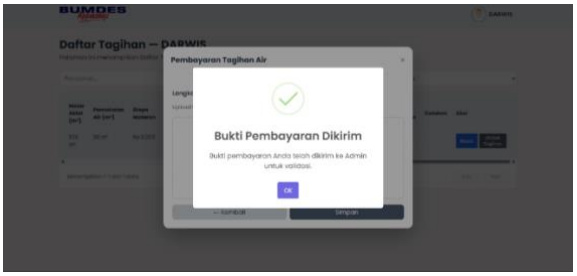

Fig. 8: Customer Payment Website View

Customer Payment Website View displays the water bill payment page, where after the customer sends proof of payment, the system displays a notification pop-up with a check mark icon and the message “Your proof of payment has been sent to Admin”, as well as an OK button to close the notification and continue the process.

6. Print View Visit Report

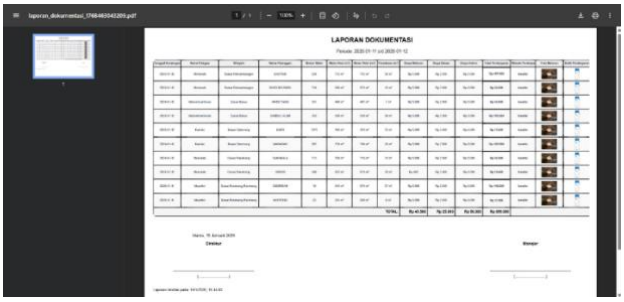

Fig. 9: Website Print View Visit Report

The Print View Visit Report website displays a print preview of the visit/documentation report in PDF format, containing the report title, period, complete visit data summary table (including customer information and documentation), and a signature section below as approval before printing.

4.1. Blackbox (Alpha) Test Results

Blackbox (alpha) testing was conducted on several key features of the Appakabaji BUMDes system, including login, adding customer data, and visit documentation. In the login feature, the system successfully verified users with valid accounts and displayed a dashboard according to their role, while invalid username or password input was rejected and displayed an error notification. In the add customer data feature, complete customer data was successfully saved to the database and appeared in the customer table and area distribution map, while incomplete input was rejected with a warning notification. In the visit documentation feature, complete visit data, including meter photos, was successfully saved to the database according to the visit date, while incomplete input was rejected and not saved.

4.2. Blackbox (Beta) Test Result

Blackbox (Beta) testing was conducted by involving users as respondents to assess the performance and quality of the Appakabaji BUMDes-based website-based Management Information System. The assessment was conducted through a questionnaire distributed to 25 Appakabaji BUMDes employees, then the data was processed using a Likert scale and the mean method to determine the level of system feasibility. Aspects assessed included testing for damaged or incorrect functions, software interfaces, system performance,

initialization/termination processes (login-logout), and data structures or database access. The recapitulation results showed an overall average value of 86.8% which is included in the Very Good category based on the assessment range (82-100). These findings indicate that the system has functioned as needed, is easy to use, is stable when running, and is acceptable to users, so it is declared suitable for use and implementation.

5. Conclusion

Based on the results of research and implementation of website-based management information systems at BUMDes Appakababaji using the prototyping method, it can be concluded that:

1. this research has succeeded in designing and building a system that improves operational efficiency, especially in recording visits, managing customer data, mapping the documentation team's work area, and making reports, thus replacing time-consuming manual processes
2. the application of the prototyping method makes system development more suited to user needs through gradual evaluation, and the test results show that the system runs well in the Alpha test and obtains an average value of 86.8% (Very Good category) in the Beta test, so that the system is declared easy to use, stable, and feasible to implement

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References

[1] L. Mufidah and L. Mursyidah, "Meningkatkan Pendapatan Lokal melalui Badan Usaha Milik Desa di Indonesia," *J. Pemberdaya. Ekon. dan Masy.*, vol. 1, no. 1, p. 22, 2024, doi: 10.47134/jpem.v1i1.322.

[2] R. Salman, W. Prihatiningtyas, S. Winarsi, and G. J. Pamoro, "Pendampingan Hukum dalam Optimalisasi Fungsi BUMDES Pasca Berlakunya PP No. 11/2021 Tentang BUMDES di Desa Sumberbendo, Lamongan," *J. Dedik. Huk.*, vol. 2, no. 3, pp. 276–290, 2022, doi: 10.22219/jdh.v2i3.20571.

[3] A. F. Gani Wardana, "Analisis Kesesuaian Pengaturan Badan Usaha Milik Desa Dengan Nilai-Nilai Pancasila," *AL WASATH J. Ilmu Huk.*, vol. 2, no. 2, pp. 61–76, 2021, doi: 10.47776/alwasath.v2i2.180.

