Jurnal Informasi dan Teknologi

https://jidt.org/jidt

2024 Vol. 6 No. 3 Hal: 63-71 e-ISSN: 2714-9730

Clean Water Payment Management Information System Using Extreme Programming Method

Amrullah Fadhil[1]✉, Suendri[2]

[1,2]Universitas Islam Negeri Sumatera Utara, Medan, Indonesia

amrullahfadhil23@gmail.com

Abstract

In the dynamic information age, society has transitioned into an informational society where information technology plays an important role in this transformation. Information systems, as a support for the managerial functions of organizations, are developing with the integration of technology to increase effectiveness and efficiency. The growth and increase of the population in an area increases the need for basic services, including the provision of clean water. Efficient management, especially in the aspect of the payment system, is crucial to ensure the availability of clean water as a human right. In this context, the development of a clean water payment management information system using the Extreme Programming method is very helpful for researchers in developing the system quickly and responsively. This system is expected to simplify the payment process by focusing on efficiency, accuracy, transparency, and accessibility for users. This study aims to design and implement a clean water payment management information system adopting the Extreme Programming method, with the aim of improving clean water payment services as a whole. An evaluation of the system will be carried out to ensure suitability with the needs of users and their ability to overcome the problems faced in the management of clean water payments. Thus, the results of this study are expected to make a significant contribution to the understanding and development of an effective and sustainable management information system for clean water payment services.

Keywords: *Clean Water, Extreme Programming, Payment, Management Information System*.

1. Introduction

Along with the development of the world in the information age, the existence of society has experienced a dynamic pattern shift. The presence of human works in the field of information technology is a characteristic where society in the current era is known as an informational society [1][2], . An information system is a system that can manage data and meet the needs of processing daily activities that support the managerial function of the organization in the strategic activities of an organization or company to be able to provide certain external parties with the necessary reports [3][4]. In line with developments in the field of technology, information systems are also developing with the integration of technology in the use of information systems. The integration is expected to produce a form of more effective and efficient use of information systems [5][6].

Rapid community growth and an increase in the population in an area are often accompanied by an increase in the need for basic services, including the provision of clean water. Clean water is one of the most important natural resources to pay attention to and is one of the parts of human rights that must be fulfilled for its survival [7][8], [9]. In managing clean water supply services, the government and clean water companies need to implement an efficient and effective management system [10], . One of the important aspects of this management is the payment system, which must be able to provide convenience and security for users.

Along with the development of information technology, the use of management information systems is an urgent need in simplifying the clean water payment process. This system can increase efficiency, accuracy, and transparency in financial management and provide easy access for users [11][12]. A management information system is a planning system in the internal control of a business that includes the use of management accounting over people, documents, technology, and procedures to solve business problems [13]. Generally, management information systems are used to solve and provide solutions to business problems such as production costs, services or business strategies implemented. The difference between management information systems and other ordinary information systems is that they can automatically provide analysis of other information systems [14].

However, the success of the implementation of this system does not only depend on the sophistication of the technology, but also on the extent to which the system can be easily used by users. Many clean water companies

Receipt: 26-07-2024 | Revision: 29-09-2024 | Publish: 01-10-2024 | doi: 10.60083/jidt.v6i3.594

or government agencies that manage water payments still use manual processes, such as manual payment recording and non-automated customer data management. This can lead to delays in payment processing, data errors, and limitations in accessing customer information. In computerizing payment data that is processed into an information system, the system is useful for companies.

Currently, from the perspective of efficiency and accountability, the conventional system still implementsmanual recording systems using spreadsheet applications starting from the historical processing process, receivables and customer distribution cannot be done quickly. The customer data recording system also requires a lot of data verification, so it takes a very long time to process data.

In addition, the inaccuracy of customer data due to conventional data processing, the accuracy of the latest data is not guaranteed because the data processing process is likely to cause errors in input and processing. This causes financial data reporting to not be obtained accurately in a short period of time (real-time), as a result of which decision-making by Clean Water managers located in Mekar Sari Raya Village will also be very slow. In processing data, it is also inaccurate where customer historical data is not guaranteed and not centralized. This manual management system shows that staff spend a lot of time completing these tasks, thus impacting the timeliness of customer payments in the following month and delaying the payment of contributions.

