

A Web-Based Management System Utilizing Descriptive Analytics and Scheduling Algorithms for SJOE Pet Supply

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ABSTRACT

The development of a web-based management system that integrates descriptive analytics and scheduling algorithms helps overcome the limitations of manual processes such as inefficiency, data inaccuracy, and lack of real-time updates. Through automation and data analysis, the system enhances productivity, minimizes human error, and enables informed decision-making. By centralizing operations, it ensures improved accuracy, accessibility, and overall business performance. The combination of descriptive analytics and scheduling algorithms strengthens operational efficiency and organizational intelligence. Descriptive analytics reveals patterns and performance insights, while scheduling algorithms automate and optimize resource allocation in real time. Together, they create an adaptive, intelligent, and reliable management solution that continuously improves business operations. SJOE Pet Supply, established in 2018, struggles with managing appointments, inventory, and customer records due to its manual system. To address these challenges, the proposed PetStreet system aims to automate core business processes and enhance operational efficiency. It incorporates descriptive analytics for data-driven insights and a scheduling algorithm to optimize appointments and staff workload management.

Applied Developmental Research, focusing on designing and implementing a Web-Based Management System for SJOE Pet Supply, evaluated through the ISO/IEC 25010 software quality model. The evaluation centered on Functionality, Reliability, Efficiency, Usability, and Security to ensure the system performs accurately, operates smoothly, and safeguards sensitive business data. Data collection was conducted before and after system development, using interviews, surveys, and a Likert-scale questionnaire based on ISO 25010 criteria to measure user satisfaction and system performance. The Agile Methodology served as the development framework, emphasizing iterative development, continuous testing, and feedback integration to rapidly adapt to changes and refine features. Each phase aligned with ISO 25010 standards, ensuring that the system was functional, reliable, efficient, user-friendly, and secure to meet the operational needs of SJOE Pet Supply.

PetStreet is a web-based management system developed for SJOE Pet Supply to automate grooming appointments, manage client and pet records, and control inventory efficiently. Based on the ISO/IEC 25010 evaluation, both users and technical experts strongly agreed that the system is highly functional, reliable, efficient, user-friendly, and secure.

The study successfully developed and evaluated the PetStreet system, meeting all ISO/IEC 25010 quality standards. It proved to be an effective, secure, and user-centered solution for improving operational processes in the pet care industry.

Future enhancements for PetStreet include developing a mobile version, strengthening security features, and enabling offline functionality. It is also recommended to integrate advanced analytics, payment options, and scalability features to support business growth and wider adoption.

Keywords: Web-Based Management System, Descriptive analytics, scheduling algorithms, ISO 25010 standards

INTRODUCTION

In today's digital age, many organizations rely on web-based systems to enhance efficiency, streamline operations, and support data-driven decision-making. Manual systems often lead to challenges such as data inaccuracies, scheduling conflicts, and limited access to real-time information, which hinder productivity. To address these issues, web-based management systems that integrate descriptive analytics and scheduling algorithms provide a centralized and automated solution. These systems not only improve accessibility and accuracy but also enable organizations to transform raw data into valuable insights for better strategic planning.

The proposed PetStreet system for SJOE Pet Supply combines descriptive analytics for business intelligence and scheduling algorithms for process automation. Descriptive analytics will summarize operational data, track customer trends, and generate reports to support management decisions. Scheduling algorithms will automate appointment bookings, task assignments, and inventory scheduling, reducing human error and optimizing resource use. By integrating both technologies, PetStreet aims to promote efficiency, reliability, and productivity within a single, data-driven web platform.

SJOE Pet Supply, founded in 2018 and managed by a licensed veterinarian, continues to face challenges due to its manual system for managing appointments, inventory, and customer records. To solve these issues, PetStreet is designed to automate and digitize business processes, providing real-time insights and optimized scheduling through analytics. This transition from manual to digital management enhances operational efficiency, minimizes human error, and ensures better customer service. Ultimately, the system aims to modernize SJOE Pet Supply's operations and serve as a model for other small pet care businesses seeking sustainable and scalable technological solutions.

