

An Online Scheduling Platform for Veterinary Appointments

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ABSTRACT

As a result of technological advancements such as the internet and wireless networks, many businesses, including veterinary clinics, have implemented these technologies in their day-to-day operations, and this trend has grown in popularity in recent years. This project proposes that veterinary clinics adopt an online, web-based appointment system to make the appointment process more efficient and straightforward. This research has two objectives: designing and developing a web-based concept for an online appointment booking system. The appointment system is subjected to a usability test to determine whether the proposed system simplifies appointment scheduling for users. This study employed the waterfall model, which consists of six phases, including requirement, analysis, design, coding, testing, and implementation. Visual Studio Code, for the coding process, and XAMPP control panel, for the development and testing of the system on a local web server, were utilized during the development of this research. During the testing period, functionality and usability tests were conducted, and based on the test results, the majority of users agree that this online appointment system is simple to use. In conclusion, this research has helped to simplify the appointment process for users of veterinary clinics, and it can be improved in the future by adding a payment gateway to the system to facilitate online banking payments.

Keywords: online appointment, online system, pets, veterinary clinic, web-based.

INTRODUCTION

In this modern era, pet care has grown in popularity in recent years, spreading from the city to the suburbs. As a result, numerous veterinary clinics are scattered around the region (Changkamanon, 2017). A veterinary clinic is a place to go to for people if their pets are having health problems. There are undoubtedly those who require the veterinary clinic's services daily. But how can a veterinary clinic deliver efficient and fast services if they continue to operate in the old manner? For the traditional method, clients may have to wait hours to obtain care at government facilities. The study of clinic scheduling and waiting times began in 1952. Queues and appointment systems based on research for hospital medical clinics were suggested since the waiting time-to-service ratio was high (Jeebandara, 2015). With the advancement of technology, the appointment process is becoming more effective and efficient than the traditional method. The veterinary clinic is one of the institutions that need the development of this technology in the form of a veterinary online booking appointment system. This

new system will replace the traditional method at the veterinary clinic and will inevitably improve its services and make everyday operations run more smoothly and efficiently. The veterinary appointment system was created to enhance clinic administration by automating the process that occurs in the clinic. This system also provides appointment features, which allow staff to view the appointment that doctors have already made (Teke et al., 2019). The online appointment system function in a planning framework or straightforwardly whereby a patient may access the site or web application and connect with the clinic staff, and the clinic can simply schedule their arrangements using the online programming framework (Mayor, 2021). Then, it will facilitate the recovery of the patient history information. If a pet has an allergy history to any medicine, the doctor can detect it more quickly and easily. After that, the pet record will be saved in a database. This system is beneficial for the customers and the clinics (Teke et al., 2019).

People increasingly necessitate new technologies to make their daily lives easier and simpler. Technology nowadays has become one of the foremost practical tools in our everyday lives. As a result, to adapt to the development of technology in the present, the researcher and others are attempting to bring more value to our lives by building new systems, such as the online appointment system, which is a beneficial system that may decrease and save expenses and time (Odeh et al., 2019). The system currently in use is the traditional method of veterinary clinics that requires the customers to put their information in the appointment form manually, and the information is only kept in files. This method will cause difficulties for the clinic staff because customer information and documents in a physical form potentially will be lost or misplaced (Teke et al., 2019). This condition will harm and will adversely affect the customer because it will not only slow down the process of getting an appointment for them but also will threaten the health of their pets for not getting the proper treatment due to the weakness of this traditional method. Using an online system may contribute to cost-saving as the conventional method needs an abundance of paper and stationaries. Moreover, the traditional system has various flaws, such as permitting a mistake in writing patients' data, taking a long time to search for patients' data, and less effective recapitulation of data for patients' registration (Hapsari et al., 2017). Also, the need for many types of materials for the appointment process will make the space in clinics get packed since the area is limited. Therefore, this study is critical to meeting the customers' demands and making the appointment system easier for them. The findings prove that the veterinary online appointment system is efficient and helpful in easing clients' burdens.