Based on the above background, in this study the researcher took the above problem as the theme of the article for the final project with the title "CLEAN WATER PAYMENT MANAGEMENT INFORMATION SYSTEM USING EXTREME PROGRAMMING METHOD". Thus, the implementation of the clean water payment management information system using this method is expected to increase the acceptance rate and user satisfaction, as well as ensure the sustainability of the provision of clean water services that effective and efficient in supporting the lives of the rapidly developing community.

2. Research Methods

2.1. System Development Methods

The system development method that will be used in this study is Extreme Programming. The use of this method is due to the fact that this system development method allows for fast, flexible software development, actively engages customers, produces high-quality products, improves team communication, improves team satisfaction, and increases resilience to project changes and risks. The Extreme Programming method is a method that supports change by offering repeatable levels in a short period of time, depending on the focus you want to achieve. The stages include: planning, design, coding, and testing [15][16]. The stages of analysis and system design can be seen in Figure 1:

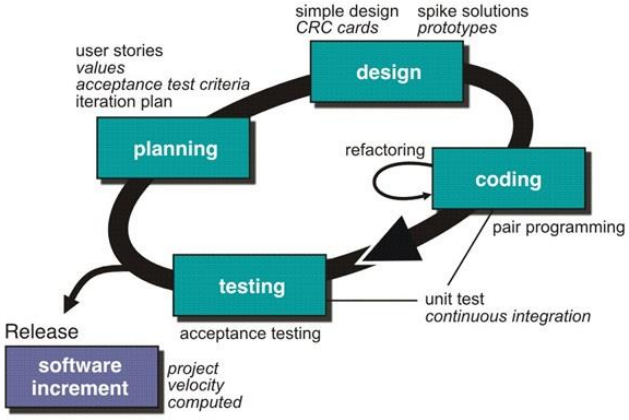

Figure 1. Extreme Programming Scheme

a. Planning
   The planning stage begins with the process of listening in detail to the needs of various activities in the system, which will help users to understand existing business processes and gain a deep understanding of important characteristics, functions, and expected results. For mobile commerce development, this stage takes place by identifying the problems that exist in the currently active system, which is followed by an analysis of the user's needs for the system to be developed [17].
b. Design

In the design phase, we carry out the creation of a system model oriented to the previously identified analytical needs. It also includes the development of database models that explain data interactions. The model chosen for this system is the Integrated Modeling Language (UML), which includes a variety of diagrams such as Use-Case Diagrams, Activity Diagrams, and Classroom Diagrams [18], [19], [20].

c. Coding
In this phase, the coding process is carried out according to the design and analysis that has been carried out. Coding is the process of converting a design into code that can be processed by a computer. In this study, the application is divided into two parts: *front-end* and *back-end*. The *back-end* is developed using the PHP programming language and uses *the CodeIgniter framework* , with Visual Studio Code as the editor application and MySQL for the database. Meanwhile, the front-end part is built using HTML and CSS [21].

d. Testing
Once the coding process is complete, the next step is to test the system. The goal is to identify errors that arise during the operation of the application and ensure that the system that has been created meets the needs of the user. At this stage, the method used for testing is blackbox testing, which focuses on testing the functionality of various input forms to ensure that each function works as intended.

3. Results and Discussion

3.1. Planning

The first step in the development of an information system is to identify the problem. In this context, the main problem in the development of a clean water payment management information system in Mekar Sari Village is the limited access of the community to information regarding clean water bills and payments. Currently, customer have to come directly to the water management office or wait for information from the officers, which is often impractical and can result in delays in payment. This causes inconvenience and potential fines for residents who are unable to pay on time, especially for those with limited mobility or access to the manager's office.

Based on this problem, the next step is to analyze the functional and non-functional needs of the system to be developed. Functional requirements help in determining the features that should be present in the system and who can use them. Users of this system were identified as consisting of three categories: admins, field officers, and customer.