The primary goal of the system is to improve the current manual appointment scheduling system to prevent double bookings and optimize time slots. It also aims to automate inventory management to reduce errors and accurately track stock levels, and to provide insights into customer behavior, inventory trends, and service performance through descriptive analytics. The general objective is to develop an integrated management system that streamlines and automates the operations of pet shops and grooming services for improved efficiency, accuracy, and customer satisfaction.

The study developed an integrated management system that streamlines and automates the operations of pet shops and grooming services for improved efficiency, accuracy, and customer satisfaction. Specific Objectives are to design and develop the following:

a user-friendly interface that enables pet shop staff and grooming personnel to efficiently manage appointments, customer records, and pet profiles.

an inventory management module that monitors product availability, stock levels, and sales transactions in real time.

a pet profile module that stores and organizes key pet details such as species, breed, grooming history, and special instructions.

an online appointment scheduling module that uses a scheduling algorithm to allow customers to conveniently book, reschedule, or cancel grooming services.

a descriptive analytics module that provides summarized reports on sales, service usage, and customer trends to assist management in making data-driven business decisions.

Scope

The study focused on the development of a web-based integrated management system designed for SJOE Pet Supply. The system covers the following:

Responsive Design - Mobile-friendly and accessible on various screen sizes and devices (PC, tablet, and smartphone).

User Accounts and Dashboards - Includes two user types: Admin/Staff (managing users, schedules, inventory, and reports), and Customer (viewing profiles, booking appointments, and tracking history).

Online Appointment System with Scheduling Algorithm - Allows customers to book, reschedule, or cancel grooming appointments, with the algorithm automatically assigning time slots based on staff availability and service duration.

Customer and Pet Records - Stores essential pet information (type, breed, age, grooming history, allergies) and customer contact details.

Inventory Management - Tracks product availability, stock levels, and restocking needs.

Sales and Descriptive Analytics Reports - Generates summaries of daily sales, most availed services, peak grooming hours, and customer trends.

Notification System - Sends automated email or SMS reminders to customers about appointments and promotions.

Limitation

The PetStreet system has defined constraints that specify the boundaries of its implementation and functionality. These limitations ensure transparency for users and guide the system's proper scope of operation:

It is for single branch use only. It is not designed to support the complex, scalable management required for multi-branch organizations or franchise models.

The platform's analytical capability is limited to Descriptive Analytics. It does not include advanced features like Predictive Analytics or Machine Learning for forecasting future performance.

Initial inventory and pet data must be entered manually by staff. The system does not integrate automated data capture technologies, such as barcode or QR code scanning, to speed up inventory management or client check-in.

It is not configured to function in an offline mode, meaning service recording and scheduling are inaccessible without connectivity.

These constraints are acknowledged to maintain transparency and provide clear direction for future system improvements, such as enabling offline functionality or expanding its analytical depth.

Theoretical Framework

The PetStreet system is anchored on key theoretical foundations that guided its technical design, process optimization, and overall objectives. These are:

Descriptive Analytics Model - This model emphasizes the systematic transformation of raw data into meaningful and accessible insights, primarily focused on understanding past and current business performance. This ensures that the system provides pet shop owners with clear, actionable intelligence for data-informed decision-making.

Scheduling Algorithm Theory - This theoretical foundation involves the application of logic and defined rules to optimize resource allocation over time. This ensures efficient workflow, reduces human error in booking, and improves overall service capacity.

The integration of these two models ensures that the PetStreet system is not only a tool for recording data but also a strategic platform for analyzing business operations and automatically optimizing staff and service schedules.

Conceptual Framework

The system's operation is structured around the Input–Process–Output (IPO) Model with a Feedback Loop for continuous improvement.

