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DESIGN AND BUILD AN ONLINE RESERVASTION SYSTEM FOR HEALTH SERVICES AT PET CLINICS USING THE PRIORITY SCHEDULING ALGORITHM

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ABSTRACT

The limited number of veterinarians and the absence of an online reservation service at Louis Pet Shop Palu, which requires prospective patients or customers to come in person to take a queue number and wait to receive medical services. The long queues that often occur cause inconvenience and waste of time for customers. In addition, the mismatch of schedules with customer preferences adds to the inconvenience, which can result in customer dissatisfaction and potential losses for the clinic as customers seek services elsewhere that are more convenient. This research uses the Black Box testing method to ensure the smooth running of the created program. In conclusion, this problem can be overcome by building an online reservation information system that integrates a priority-based queue management mechanism. The implementation of this feature uses Priority Scheduling Algorithm combined with WhatsApp Gateway as a reminder.

I. INTRODUCTION

THE growing interest in pet ownership is a positive trend in building strong and loving relationships with other living beings[1]. Veterinary clinics are an essential part of social and health organizations whose mission is to provide curative and preventive services to their communities. Veterinary clinics are essential for maintaining the well-being and health of pets[2]. In an online reservation system at a pet clinic, a priority scheduling algorithm can be applied to manage the order of appointments based on the urgency level of the required services. For example, when pet owners make a reservation, they will select service types such as grooming, vaccination, consultation, and surgery. The system will determine the priority based on the type of service and the condition of the animal, with emergency cases getting the highest priority. With this algorithm, high-priority appointments, such as surgeries, will be scheduled first, even if they are made after reservations for lower-priority services, such as vaccinations. For example, if there are three reservations made for surgery, consultation, and vaccination, the system will arrange the schedule with surgery first, followed by consultation, and finally vaccination. The implementation of this algorithm allows the clinic to handle the most urgent cases quickly, improve service efficiency, and ensure that clinic resources are allocated appropriately according to patients' prioritized needs. The following statistics of patient data can be seen in Figure 1.

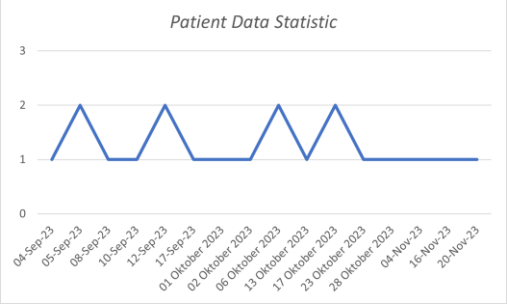

Figure 1. Patient Data Statistic

Research conducted by Setyawatu R, Bachtiar Maulachela A in 2020 focuses on the problem of inefficient queuing systems in car wash services, this causes the process to be less than optimal and there are many obstacles faced such as, queue buildup and unclear queue information received by customers. The proposed solution is the development of an application that integrates the queue prioritization system. The first approach is testing the dynamic priority scheduling algorithm applied to the car wash queue application, using the white box method. Meanwhile, the second test is to test the functionality of the system using the black box method. The results of this study show that the car wash queue application successfully sorts customer orders based on priority rules using the priority scheduling algorithm which is determined based on distance and order time. While the results of system functionality testing show that the application successfully manages various kinds of errors both caused by system failures and due to human error.[3]

Research conducted by ivan nur yuliansyah, Dewi safitri in 2020 focuses on the problem of inefficiency in the service process due to the use of manual systems so that it experiences obstacles and limitations. so a service information system is needed to help manage the clinic, Every customer who comes also has the possibility of bringing more than one pet. This information system makes it easier for officers to manage patient data, owners, employees, and medical records. The achievements of the research on the implementation of the Draft Information System for Animal Health and Maintenance Services at the Doctor Arif Veterinary Clinic can facilitate, accelerate, and improve animal services at the Doctor Arif Animal Clinic.[4]