Traditional Veterinary Appointment System

The appeal of pet care has now spread from the city to the suburbs. As a result, there are several veterinary clinics scattered around the region. However, most internal management of the clinic is performed manually using paper documentation (Changkamanon, 2017). Using the traditional method, the appointment can be made when patients come to the clinic physically to set an appointment. Customers must manually fill out the paper appointment form with their information correctly to complete the appointment. Furthermore, the problem with the traditional veterinary appointment system is due to having many steps, and it takes a long time to process. It will also threaten the health of the pets for not getting the proper treatment that they should be getting and will give the customers the wrong impression about the clinic. The traditional system has a lot of flaws. The conventional method uses a lot of paper, which will be costly for the veterinary clinic because every appointment will use innumerable materials. If this situation continues, it will have dire consequences for the veterinary clinic in economic terms. Such veterinary clinics cannot afford essential items for clinics, such as medicines and equipment, because money has been wasted on buying other items for making appointments purpose. Then, after the appointment, the files will be placed on the rack, resulting in issues such as taking longer time to access information, making mistakes when writing, and misplacing the files.

Veterinary Online Appointment System

Traditional activities in companies, such as veterinary clinics, have evolved into digitally structured operations in recent years, as the internet and mobile phone use have changed corporate activities and consumer expectations for services. The veterinary clinic has altered its everyday operations and begun building online capabilities such as appointment scheduling. Customers, on the other hand, have demanded digitally planned, organized, and timely managed services. This changing demand-supply connection between veterinary clinics and their clients has allowed advancements in primary online services and apps. The online appointment arranging and scheduling framework is straightforward, whereby a customer may access the site or web application and connect with the physician. Customers can simply schedule their arrangements over the online programming framework and increase their value by eliminating the issue of extended waiting periods. Online appointment systems are also becoming more popular due to their ease of use (Mayor, 2021). Furthermore, online appointment booking has gained popularity in recent years. Many organizations utilize a web-based online appointment management system to expedite the appointment setup process. The clients can register and arrange appointments with the veterinary clinics using an online appointment management system by using this system (Teke et al., 2019).

Previous Works

Web-based Customer Relationship Management (CRM) system for beauty clinics was developed for beauty clinics by utilizing the services of beauty physicians as the clinics are currently struggling for customers' confidence. Cosmetic physicians counsel clients on beauty concerns and the appropriate treatment solutions. CRM is the technology that allows organizations and consumers alike to form networks. It enables companies and consumers to engage without taking up time, which is unquestionably advantageous for firms and consumers alike (Sarwindah et al., 2020).

A Web-Based Clinic Appointment System for the Ministry of Health (MOH) Clinics in Sri Lanka is known as E Sayana. The Ministry of Health Office in Sri Lanka is the preventative side of the Primary Health Care institution. It runs various clinics and health initiatives to minimize mortality and morbidity. Health promotion and prevention initiatives and early and fast treatment access are crucial components in improving the health sector. There are three sorts of waiting times in MOH clinics. Currently, the MOH is using a paper-based system. According to government rules, clinics have their way of scheduling appointments, conducting clinics, and documenting data. The researcher has worked at the MOH office for eight years and is familiar with the system. Data on the shortcomings of the present system were gathered through personal interviews with patients and their families where these interviews were conducted by health workers (Jeewandara, 2015).

Online Clinic Management System, a clinic management system with GSM Modem Notification, is uniquely created to provide clinic employees with high-efficiency management tools, computerized and systematic patient records, and detailed treatment records. It covers all elements of clinic management and operation. This website contains information on doctors, patients, online appointments, patients' reports, billings, clinical testing, and medical shop billings, among other things. The project allows administrators to access the whole program, patients to book appointments online or in person, doctors to manage patients' reports, receptionists to authorize appointments and patients' bills, and medical store administrators to examine proposed prescriptions. Each polyclinic patient has a unique patient ID and password. Patients can access the polyclinic website by providing their User ID and password and access to the clinic management system (Teke et al., 2019).