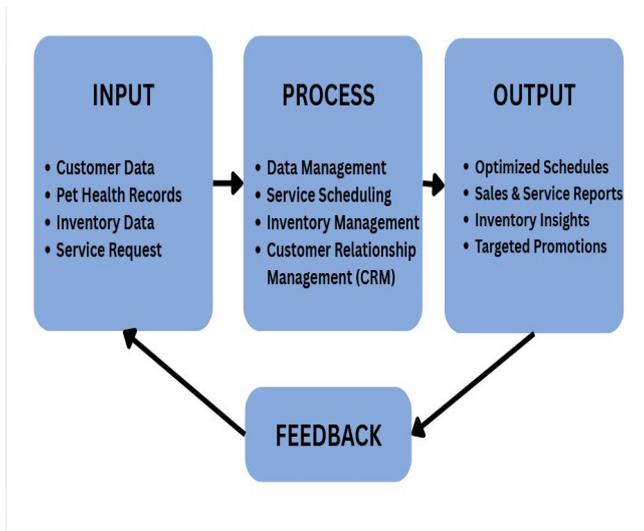


Figure 1: Conceptual Framework

Input: Data Collection

Key activities involve feeding essential data into the system, including Customer Data, Pet Records, Inventory Stock, and new Appointment Requests.

Process: Core Functions

The system transforms the input data through its main operations - Data Management, Automated Scheduling (using the algorithm), Inventory Tracking, and CRM (Customer Relationship Management).

Output: Deliverables

This stage produces measurable results and benefits, such as Optimized Schedules, sales & service reports, and actionable inventory insights.

Feedback Loop: Refinement

Performance data, usage logs, and analytics are channeled back into the Input and Process stages to continuously improve the system's accuracy and effectiveness.

Significance Of the Study

This study is significant as it contributes to improving the operations and service delivery of the pet care business through the integration of digital technology, data analytics, and an intelligent scheduling system. The main beneficiaries include:

Pet Shop Owners and Managers - The system facilitates informed decisions (pricing, staffing, inventory) based on analytics, leading to increased operational efficiency and profitability.

Employees and Grooming Staff - Staff benefit from improved workflow due to the automated scheduling algorithm (preventing conflicts) and instant access to centralized customer and pet records.

Customers - They experience a convenient and reliable digital experience by easily managing services 24/7 through the online platform, enhancing satisfaction.

Future Developers and Researchers - The study serves as a practical reference for developing similar integrated management systems that use scheduling algorithms and descriptive analytics in small enterprises.

Review Of Related Literature

The global pet grooming industry is expected to continue its growth, with increasing demand for grooming, pet sitting, and training services. According to the Pet Grooming Services Market Size & Share Report (2030), there is a significant shift toward mobile grooming and subscription-based services, highlighting the industry's focus on flexibility and customer convenience. These developments underscore the need for management systems that can support dynamic service delivery models (Pet Grooming Services Market Report, 2030).

Recent global trends reveal an increased integration of AI-powered grooming tools, wearable pet health monitors, and automated grooming stations. These technological innovations reflect customer preferences for highly personalized and sustainable services. As noted in Pet Grooming and Pet Industry Trends in 2025, these changes require digital systems capable of managing advanced tools and offering customizable service options (Pet Grooming and Pet Industry Trends, 2025).

In the Philippine setting, the pet industry continues to grow, especially in urban areas. However, challenges such as market competition and outdated systems hinder business operations. The report Pet Industry in the Philippines: Opportunities and Challenges highlights the need for innovation and the adoption of digital technologies to improve service delivery and meet rising consumer expectations (Pet Industry in the Philippines, n.d.).

Synthesis

The review of related literature and studies, both local and foreign, underscores the growing demand for automation and digital transformation in the pet care industry. Studies have shown that manual processes in pet shops and grooming services often lead to inefficiencies in appointment handling, inventory tracking, and customer service. With the rise of technology, integrated systems have been developed globally to address these issues by streamlining operations and improving overall service quality.

Locally, many small-to-medium pet care businesses still rely on traditional methods due to resource limitations and lack of digital infrastructure. However, related studies affirm that adopting a user-friendly, data-driven platform can significantly enhance efficiency, accuracy, and customer satisfaction. Systems that incorporate descriptive analytics and automated scheduling features not only help reduce manual work but also provide business insights that support decision-making.

Based on the findings from related research, the development of the PetStreet system is timely and relevant. It addresses common operational challenges while supporting the modernization of pet care services in the local context.

METHODOLOGY OF THE STUDY

The study utilizes the descriptive method of research to gather, analyze, and interpret data relevant to the development of the PetStreet system. It created a system that addresses operational challenges in managing pet records, appointments, inventory, and customer service. The study involved the shop owner, grooming staff, and selected customers as key respondents.