Research conducted by Saputra O, Safitri W in 2022 focuses on the problem of notification messages or reminders of SPP payments that have been running at SMAN 10 Mukomuko which still deliver messages directly by teachers to students related to Education Development Contributions (SPP). Messages sent directly are often not noticed by students, so students are often late in making the SPP payment process. A more effective and efficient SPP payment procedure can expedite all school operational activities. This research aims to improve the administration of SPP payments with a whatsapp gateway-based system. This system can perform all SPP payment procedures in a mobile or mobile manner. The data processed in this study comes from the SPP payment administration system at Mukomuko High School (SMA). The system uses PHP programming language tools and MySQL database. The achievement of this research is a computerized tuition payment administration system, so that school administration can control tuition payments more effectively and efficiently. So that this system is very precise and fast in the administration of SPP payments and becomes a reference for other administrations in order to help the administrative process and increase time efficiency and provide precise information.[5]

This research will combine priority scheduling algorithm and WhatsApp gateway at Louis pet shop to improve efficiency and quality of service. The priority scheduling algorithm allows the clinic to prioritize animal patients based on health conditions, while WhatsApp gateway facilitates effective communication and reminders between the clinic and animal owners. This combination not only improves customer satisfaction through faster and more transparent service, but also increases staff productivity by automating many tasks. In addition, the system also reduces the risk of human error and improves data accuracy. The ultimate goal of combining these two technologies is to create a more modern, efficient and customer-centric service system.

Various sectors, such as businesses, schools, and hospitals, are highly influenced by the advancement of science and technology, especially information technology[6], [7]. The internet is one of the inevitable information technologies that allows people to connect with each other without time or space limitations[8]. The emergence of the internet has had a significant impact on online reservation systems, changing the way people book services and products. Louis Pet Shop Palu still uses a manual or paper-based reservation system that is often inefficient, error-prone, and unable to accommodate the increasing number of patients. In addition, the system is unable to provide accurate information about service availability, waiting time, and patient prioritization. This results in customer dissatisfaction, long queues, and difficulties in managing clinic schedules. All of these factors contribute to the clinic's poor reputation, which can negatively impact the number of customers coming in. By addressing these issues, clinics can improve efficiency, provide better services, and increase customer satisfaction and loyalty.

An online reservation system that utilizes a priority scheduling algorithm can address the aforementioned issues. One advantage of this system is that patients can book appointments online, saving time and reducing queues. To determine the order in which patients will be served, a priority scheduling algorithm is employed. This algorithm takes into account various factors, such as the type of service required and the severity of the pet's illness. The priority scheduling algorithm also offers other specific advantages, such as increased flexibility in clinic schedule

management. With this system, clinics can dynamically adjust schedules based on changing urgent needs, thus ensuring emergency cases always get top priority. In addition, the system allows for better integration between the medical and administrative teams, allowing all parties to access scheduling information easily and minimizing coordination errors. These advantages make the priority scheduling algorithm an effective method to improve operational efficiency, service quality, and customer satisfaction in pet clinics. Each process is assigned a priority using the FCFS (First Come First Served) order, which differs from other scheduling algorithms that focus on arrival time (FCFS) and shortest job first (SJF)[9], [10]. The proposed priority scheduling algorithm is better in the context of veterinary clinic reservations compared to other algorithms such as FCFS (First Come First Served) and SJF (Shortest Job First). The algorithm prioritizes based on medical urgency and patient needs, ensuring that animals that require immediate treatment receive faster attention. In addition, the algorithm is flexible and can adjust the schedule in real-time based on changes in the situation, such as the addition of emergency cases or appointment cancellations. By optimizing the use of clinic resources, such as veterinarians and equipment, the algorithm prevents overload and improves operational efficiency. Unlike FCFS and SJF, this algorithm also takes customer preferences into consideration, providing greater flexibility and improving customer satisfaction. Thus, this priority scheduling algorithm is able to reduce unnecessary waiting times, prevent delays in important cases, and provide more responsive and efficient services in veterinary clinics.

II. METHODS

A. *Type of Research*

This research employs an applied research approach to examine and evaluate the applicability of a theory in solving practical, real-world problems [11]. Specifically, this study aims to address patient challenges related to appointment management, including difficulty in accessing appointment status, making changes or cancellations, and experiencing scheduling errors that lead to increased wait times. By developing effective solutions, this research seeks to enhance service efficiency and effectiveness.