The following are the results of the functional needs analysis of the clean water payment management information system to be developed:

a. Admin: Has the ability to manage payment systems, including managing user data, managing bills, and monitoring incoming payments through a web-based platform.
b. Admin and Field Officers: Can add, delete, and change user data and update payment status in a web-based system.
c. Admin: Able to add, delete, change, and view data related to water distribution infrastructure and technical complaints through a web-based system. Customer can also report technical issues and monitor the status of their completion.
d. Customer: Can view bill information, make payments, and get notifications or warnings related to payment due and disruption of clean water services.

Non-functional requirements include hardware and software requirements that support the development of these systems. The following are the non-functional needs that have been identified:

a. Hardware:
   1. 14-Inch LCD monitor.
   2. Minimum Intel Core i3 processor with a speed of 2.13 GHz.
   3. Minimum 4 GB RAM.
   4. Screen resolution 1366 x 768 pixels (64-bit).
b. Software:
   1. Microsoft Windows 11 operating system.
   2. Development framework such as CodeIgniter.
   3. MySQL server database.

3.2. Design

a. Use Case Diagram

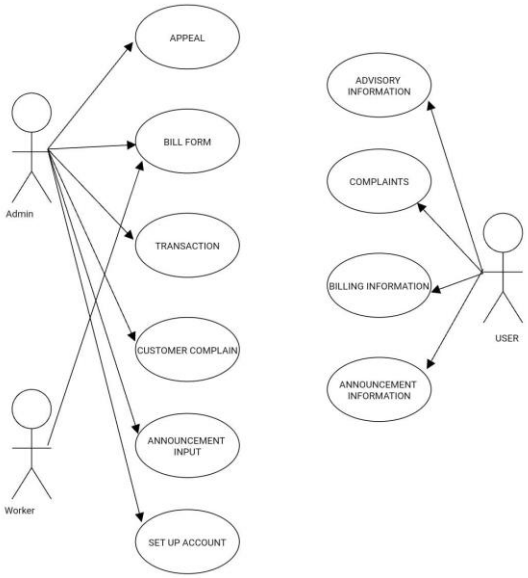

Figure 2. Use Case Diagram

In Figure 2, is a *use case* diagram for the Mekar Sari Village Clean Water Payment Management Information System. This diagram illustrates the relationship between the actors involved and the various functions that exist in the system. There are three main actors in this system: Admin, Field Officers, and Customer.
Admins have an important role in managing various aspects of the system, such as creating and displaying appeals to customers, managing billing forms, making and arranging payment transactions, and managing customer accounts. The admin is also responsible for the input of announcements that can be accessed by customers through the Announcement Info feature. In addition, admins and field officers have the task of handling and responding to customer complaints through the Customer Complaints feature.
Field Officers work closely with admins in managing announcements and helping to resolve complaints submitted by customers. Meanwhile, Customers have access to view their clean water bill information through the Bill Info feature, file complaints or complaints related to services through the Complaint feature, as well as access information announcements and appeals provided by the admin.

With this use case diagram, it can be clearly seen how each user interacts with the functions in the system, helping in the development and maintenance of a web-based clean water payment management information system in Mekar Sari Village.

3.3. Coding

In Figure 3, it shows a login form that asks the user to enter a username and password. This form is used as a security measure to access the system or services provided by Clean Water Management Information System.

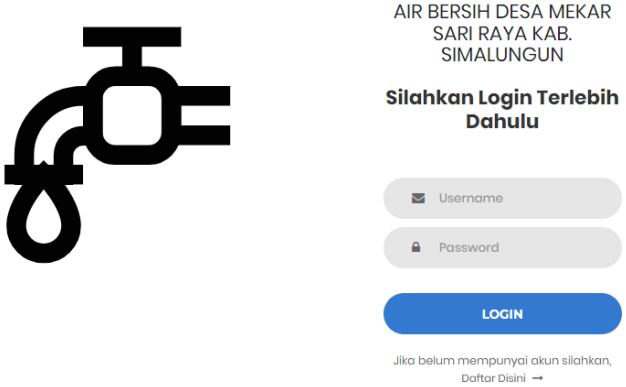

Figure 3. Login Page Prototype (Indonesia)