Data collection methods involve directly measuring variables and gathering information to obtain firsthand data and fresh insights into the research problem. In the study, primary data is collected through an assessment

process using a rating scale, which helps quantify, describe, and interpret results related to the system's effectiveness, performance, and overall quality. Meanwhile, secondary data is gathered through library research and online sources, drawing from existing literature and related studies to support and contextualize the findings.

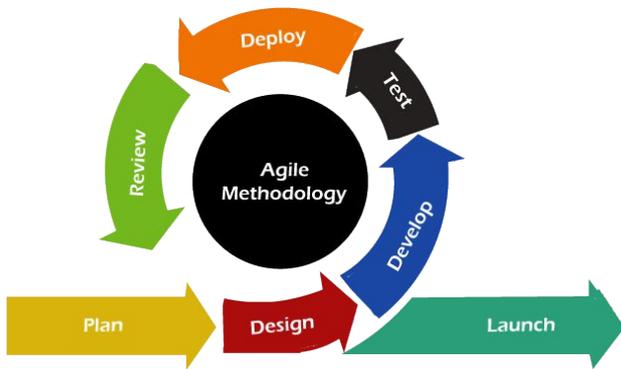


Figure 2: SDLC Agile Model

The development of the PetStreet system follows the Agile methodology, which emphasizes iterative development, continuous testing, and feedback integration. This approach allowed the team to rapidly adapt to changes and ensure that system features aligned with the needs of both users and stakeholders at SJOE Pet Supply. The process included planning, development, testing, and maintenance, with regular reviews and updates per iteration.

The database design created logical and physical models that define how data is organized, stored, and accessed to meet the functional requirements of the proposed system. By carefully planning the database structure, the system ensures data integrity, scalability, and efficient retrieval of information such as customer details, pet records, inventory levels, and appointment schedules.

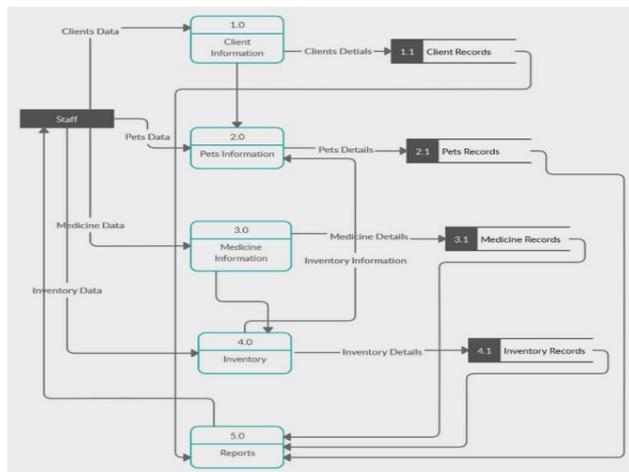


Figure 3: Level 0 Diagram of the PetStreet

The diagram illustrates the data flow process of the PetStreet Management System, showing how information moves between modules such as clients, pets, medicine, inventory, and reports. Each main process (e.g., Client Information, Pets Information, Medicine Information, Inventory, and Reports) is connected to corresponding record modules where detailed data are stored and retrieved. Overall, it demonstrates an organized and systematic flow of data that ensures accurate tracking, efficient record management, and seamless integration across all operational components.

Respondents of the Study

The study used two groups of respondents: (a) user and (b) technical experts.

The user respondents consisted of forty (40) individuals, including pet shop customers, grooming service clients, and store staff who regularly interact with the system. These participants are selected because of their direct involvement in service booking, pet profiling, and inventory-related interactions. They evaluated the system based on usability, interface design, functionality, and how well it supports their daily tasks from a user experience perspective.

The technical experts are composed of ten (10) individuals, consisting of Information Technology (IT) professionals such as developers, system analysts, and graduates of computer studies. They assessed the system's technical quality, focusing on performance, reliability, maintainability, and security, aligning with ISO 25010 software quality standards.

Development and Evaluation Procedure

The development of the system employed a range of tools and frameworks to ensure efficiency, scalability, and a positive user experience. These are:

Front-End Development:

HTML5: Used to structure the application's content with semantic elements.