B. *System Development*

The waterfall method is a system development technique that divides a process into steps that must be completed sequentially before starting the next step [12]. It is similar to the gradual flow of a waterfall[13]. With this method, developers can follow well-defined steps, ensuring that each stage is completed before moving on to the next. This helps achieve consistent results and minimizes the risk of errors. The waterfall method was chosen for this research because its structured and systematic approach perfectly suits the needs of developing an online reservation system at a pet clinic. This method divides the development process into steps that must be completed sequentially, ensuring that each stage, from requirements analysis to implementation and testing, is carefully completed before moving on to the next stage. This method also provides a clear structure for project management, assisting in planning and risk control with well-defined timelines and stages. Thus, the waterfall method enables the development of a more organized and reliable system, meeting the needs of pet clinics effectively and efficiently. Therefore, the waterfall method provides a solid structure in software development [14]. The following is the process of the research stages can be seen in Figure 2.

Figure 2. Research Stages

Each stage of system development is carried out sequentially to ensure project success. In the analysis stage, the main focus is on collecting and documenting requirements from relevant parties to compile a comprehensive system specification. This creates a solid foundation for the design of a system that fits the clinic's needs. Next, in the design stage, the system architecture, user interface, and priority scheduling algorithm are carefully designed, ensuring a clear and functional blueprint. The implementation stage involves coding and module development as well as system integration, focusing on technical completion and ensuring all components function properly. Finally, the testing stage ensures that the system is thoroughly tested to meet specifications and user expectations, focusing on problem fixing and performance evaluation. Each stage supports the research objectives by ensuring the developed system meets the clinic's needs, functions properly, and is ready for effective use.

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III. RESULT

A. Problem Identification

Many veterinary clinics still use manual or paper-based reservation systems today. These manual reservations are often inefficient, error-prone, and cannot handle the increasing number of patients. In addition, it cannot provide accurate information on service availability, waiting time, and patient prioritization. As a result, customers become dissatisfied, queues are long, and it is difficult to manage clinic schedules.

B. Data Collection

Two main methods were used to collect data in this study. First, researchers were able to observe firsthand the process of animal services at the veterinary clinic, from registration to medical treatment. Second, conducting in-depth interviews with veterinarians and clinic staff. The purpose of these interviews was to obtain more information about service procedures, and barriers that often occur.

Interviews are an effective way to obtain in-depth qualitative data. Researchers can ask interviewees specific questions in an interview to gain a deeper understanding of a phenomenon [15]. On the other hand, observation allows researchers to see firsthand the behaviors and actions that occur in a particular environment [15], [16]. Data collected in the form of service types can be seen in table 1.

TABLE 1
TYPE OF ANIMAL SERVICE

Type of Service	Priority	Description
Grooming	Low	Veterinary clinics are more likely to prioritize patients who need immediate medical care because the grooming process takes quite a long time compared to other medical services.
Consultation	Low	Not all consultations are urgent. Some consultations are only related to general inquiries or follow-up after treatment.
Vaccines	Low	Vaccinations usually have a schedule that can be arranged, unlike emergency cases. Pet owners can choose the most suitable time to bring their pets for vaccination.
Surgery	High	Many veterinary surgical procedures are performed in emergencies such as accidents, serious injuries or life-threatening medical conditions, and these procedures must be performed as quickly as possible to save the animal's life.

The data obtained will be used to test and evaluate the performance of the priority scheduling algorithm developed for the newly created online reservation system. The purpose of this data processing is to determine service priorities, reduce patient waiting time, and improve the effectiveness of using clinic resources. The data obtained will be used to test and evaluate the performance of the priority scheduling algorithm developed for the newly created online reservation system. The purpose of this data processing is to determine service priorities, reduce patient waiting time, and improve the effectiveness of using clinic resources.

C. System design

Researchers designed the structure and workflow of the system at the system design stage. Flowchart is a visual tool that can be used to map and analyze the steps and sequence of procedures in a program, which includes the internal controls implemented in the system [17], [18]. A flowchart illustrating this process can be seen in Figure 3.