Based on Table 1, this research proposed a system called the Veterinary Online Appointment Booking System (VOAS), which is anticipated to employ full functions in having an alert system, queue list view, registration, and login functions compared to the previous systems that were developed.

Table 1: Comparison of the Previous Systems

	System Alert	Queue List View	Registration and Log in System	Language Selections
Veterinary Online Appointment Booking System (VOAS)	✓	✓	✓	✗
Web-based Customer Relationship Management (CRM) System for Beauty Clinics	✗	✗	✓	✗
E Sayana: A Web-Based Clinic Appointment System for MOH Clinics in Sri Lanka	✗	✗	✓	✓
Online Clinic Management System.	✗	✗	✓	✗

METHODOLOGY

The waterfall model is the mother of all models or linear sequential models in software engineering as shown in Figure 1. The waterfall model is simple and understandable to non-technical people. From a management perspective, it is a white-box process model that can be described as a heavyweight process model for software development. It requires detailed and comprehensive documentation and extensive planning upfront (Ismail & Dawoud, 2022). The first phase of this model was about clearly determining the software's requirements, which should be analyzed so the system could be designed accordingly. In the following phase, the product was developed and tested. The software product would be released for operation if the last phase had led to an acceptable result. The waterfall model is well suited if the software product has clear and straightforward requirements and if there is adequate project management.



Figure 1: Methodology

As the waterfall model dictates, the requirements must be well documented before any other project phase begins. The waterfall model comprises six primary phases: Requirement, Design, Implementation, Verification, Deployment, and Maintenance. Each waterfall phase has its process and flows that the project's development could produce positive outcomes. In the Requirement Planning phase, all the information and data were collected from various sources of information. Within the data and information collected, we can use them to define the target user's exact problem and provide an initiative to solve the problem. The gathered information consists of the problem statements, the scope of the project, and the objective of the project. One of the methods used to receive critical data is a survey. The survey was distributed to veterinary clinic clients. Getting their opinion and point of view on this project is relevant. After the requirement phase had been through, the next phase was the design phase. A storyboard was created to have an overview of the final project output. It showed a graphical representation of the Veterinary Online Appointment Booking System, which helps in having an overall idea of the outcome and whether it meets the requirement and users' satisfaction. The storyboard illustrates the log-in page, register page, appointment page, log-out page, accessibility, and user-friendliness of the system.

The third phase is implementation, where the whole project was implemented and developed. The project requirements and specifications were outlined to create the project. The information that had been collected from the previous phases was thoroughly used. The hardware involved was a gaming computer while the software involved were Xampp, Visual Studio Code, MySQL, PHP, CSS, and JavaScript. It is critical to identify the suitable hardware and software used to avoid problems from

occurring, such as compatibility issues. Hardware has an important role in preparing the project. The hardware required is a computer that can support the designing and developing of the Veterinary Online Appointment Booking System.

Once the application was functional in the testing phase, the application was deployed in a real-life environment to the end-user and became available to the veterinary clinic clients and workers. This phase is vital to test the application thoroughly to maintain its functionality when it is released. The last required phase in the waterfall model is the maintenance phase. This phase is essential to modify the system, whether to enhance, change or modify it, to ensure that the application is performing accordingly. These changes are required to maintain the system's capability, such as fixing the bug uncovered during the testing phase. In addition, the maintenance phase also allows for the enhancement of the web system. For instance, adding new functionality based on users' requests to improve the appointment system.

Web-Based Veterinary Online Appointment Booking System

The Veterinary Online Appointment Booking System interface was designed following the development of the database design and object design. The screenshot of the interface available in the project is shown and explained in this section.

Figure 2 shows the home page of the Veterinary Online Appointment Booking System, where the users will log in first when he/she browses the website. If the user already has an account, he/she can just log in to the system by using their username and password, and choose "user" on the level section. Users can also click forgot password if they do not remember their password and can click "sign up here" if they are new to the website and need to create a new account. Moreover, the users can click the "About" section where they can read the details of the veterinary clinic.