CSS3: Utilized for designing a responsive and visually appealing user interface.

JavaScript (ES6): Enabled interactivity, real-time validation, and dynamic UI updates.

Back-End and Data Management:

PHP: Served as the primary server-side scripting language for data processing and handling user requests.

MySQL: The relational database used to store essential information (customer records, pet profiles, inventory, schedules).

Custom Scheduling Algorithm: Implemented on the back-end to optimize appointment booking and resource allocation.

Frameworks, Libraries, and IDE:

Bootstrap: Provided pre-designed responsive components to accelerate UI development.

Chart.js: Employed for descriptive analytics, presenting data visualizations like sales trends and appointment frequencies.

Visual Studio Code (VS Code): The primary Integrated Development Environment (IDE) for writing and debugging code.

XAMPP/WAMP: Used for local server hosting during the development and testing phases.

Version Control and Collaboration:

Git and GitHub: Implemented for version control, tracking code revisions, and facilitating team collaboration.

Postman: Used for API testing to verify correct data exchange between front-end and back-end services.

The system is evaluated against the ISO 25010 standard to assess its quality based on the following criteria:

Functional Sustainability - Achieved through continuous iteration (Agile principles) and maintenance to adapt to evolving user needs and ensure scalability.

Reliability - Ensured by rigorous and continuous testing and system monitoring to guarantee consistent, dependable performance with minimal downtime.

Usability - Focused on a clean, intuitive user interface and ease of navigation, with refinements guided by user feedback.

Performance Efficiency - Optimized through efficient database queries and asynchronous processing to maintain high speed and minimal load time during high-volume operations.

Security - Implemented using role-based access control, encrypted credentials, and secure database protocols to protect sensitive customer and pet data.

DATA ANALYSIS PLAN

The researchers employed the proper statistical tools to examine the evaluation outcomes. Each software quality criterion's average replies are calculated using the weighted mean, and the dispersion of participant responses is summarized using the frequency percentage.

Respondents' viewpoints are also interpreted using a four-point Likert scale. Respondents could score how much they agreed with each statement on the effectiveness and caliber of the system on a scale that went from "1" (strongly disagree) to "4" (strongly agree).

The System

The study produced a web-based system known as PetStreet, which is specifically created for SJOE Pet Supply, a pet care company. The system combines appointment scheduling, inventory management, and client data handling into a single consolidated platform. It uses scheduling algorithms to optimize appointment times and avoid overlaps, while descriptive analytics gives information like client frequency, service demand, and inventory turnover. The system also includes facilities for managing client profiles, pet data, and inventory levels, which improves overall efficiency and service quality.

The system is designed with web development technologies such as PHP, MySQL, JavaScript, Python, and CSS to ensure its functionality, usability, and efficiency. It is evaluated according to the ISO 25010 standard, with emphasis on functionality, dependability, usability, efficiency, and security. Testing is carried out to ensure that the system functions well, protects data, and provides a convenient experience for both employees and customers. These are the user interfaces of the system:

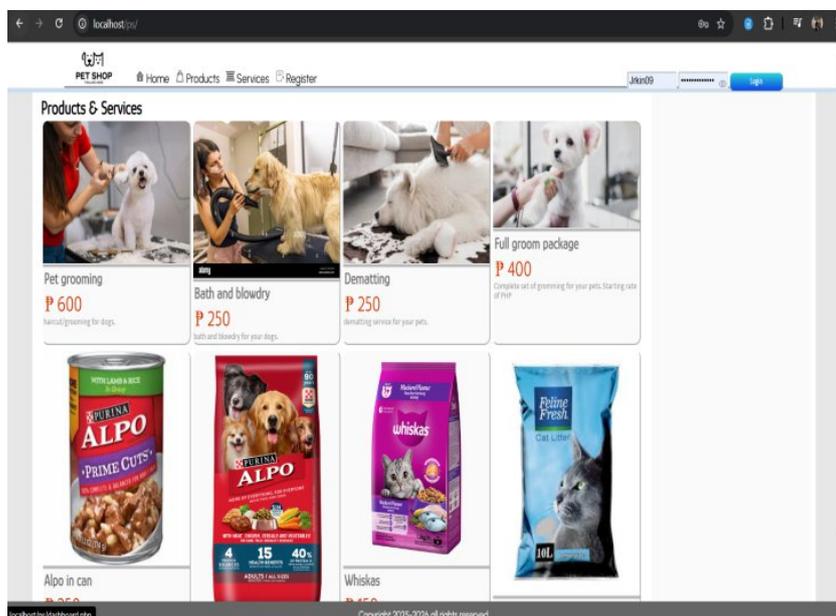


Figure 4: User Account and Dashboard

Figure 4 presents the home page of a web site of a pet shop that sells products and services. This page has the two major sections; Services and Products. There is also the navigation links, Home, Products, Services and Register and the top-right has a login form.

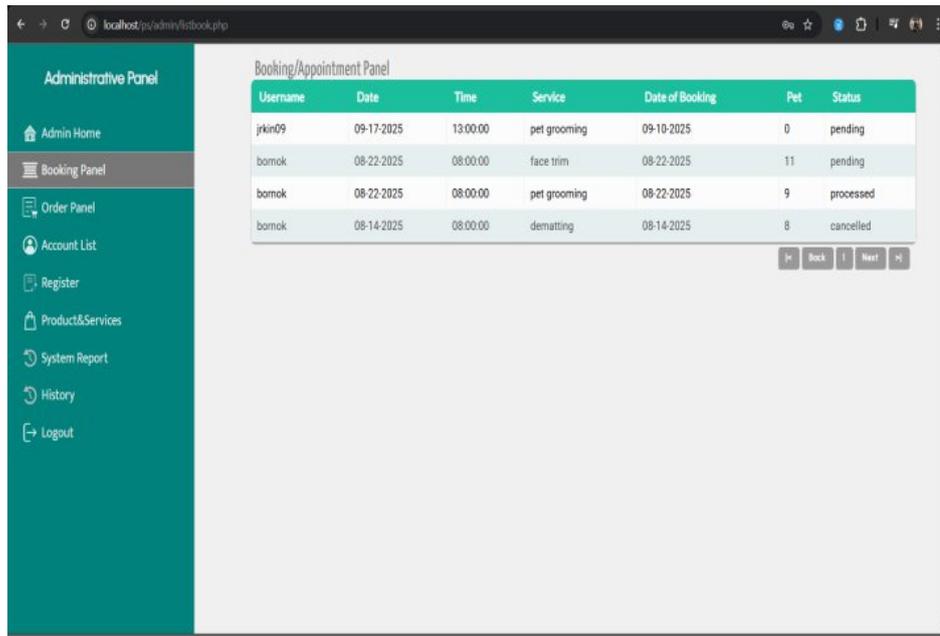


Figure 5: Account List

Figure 5 illustrates the accounts list section of the administrative panel in which an account of registered user accounts is presented as a table. The information on each entry would consist of the ID, Username, the name of the owner, E-mail address, and Contact numbers. An Action section of the table also has a button of disable where an administrator can control the user access.