After successfully *logging in*, users will be directed to the *dashboard* page as shown in Figure 4, the user interface page (*dashboard*) of Clean Water Management Information System in Mekar Sari Raya Unit Simalungun Regency, which is designed to provide access to important functions in this system. These functions can be accessed by pressing the available menus. These menus include the Quality Complaint Menu, the Announcement Menu, the Customer Profile Menu, and the Billing Menu. There is also a sidebar on this page.

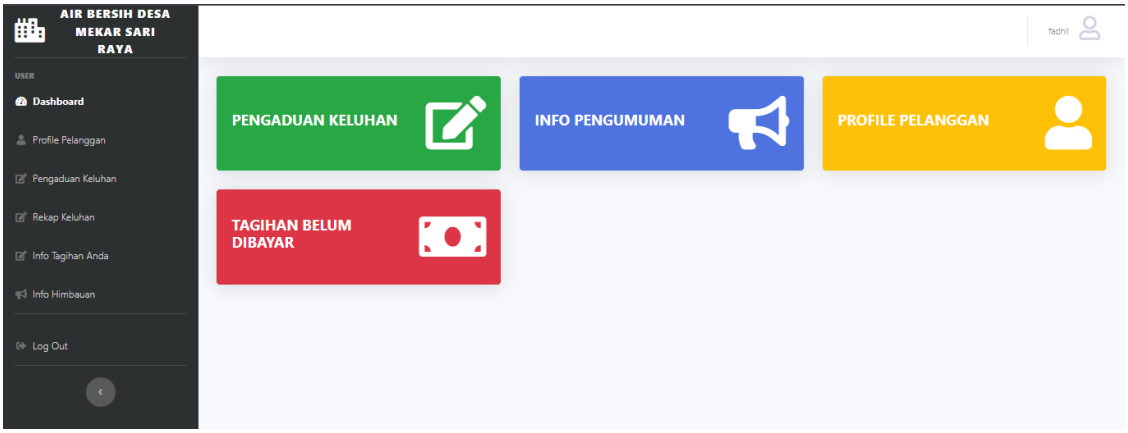

Figure 4. Dashboard Page Prototype (Indonesia)

In Figure 5, it shows the customer complaints page. On this page there is a sidebar for navigation on each page. On this page, there is also a form that can be filled out to file complaints experienced by customers. On this page, customers or users must enter information about the complaints they experience. The information is in accordance with existing forms such as meter size, meter brand, meter series, complaint date, Complaint Grievance date, meter date, meter installation date, type of complaint and complaint record or description.

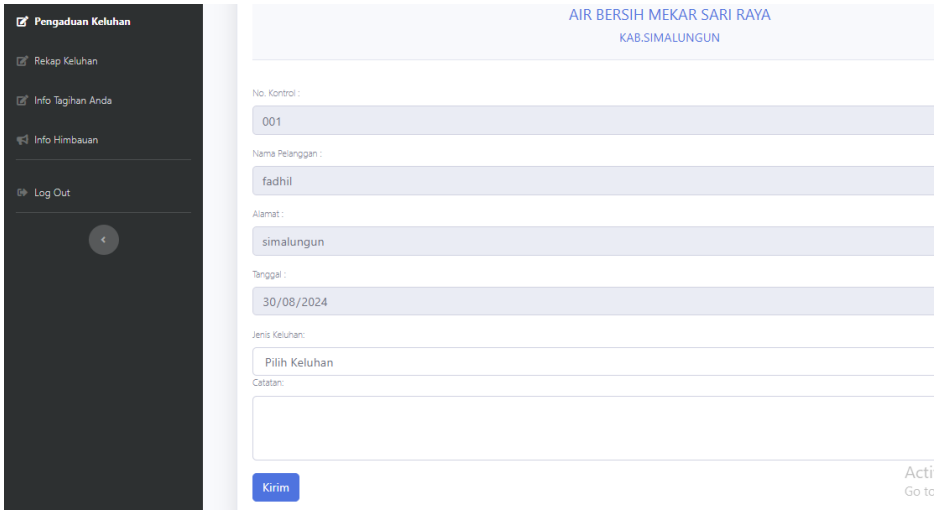

Figure 5. Prototype User Complaint Page (Indonesia)

In Figure 6, it shows the Customer complaint history page. This page displays information about customer complaints that have already been submitted by customers. This page can also search for customer complaints with its search feature. On this page, the number of customer complaints displayed can reach 100 entries.