[4] J. Khairul Hadi, "Kedudukan Badan Usaha Milik Desa (Bumdes) BerdasarkanUndang-Undang Nomor 11 Tahun 2020 Tentang Cipta Kerja," *JURIDICA J. Fak. Huk. Univ. Gunung Rinjani*, vol. 3, no. 2, pp. 42–115, 2021.

[5] M. A. Kusdiyanto and R. R. Pahlevy, "Analisis Yuridis Pendirian BUMDes Pasca Undang-Undang Cipta Kerja," *J. Contemp. Law Stud.*, vol. 2, no. 2, pp. 245–266, 2024, doi: 10.47134/lawstudies.v2i2.2912.

[6] M. Iqbal, P. L. L.B., and N. Kurniati, "Penerapan Metode Haversine Formula Pada Sistem Informasi Geografis Pencarian Laundry Terdekat Di Kota Makassar," *Bul. Sist. Inf. dan Teknol. Islam*, vol. 2, no. 1, pp. 12–16, 2021, doi: 10.33096/busiti.v2i1.710.

[7] F. Hasan, P. L. L. Belluano, and A. R. Manga, "Rancang Bangun Aplikasi E-Budgeting Untuk Memonitor Realisasi Anggaran Spn Polda Sulsel Berbasis Web," *Bul. Sist. Inf. dan Teknol. Islam*, vol. 4, no. 3, pp. 252–261, 2023, doi: 10.33096/busiti.v4i3.1829.

[8] A. Ulfah, T. Syahar, H. Ma'tang Pakka, and A. Faradibah, "Perancangan Sistem Manajemen Laboratorium Terpadu Untuk Mendukung Pengembangan Smart Campus," *J. Tecnoscienza*, vol. 8, no. 1, pp. 171–181, 2023, [Online]. Available: https://www.ejournal.kahuripan.ac.id/index.php/TECNOSCIENZA/article/view/1081/733

[9] H. Situmorang and M. I. Zul, "Implementasi Metodologi Prototype dalam Pengembangan Sistem Manajemen Kehadiran Pegawai Perusahaan Berbasis Web," *JTIM J. Teknol. Inf. dan Multimed.*, vol. 6, no. 3, pp. 260–270, 2024, doi: 10.35746/jtim.v6i3.559.

[10] A. Djamereng, L. N. Hayati, E. Siruna, S. Fitriani, and N. K. Yulinda, "Pemanfaatan E-Commerce Berbasis Website untuk Pemasaran pada UMKM Kecamatan Parangloe Kabupaten Gowa," *Ilmu Komput. untuk Masy.*, vol. 3, no. 1, pp. 26–33, 2022, doi: 10.33096/ilkomas.v3i1.1218.

[11] M. Firman, A. Rahman, H. Darwis, and U. M. Indonesia, "Perancangan Website Pada Toko Firman Tani Menggunakan Pendekatan Waterfall," vol. 2, no. 3, pp. 390–405, 2025.

[12] A. Z. Fila, M. C. Mursid, and S. A. Caniago, "MANAGEMENT INFORMATION SYSTEMS : CHARACTERISTICS AND ROLE IN MODERN ORGANIZATIONAL TRANSFORMATION," vol. 9, no. 2, pp. 692–701, 2025, doi: 10.52362/jisamar.v9i2.1860.

[13] A. Z. Nurmayuli, "Management Information System ; A Systematic Literatur Review," vol. 02, no. 01, pp. 24–42, 2024.

[14] P. W. Tanoto, D. Aryanto, and L. Hoki, "Architectural Visualization of Buildings with Virtual Reality 360 using Website Based Prototyping Method," vol. 5, no. 1, 2025.

[15] I. A. Shaleh, J. P. Yogi, P. Pirdaus, R. Syawal, and A. Saifudin, "Pengujian Black Box pada Sistem Informasi Penjualan Buku Berbasis Web dengan Teknik Equivalent Partitions," *J. Teknol. Sist. Inf. dan Apl.*, vol. 4, no. 1, p. 38, 2021, doi: 10.32493/jtsi.v4i1.8960.

[16] S. C. Mulyo Rachmanto, H. A. Agatha, T. Ramdani, A. Y. Ardiyansyah, I. A. Pratama, and A. Sholehudin, "Pengujian Aplikasi Sapawarga (Jabar Super Apps) Menggunakan Metode Black Box Testing," *J. Inform. dan Tek. Elektro Terap.*, vol. 12, no. 3, 2024, doi: 10.23960/jitet.v12i3.4741.