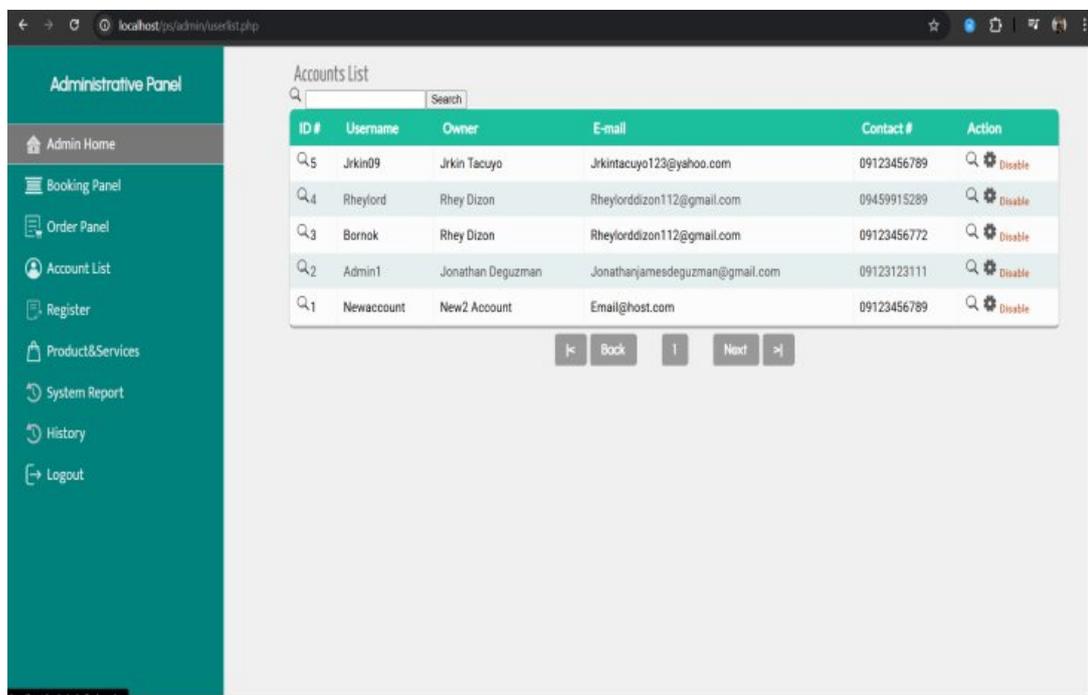


Figure 6: Product & Services

Figure 6 shows an image of the page of products and services management in the administrative panel. There is an Edit button that shows under each service and it means that an administrator can edit the details of the service. One can also create service. Under the services, a Products section can be seen which begins with an opportunity to add new products, and a list of the existing products such as canned and dry pet food.

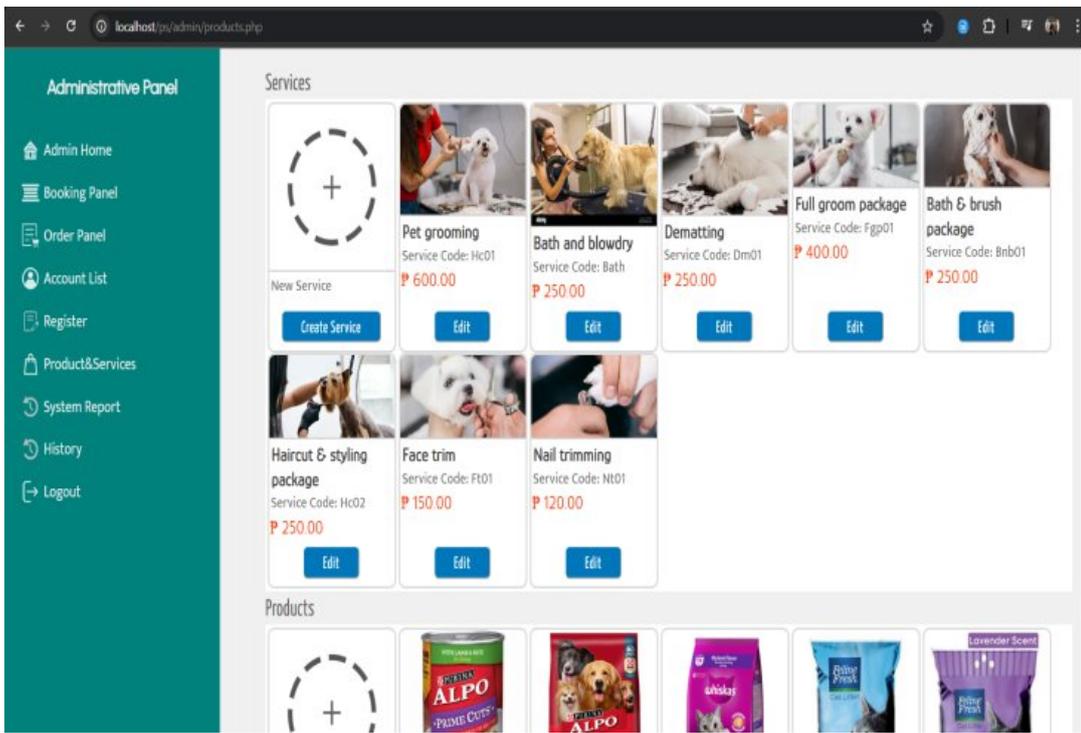


Figure 7: Booking Panel

The image in figure 7 displays the "Booking/Appointment Panel" that gives the administrator a view of all booked services of pets.