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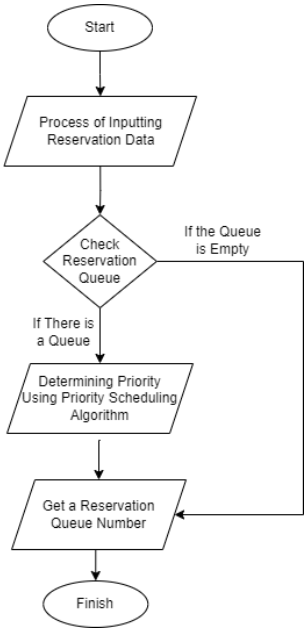

Figure 3. Flowchart

Figure 3. explains that the system will receive new patient data, check whether there is a reservation queue, and then determine the reservation queue number based on priority using the priority queuing algorithm. If there is no queue, the patient will get a direct queue number.

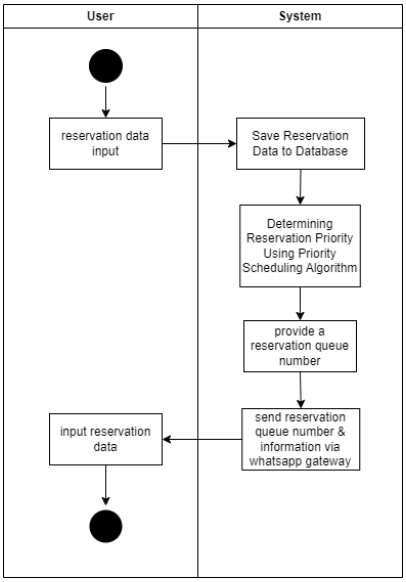

Figure 4. Activity Diagram

This reservation system is designed to make reservations easier for users, as shown by the activity diagram. The clear and structured flow of the system includes reservation data input, data storage, prioritization, and confirmation delivery. One of the excellent features of this system is the use of priority scheduling algorithms, which can optimize the use of resources and provide more efficient services. In addition, the integration of WhatsApp as a confirmation medium provides users with additional benefits. Activity Diagrams show the work flow of a business process and the sequence of processes [19], [20]. The activity diagram can be seen in Figure 4.

D. Implementation

1) Login Page

The login page can only be accessed by users who have the administrator role. This shows that the system has a fairly high level of security because authorized users can only access system data and features. After a successful login, the administrator has full control over the system. Management of customer data, schedule

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settings, and overall system configuration are the main tasks of the administrator. Therefore, the administrator's role is crucial in maintaining the smooth operation of the system. The login view can be seen in figure 5.