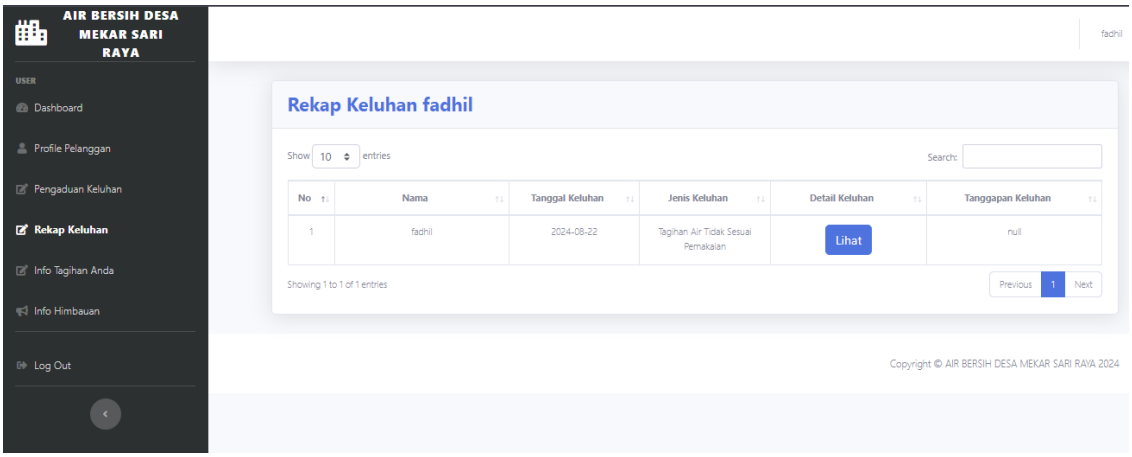

Figure 6. Prototype of the user complaint history page (Indonesia)

In Figure 7, it shows the customer's billing page. On this page, there is information about the customer's CLEAN WATER MANAGEMENT INFORMATION SYSTEM bill such as bills that must be paid, fines that must be paid, payment deadline and due date. On this page too, customers can pay their bills. There is also brief information about the customer. The information is in the form of the customer's full name, customer address, customer's active status, customer phone number, and customer's active date.