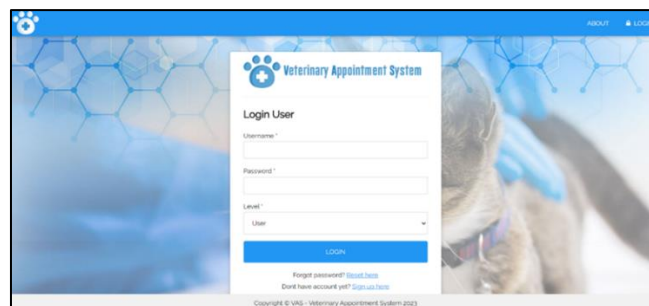


Figure 2: VOAS Home and Log-in Page

Figure 3 depicts the sign-up page, where the users need to fill in a few details that are their full name, email, username, and password. After that, they need to click the "submit" button and the account will be registered, a pop-up will be displayed and the users can click the "login" text on it to go to the log-in section. There is also a forgot password page, where the users need to fill in their username and email and click the "request reset password". Then, the notification stating "new password successfully created" will be shown and the users can open their Gmail and check for the related email. Users can log in to the system by using the 4-digit code that is sent to their Gmail.

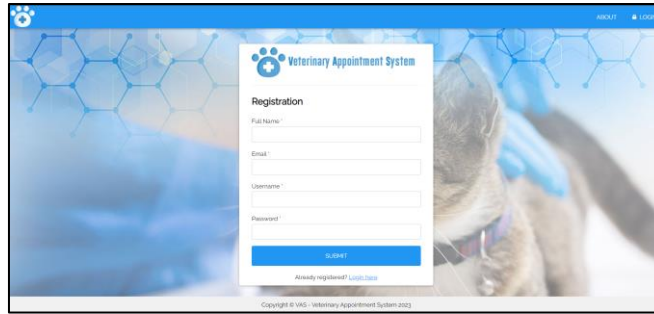


Figure 3: Veterinary Online Appointment Booking System Sign-up Page

Figure 4 shows the “About” page of the system. Users can view any information about the veterinary clinic on this page. Figure 5 illustrates the user’s “Home” page. After the users log in, they will see “My Profile”, “Doctor List”, “Make Appointment”, and “Appointment Status” sections. Furthermore, they can also use the navigation bar on the top right to go to the “Main Page”, “Appointment Status”, and “Log Out”.

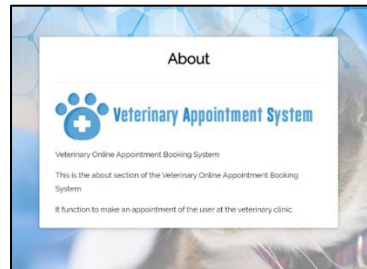


Figure 4: VOAS About page

On the “My Profile” page (Figure 5), user can change their information such as name, username, password, and email, and only need to click the “save changes” button. The “Doctor’s List” page allows users to view the doctors available for the day. On this page, users can view the doctors who are available along with their contact numbers.

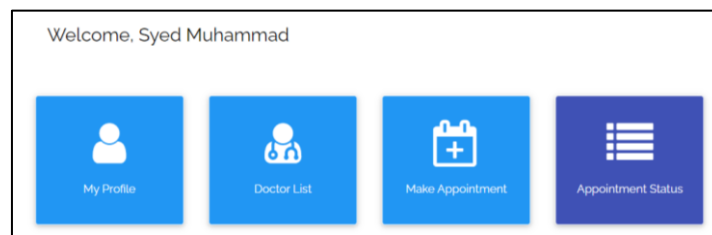


Figure 5: VOAS Users' Home Interface

Afterward, the users can view all information about their appointments such as the date of appointment, animal type, service that they choose, description, and the status of the appointment as shown in Figure 6. If the admin has accepted or rejected the appointment, Figure 7 shows that the status will change. Users also can cancel their appointment if they want by clicking the “cancel” button.