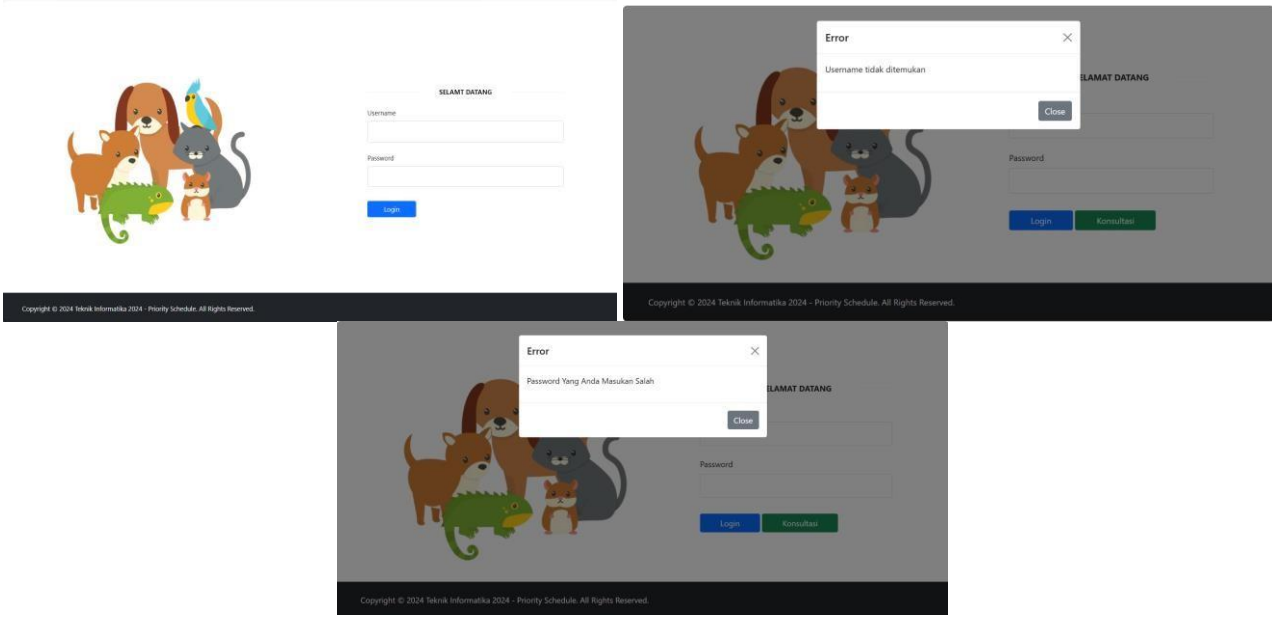

Figure 5. Login Page

2) Reservation Form Display

A reservation form is created to collect necessary information during the reservation process. All necessary information, such as the animal owner's name, phone number, and the type of service desired, will be recorded thoroughly. The system will use this data to set up a consultation schedule that matches the customer's request. Once the data is complete, the system will automatically process it. In this process, the consultation time is set based on service availability and priority of service, and the customer is contacted to confirm the set schedule. As a result, the reservation process can be done more quickly and accurately. Reservation Form Display can be seen in Figure 6.

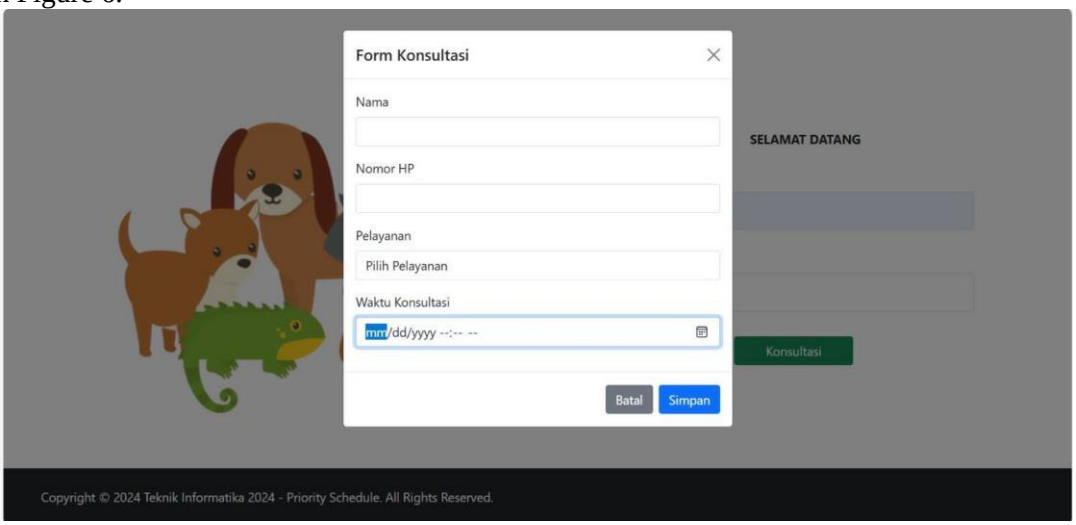

Figure 6. Reservation Form Display

3) Whatsaap message display

To provide the best service, the system can be integrated with whatsaap gateaway, which will automatically notify customers of changes to their visit schedule. Customers will receive a message containing a unique queue number as well as details of the reserved schedule. Thus, customers can easily know the queue number and prepare themselves to arrive at the clinic at the appointed time. This confirmation message also helps the clinic and the customer communicate. Customers will be notified immediately through the message in case of any unexpected schedule changes. With complete information such as the animal's name, date, and time of visit, customers are more comfortable and confident about the service they receive. Whatsaap message display can be seen in Figure 7.