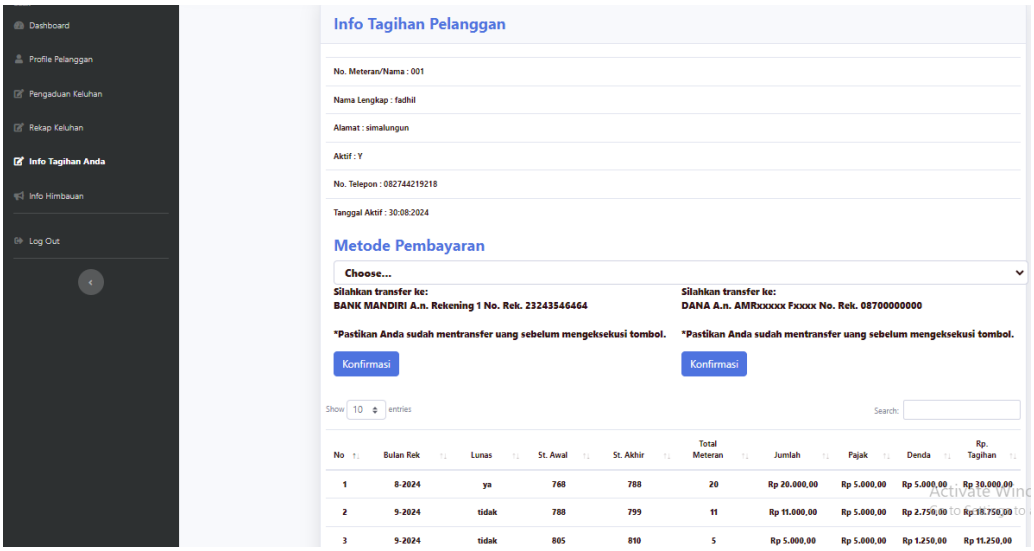

Figure 7. Prototype customer billing page (Indonesia)

In Figure 8, it shows the customer appeal page. This page serves to print letters for customers whose bills are due.

Figure 8. Prototype of the Customer Appeal Page (Indonesia)

3.4. Testing

The tests carried out aim to find errors and shortcomings in the built application, so that it can be known whether the application has met the criteria according to its purpose or not. This test is carried out by a functional testing method using black-box testing techniques.

Table 1. Blackbox Testing Application

No.	Use Case	Description	Input	Expected Output	Status (Pass/Fail)
1	Appeal	Displaying appeals to customer	Access the appeal page	Appeal information displayed	PASS
2	Appeal Info	Displays detailed information from the appeal	Select the appeal you want	Detailed information about the selected appeal appears	PASS
3	Billing Form	Customers access the billing form	Access the billing form page	Billing form displayed	PASS
4	Complaints	Filing a service-related complaint	Fill out the complaint form	Complaints are stored in the system and notifications are sent	PASS
5	Transaction	The customer makes a payment transaction	Enter payment information	The transaction was successful and a payment notification appears	PASS
6	Billing Info	View customer billing information	Access the billing info page	Billing information that matches the customer appears	PASS
7	Customer Complaints	View announcement information	Access the announcements page	Complaint information appears or complaint status is update	PASS
8	Announcement Info	View announcement information	Access the announcement page	Announcement information displayed	PASS
9	Announcement Input	Input new announcement into the system	Fill out the announcement form	Announcement are successfully saved and displayed in the announcement list	PASS
10	Set Up Account	Setting up customer/admin account information	Select the account settings option	Account information updated successfully	PASS

The *blackbox testing* table above is used to test the functionality of the Mekar Sari Village clean water payment management information system based on the use case diagram that has been created. These tests focus on the

output generated by the system after receiving certain input from the user, without paying attention to how the system's internal processes work.
Each use case in the system is tested to ensure that it functions as expected. For example, when a user accesses the appeal page, the system must be able to display the appeal information correctly. Similarly, in transaction testing, the system must ensure that the payment information entered by the user is processed correctly and that the transaction is declared successful.
Each test scenario has an input column that describes what the user is giving, as well as an output column that describes the expected outcome of the system. Once the test is performed, the status of each test will be recorded as "*Pass*" if the results are as expected, or "*Fail*" if there is an error. Through these tests, it is expected that any errors or inconsistencies in the system can be identified and corrected before they are fully implemented.

4. Conclusion

In the context of society's shift towards the informational era, this article details the implementation of the Clean Water Payment Management Information System using the Extreme Programming method. The development of the system uses this method as the key to success, the article discusses the role of information technology in improving the efficiency of clean water payments. With the rapid growth of the population, this article emphasizes the importance of an efficient management system and a payment system that provides convenience and security for users. Through the application of the Extreme Programming method, it is hoped that it can increase user acceptance and satisfaction, as well as support the sustainability of the provision of effective and efficient clean water services in a rapidly growing society.