Make Appointment

Animal Type *
- Please select -

Services *
- Please select -

Appointment Date *
mm/dd/yyyy

Description (if any)

SUBMIT BACK

Figure 6: "Make Appointment" Page

MY APPOINTMENT STATUS

Show: 10 entries

#	Date	Animal Type	Services	Description	Status
1	2023-09-30	Bird	Check up		Pending

Showing 1 to 1 of 1 entries

Cancel Previous Next

Figure 7: "Appointment Status" Page

Figure 8 shows the admin home page. On this page, the admin is able to see how many users are in the system, appointments, and pending appointments. Furthermore, the admin can also edit and delete appointments, add, edit, and delete animals' types, services, and doctors available, and they can also delete users in the system.

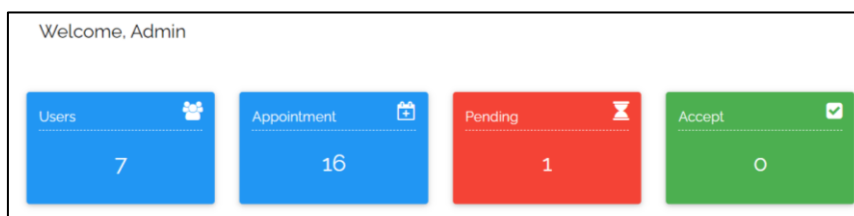


Figure 8: Admin Dashboard

On the "appointment page", the admin can see all the appointment details like name, date of appointment, animal type, services, description, and status. Then, the admin can edit whether they wish to accept or reject the appointment or delete the appointment. On the "animal" page, the admin can add, edit, and delete the type of animal in the system. On the "service" page, the admin can add, edit, and delete any service that had been offered by the veterinary clinic. Admin can also add, edit, and delete the information of doctors that are available at the clinic as well.

System Tests

Two tests were carried out in this research which are functionality and usability tests. These tests were executed on the clients and the vet clinic staff as shown Figure 9.



Figure 9: Veterinary Clinic Staff and Pet Shop Testing the System

Functionality Test

The functionality test evaluates the software system against the functional requirements. The goal of functional testing is to test each function of a software program by giving adequate input and comparing the output to the functional requirements (Hamilton, 2023).

Table 2 depicts that most of the respondents (78.1%) choose “strongly agree”, while 21.9% of the respondents choose “agree”. This demonstrates that the process of the online appointment system is efficient and quick. 87.5% of the respondents choose “strongly agree”, while only 12.5% of the respondents choose “agree”. This displays that most of the users of the online appointment system received a notification email about their appointment status. 87.5% of the respondents choose “strongly agree”, while only 12.5% of the respondents choose “agree”. It confirms that most of the users of the online appointment system can clearly tell and keep updated with their appointment status. 93.8% of the respondents choose strongly agree, while only 6.3% of the respondents choose “agree”. This expresses that most of the users of online appointment systems can browse the system with their devices like computers, laptops, tablets, and mobile phones without facing any problems. 90.6% of the respondents select a mean of 5, while only 9.4% of the respondents choose a mean of 4. This illustrates that most of the users of the system receive the recovery email about their password through their email.

Table 2: Functionality Testing Questionnaire and Mean

No	Question	1	2	3	4	5	Mean
1	Is the appointment process efficient and quick?	0	0	0	7	25	4.78
2	Is there any email received about the appointment status?	0	0	0	4	28	4.87
3	Is the appointment status clearly displayed?	0	0	0	4	28	4.87
4	Is the appointment system compatible with your device?	0	0	0	2	30	4.93
5	Is there any email received about the forgotten password?	0	0	0	3	29	4.90

Usability Test

Usability is an important feature of a software system since a bad user experience can lead to users switching to alternative software. Testing is one method for improving usability. However, usability testing is difficult since it cannot be performed without the presence of real users, which is complex and time-consuming. The percentage of respondents to the online appointment system by gender shows that 56.7% of the respondents are female, while 43.3% of the respondents are male.