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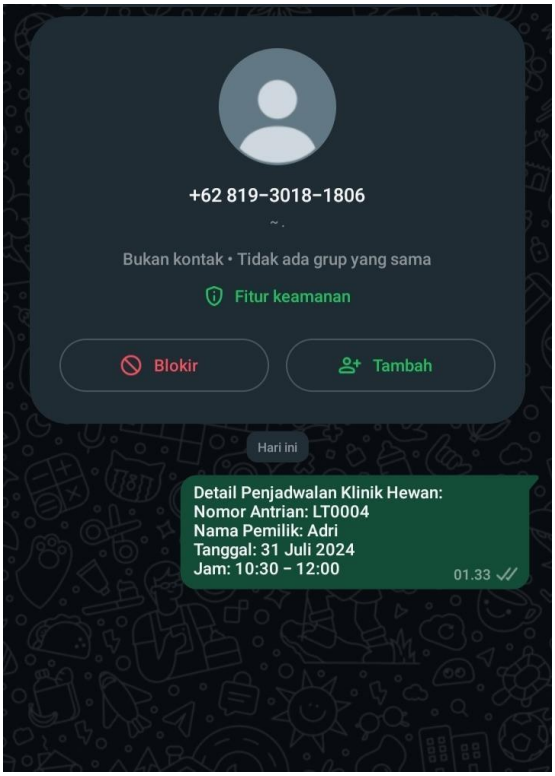

Figure 7. Whatsapp Message Display

E. System Testing

The software testing method known as "black box testing" focuses on the performance of the system without looking at its inner program code structure. To ensure that the software works according to predefined specifications, the main purpose of this test is to ensure this [21]. In other words, this test will check whether the given input meets the needs of the user. Black box testing is helpful in finding different types of software errors, including performance issues, system functions, menu incompleteness, and data structure issues [22]. It can also find errors in the user interface, both graphical and interfaces that interact with other systems [23]. Black box testing can be seen in table 2.

TABLE 2
BLACK BOX TESTING

Test Case	Test Scenario	Testing Results
Login	Display dashboard page if the username and password are correct	Success
Reservation Form Input	Fill in all form fields with valid data (owner name, service type, reservation date, etc.). The system must successfully save the data.	Success
Animal Service Type Input	Ensure the admin can add new animal service types to the system and can also edit, and delete animal service types.	Success
Send Whatsapp Messages	The system must successfully send a reservation confirmation message to the registered customer's whatsapp number and the system must successfully send a schedule change notification message to the customer's whatsapp number.	Success
Print reservation schedule report	The system must successfully print the reservation schedule report in a readable format (PDF). The report should display all relevant reservation data (date, time, service type, etc.).	Success
Input Animal Service Type Prioritization	Ensure the feature works correctly to add, change, and delete priority service types.	Success

F. Questionnaire Testing

Questionnaire is a data collection method that is carried out by giving a number of written questions to respondents to answer. These questions are designed to collect information about the opinions, attitudes, behavior, knowledge, or characteristics of respondents. SUS (System Usability Scale) is a measuring tool used to measure the level of ease of use or system usability. The SUS questionnaire consists of 10 statements that are rated using a

Likert scale containing five to seven scale levels. The Likert scale is used to measure the views, opinions, and perceptions of individuals or groups about social phenomena [24]. The SUS questionnaire consists of 10 statements that are rated using a Likert scale containing five to seven scale levels. In this study, the use of a Likert scale involves five levels, namely 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Can be seen in Table 3

TABLE 3
QUESTIONNARIE TESTING TABLE

No	Statement	SA	A	N	D	SD	Amount	Presentase
1	I think I will use this system again	6	3	1	0	0	88	88%
2	I think the system is easy to use	4	5	1	0	0	83	83%
3	I think the features in this system work well	4	4	2	0	0	80	80%
4	I think others will understand how to use this system easily	5	3	2	0	0	83	83%
5	I don't think there are any difficulties in using this system	5	4	1	0	0	85	85%
	Total						419	84%

IV. CONCLUSION

Using a priority scheduling algorithm, this research successfully designed and built an online reservation system for Louis Pet Shop Palu. By reducing waiting time, this system is expected to increase efficiency and customer satisfaction. Test results show that the system can organize reservation schedules and provide clear information to customers. Providing information in the form of queue numbers, names of animal owners, hours and dates of visits to the clinic. This research develops an online reservation system that can manage patient visit schedules by using a priority scheduling algorithm, which prioritizes types of services or patients with urgent medical conditions. Thus, this system can ensure that patients with urgent needs can be served immediately.

The implementation of this online reservation system has the potential to positively impact Louis Pet Shop Palu by increasing customer satisfaction, and improving efficiency in managing reservation schedules. Further research can be conducted to develop the existing features of this system, such as integrating with the animal medical record system.

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