Acknowledgments

M Alhamdulillahi Robbil'alamin, praise and gratitude for the presence of Allah Subhanu Wata'ala who always bestows His grace and guidance, so that the author can complete the Final Project of the Journal Article entitled: "CLEAN WATER PAYMENT MANAGEMENT INFORMATION SYSTEM USING EXTREME PROGRAMMING METHOD". Do not forget the prayers and greetings to the ummah of the Prophet Muhammad Shalallaahu Alaihi Wassalaam, may we get his intercession in the hereafter.
The preparation of the Final Project of this Journal Article is intended as one of the requirements for completing the Strata-1 education program of the Information Systems Study Program at the Faculty of Science and Technology UIN North Sumatra Medan. The completion of the preparation of the Final Project of the Journal Article cannot be separated from the help, support, direction, and guidance from many parties. Therefore, the author would like to thank Prof. Dr. Nurhayati, M. Ag, as the Rector of UIN North Sumatra Medan, Mr. Dr. Zulham, S.H.I., M. Hum as the Dean of the Faculty of Science and Technology UIN North Sumatra Medan, Mr. Rakhmat Kurniawan. R, M. Kom, as the Head of the Information Systems Study Program of UIN North Sumatra Medan, Mr. Muhamad Alda, S. Kom, M.S.I. as the Secretary of the Information Systems Study Program of UIN North Sumatra Medan, Mr. Suendri, M. Kom, as the Supervisor Lecturer who has guided and given direction to the author during the completion of the Final Project of this Journal Article, Mr. and Mrs. Lecturer of the Information Systems Study Program who have given guidance to the author during the lecture, Both of the author's parents have always provided support, enthusiasm and motivation until now.
The author realizes that there are still many shortcomings in writing this Journal Article Final Project. Therefore, the author hopes for constructive criticism and suggestions to be used as material for future evaluation.
Finally, the author hopes that this Final Project of Journal Articles can be accepted and useful for anyone who reads it and can be used as reference material for further research. May Allah SWT always give His mercy and guidance to all of us.

References

[1] S. Hariyanto, "Sistem Informasi Manajemen," *Sist. Inf. Manaj.*, vol. 9, no. 1, pp. 80–85, 2018, [Online]. Available: https://jurnal-unita.org/index.php/publiciana/article/viewFile/75/69.
[2] Farhatun Nisaul Ahadiyah, "Perkembangan Teknologi Infomasi Terhadap Peningkatan Bisnis Online," *INTERDISIPLIN J. Qual. Quant. Res.*, vol. 1, no. 1, pp. 41–49, 2023, doi: 10.61166/interdisiplin.v1i1.5.
[3] A. Wijaya and N. Hendrastuty, "Rancang Bangun Sistem Informasi Manajemen Kepegawaian (Simpeg) Berbasis Web (Studi Kasus : Pt Sembilan Hakim Nusantara)," *J. Teknol. dan Sist. Inf.*, vol. 3, no. 2, pp. 9–17, 2022, [Online]. Available: http://jim.teknokrat.ac.id/index.php/JTSI.
[4] R. Ishak, H. Widyastuti, and S. Setiaji, "Rancang Bangun Sistem Informasi Penjualan Kue Dan Roti Berbasis Web Pada Yuki Bakery Jakarta," *Swabumi*, vol. 6, no. 1, pp. 27–34, 2018, doi: 10.31294/swabumi.v6i1.3313.
[5] S. Hasan and N. Muhammad, "Sistem Informasi Pembayaran Biaya Studi Berbasis Web Pada Politeknik Sains Dan Teknologi Wiratama Maluku Utara," *IJIS - Indones. J. Inf. Syst.*, vol. 5, no. 1, p. 44, 2020, doi:

10.36549/ijis.v5i1.66.
[6] A. Oktaviyana, "Analisis Dan Pengembangan Sistem Informasi Manajemen," *Circ. Arch.*, 2023, [Online]. Available: http://circle-archive.com/index.php/carc/article/view/21%0Ahttp://circle-archive.com/index.php/carc/article/download/21/16.
[7] R. A. Lomi, J. J. Messakh, and P. G. Tamelan, "Pemanfaatan Air Bersih Untuk Kebutuhan Rumah Tangga Dari Mata Air Oelnaisanam Di Kelurahan Bakunase II, Kota Kupang," *J. Batakarang*, vol. 2, no. 1, pp. 32–38, 2020.
[8] Sutisna and N. M. Yuniar, "Klasifikasi Kualitas Air Bersih Menggunakan Metode Naïve baiyes," *J. Sains dan Teknol.*, vol. 5, no. 1, pp. 243–246, 2023, [Online]. Available: https://doi.org/10.55338/saintek.v5i1.1383.
[9] A. R. Butarbutar, "Penyuluhan Tentang Pentingnya Air Bersih dan Standar Air Minum yang Sehat untuk Menjaga Kesehatan Pencernaan dan Tetap Bugar," *J. Pelaks. Pengabdi. Berger. bersama Masy.*, vol. 2, no. 1, pp. 67–72, 2024.
[10] P. M. R. Rizkiyah, C. A. Putra, S. Assani', and H. Hermanto, "Analisa dan Perancangan Sistem Informasi Pembayaran Air HIPPAM Desa Leran Berbasis Web," *KONSTELASI Konvergensi Teknol. dan Sist. Inf.*, vol. 1, no. 1, pp. 131–144, 2021, doi: 10.24002/konstelasi.v1i1.4313.
[11] N. I. Jayanti, M. Arifin, and A. Widodo, "SISTEM INFORMASI LAYANAN PELANGGAN BERBASIS WEB DI PDAM KABUPATEN GROBOGAN Penulis Korespondensi," 2018, [Online]. Available: http://www.jurnal.umk.ac.id/sitech.
[12] A. Syabana, S. Informasi, U. Islam, and N. Sumatera, "Manajemen Proyek Sistem Informasi Layanan Pelanggan Berbasis," vol. 3, no. 1, pp. 639–648, 2024.
[13] A. Sadikin and N. Wiranda, *Sistem informasi manajemen*. 2022.
[14] S. E. Emi and S. Farizy, *Sistem Informasi Manajemen*, no. 1. 2021.
[15] M. Muthohir, "Perancangan Media Promosi Produk Unggulan UKM Kendal Berbasis Web dengan Metode R&D," *J. Ilm. Komput. Graf.*, vol. 12, no. 2, pp. 13–20, 2019.
[16] K. Fuadi, "Sistem Informasi Manajemen Pelayanan dan Pengaduan Siswa Berbasis Web," *J. Ilm. Mhs. Sist. Inf. dan Komputer Akuntansi*, vol. 1, no. 1, pp. 1–6, 2023, doi: 10.33365/jimasika.v1i1.2494.
[17] S. M. Rambe and S. Suendri, "Geographic Information System Mapping Risk Factors Stunting Using Methods Geographically Weighted Regression," *J. Appl. Geospatial Inf.*, vol. 7, no. 2, pp. 1075–1079, 2023, doi: 10.30871/jagi.v7i2.6936.
[18] Suendri, "Implementasi Diagram UML (Unified Modelling Language) Pada Perancangan Sistem Informasi Remunerasi Dosen Dengan Database Oracle (Studi Kasus: UIN Sumatera Utara Medan)," *J. Ilmu Komput. dan Inform.*, vol. 3, no. 1, pp. 1–9, 2018, [Online]. Available: http://jurnal.uinsu.ac.id/index.php/algoritma/article/download/3148/1871.
[19] P. Arta Mandala and Kurniawan, "Penerapan Metode Extreme Programming (XP) pada Pengembangan Sistem Informasi Penyewaan Lapangan Olahraga (SIPELA)," *J. Jupiter*, vol. 14, no. 2, pp. 71–82, 2022.
[20] M. N. Arifin and D. Siahaan, "Structural and Semantic Similarity Measurement of UML Use Case Diagram," *Lontar Komput. J. Ilm. Teknol. Inf.*, vol. 11, no. 2, p. 88, 2020, doi: 10.24843/lkjiti.2020.v11.i02.p03.
[21] M. Muqorobin and N. A. Rozaq Rais, "Comparison of PHP Programming Language with Codeigniter Framework in Project CRUD," *Int. J. Comput. Inf. Syst.*, vol. 3, no. 3, pp. 94–98, 2022, doi: 10.29040/ijcis.v3i3.77.