Assessment: Summary Of Respondents on The System

The respondents are distributed as shown in the table:

Respondents (groupings)	Size (n)	Percentage
Users	40	80%
Technical	10	20%
Total (n)	50	100.0%

Table 1: Distribution of Respondents

The summary and comparison of evaluations are shown below:

Criteria (ISO25010)	Respondents (50)			
	Users (40)		Technical (10)	
	WM	VI	WM	VI
1. Functionality	3.5	SA	3.5	SA
2. Reliability	3.5	SA	3.6	SA
3. Efficiency	3.6	SA	3.7	SA
4. Usability	3.6	SA	3.6	SA
5. Security	3.5	SA	3.7	SA
Overall Average Mean	3.5	SA	3.6	SA

Table 2: Summary and Comparison of Respondents’ Assessment Based on ISO 25010 Standards

Table 2 shows the overall average means of respondents. For the user group, a 3.5 average mean is attained while the technical experts have a very small margin of 3.6 average mean. All average means are interpreted as “Strongly Agree”. This indicates that the system adheres to the ISO 25010 standards,

Ethical Considerations

Informed consent is obtained by the researchers who educated all the participants regarding the purpose, methods, and benefits of the study. They also guaranteed them that they could withdraw any time without any penalty. In order to guarantee anonymity and confidentiality, recognizable data is deleted or coded, and the information can only be obtained by the researchers. Moreover, researchers exerted all efforts to minimize possible harm to their participants by discouraging physical, psychological, social, and legal risks in their operations. Every participant is handled in a fair and just manner and the benefits of the research and its harms are spread evenly. The researchers reveal that any conflict of interest to avoid bias and ensure the credibility of the study is avoided.

Summary

PetStreet, a web-based integrated management system, is created and developed for SJOE Pet Supply to optimize operations such as pet grooming appointments, customer and pet record management, and inventory control. The system uses a scheduling algorithm to optimize appointment slots and descriptive analytics to provide insights on client frequency, service demand, and inventory turnover.

The system is evaluated by fifty (50) respondents (40 users and 10 technical specialists) using the ISO/IEC 25010 quality model.

Overall, the system received an average weighted mean of 3.5 from user respondents and 3.6 from technical experts, both interpreted as “Strongly Agree”. This shows that PetStreet is extremely functional, reliable, efficient, user-friendly, and secure, addressing the operational needs of a pet retail and grooming service.

CONCLUSION

The study successfully designed and assessed the PetStreet system. The data revealed that both users and technical respondents positively assessed the system across all ISO/IEC 25010 quality standards.

In conclusion, PetStreet is a trustworthy, secure, efficient, and user-friendly management solution. It provides an effective solution for automating grooming appointments, inventory management, and client data, hence improving everyday operations and facilitating better service delivery in the pet care industry.

RECOMMENDATION

To further improve PetStreet and expand its relevance for future implementations, the following ideas are proposed:

Mobile Application - Develop a mobile app version for enhanced accessibility by both clients and workers.

Stronger Security Measures — Integrate advanced security mechanisms such as OTP verification, two-factor authentication, and secure login APIs for enhanced user authentication. Furthermore, implement advanced encryption protocols to protect sensitive customer and pet data, improving user trust and ensuring compliance with data protection standards.

Offline Capability — Add features for temporary offline storage with auto-sync once internet connectivity is restored.

Expanded Analytics — Upgrade the analytics module to incorporate predictive data on sales, customer behavior, and inventory demand forecasts.

Payment Integration - Provide online and cashless payment options for more efficient transactions.

Regular Updates & Maintenance — Implement periodic updates, bug patches, and technical assistance to ensure system stability.

Scalability — Improve the system's capacity to support multi-branch scalability and wider adoption. This includes implementing cloud-based synchronization to manage larger datasets across numerous locations (e.g., franchise models) and ensure broader applicability.

By incorporating these recommendations, PetStreet may expand into a more complete, secure, and scalable solution that supports not only pet shops but also veterinary clinics and other businesses in the burgeoning pet care industry.

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