Table 3 shows that for most of the respondents, 81.3% choose the mean of 5 which is very good, while only 18.8% of the respondents choose the mean of 4. This confirms that most of the users could easily understand all the buttons and icons in the online appointment system and are not facing major problems. It shows that for most of the respondents, 84.4% choose a mean of 5 which is very good, while only 15.6% of the respondents choose a mean of 4. This displays that most of the users of the online appointment system do not face any problem with the navigation in the online appointment system and it is easy to use. It illustrates that most of the respondents, 87.1%, choose a mean of 5 which

is very good, while only 12.9% of the respondents choose a mean of 4. This expresses that most of the users of the online appointment system agree that the user interface is user-friendly.

Table 3: User Interface Details Questionnaire and Mean

No	Question	1	2	3	4	5	Mean
1	Are the buttons and icons clearly labeled and easy to understand?	0	0	0	6	26	4.81
2	Is the navigation within the appointment system easy to use?	0	0	0	5	27	4.84
3	Is the user interface of the appointment system user-friendly and appealing?	0	0	0	4	28	4.87

Table 4 shows that most of the respondents, 93.8% state that the system is very good, while only 6.3% of the respondents state that it is good. This displays that most of the users agree with the ease and efficiency of using this online appointment system. It exhibits that most of the respondents, 90.6%, choose “strongly agree”, while the rest, 9.4% choose “agree” which means the system is easy to use and the users do not face any major problems. It shows that most of the respondents, 87.5%, choose “strongly agree”. This confirms that most of the users agree that the instructions to use the system are clear and easy to understand. 90.6% of the respondents strongly agree that they are comfortable using this online appointment system. While 90.6% strongly agree that it is easy to find the information in this online appointment system.

Table 4: Usability Testing Questionnaire and Mean

No	Question	1	2	3	4	5	Mean
1	How would you rate the overall usability of the Veterinary Online Appointment Booking System?	0	0	0	2	30	4.93
2	Is the online appointment system easy to use?	0	0	0	3	29	4.90
3	Are the instructions for using the web-based system clear?	0	0	0	4	28	4.87
4	I felt comfortable using this online appointment system.	0	0	0	3	29	4.90
5	The information I need is easy to find.	0	0	0	3	29	4.90

CONCLUSION

The Veterinary Online Appointment Booking System (VOAS) was developed based on the veterinary traditional appointment problems that have caused a lot of problems for consumers nowadays. This veterinary online appointment system is proven to assist in simplifying the appointment procedure for veterinary clinic users. Users can make an appointment using their own devices wherever and whenever they are, and reduce their waiting time. However, this online appointment system has some limitations and boundaries, where the users cannot choose the doctor when making an appointment. In the system, the user can only view the doctors’ information and their availability at that time. Furthermore, the system does not partake in payment methods and only provides the appointment system. With this, users need to bring cash to the clinics. The suggestions for enhancement are to develop a payment feature for the users. It is because payment methods like FPX and other online payments will ease users when going to the veterinary clinics without having to bring any cash. Furthermore, the veterinary online appointment system can add the feature of a customer service section. This customer service section will help new users if they are facing any problems when making an appointment.

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AUTHORS' CONTRIBUTION

The tests were designed and planned by Mokhtar, M.H. He carried out the experiments, prepared the data, and helped analyze the findings. A.F. Rosmani was the main author of the manuscript. Each author contributed ideas that helped refine the study, the analysis, and the manuscript.

CONFLICT OF INTEREST DECLARATION

We certify that the article is the Authors' and Co-Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication nor has it been published in whole or in part elsewhere. We testify to the fact that all Authors have contributed significantly to the work, validity, and legitimacy of the data and its interpretation for submission to Jurnal Intelek.

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