

# Functional Salon Website for Service Display and Online Booking Management for Gold and Gorgeous Salon using Prescriptive Analysis and K-Means Clustering

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## ABSTRACT

The system was designed to address issues related to manual booking processes, inconsistent service promotion, and lack of customer data utilization. By incorporating Prescriptive Analysis, the system provides intelligent recommendations for staff scheduling, promotional offers, and service optimization based on real-time customer and business data. The K-Means Clustering algorithm categorizes customers into segments according to their booking frequency, preferred services, and spending behavior. These insights enable the salon to implement personalized marketing strategies and loyalty programs that strengthen customer engagement and satisfaction. Gold and Gorgeous Salon, a local full-service salon located in Pasig City, faces challenges in digital promotion and appointment handling. The lack of an organized online platform makes it difficult for customers to book services and for the salon to consistently promote its offers. The business currently relies on walk-ins, referrals, and manual social media replies, which are time-consuming and prone to missed inquiries. The system also features a dynamic dashboard and automated report generation that visualizes key performance indicators such as service demand, booking trends, and revenue distribution. The integration of analytics into the website helps administrators make data-driven decisions, improving both operational management and customer service quality. To ensure system effectiveness, a total of 150 participants composed of one owner, ten employees, one hundred customers, twelve IT professionals, and twenty-seven IT students evaluated the system using the ISO 25010 quality model, focusing on five characteristics: functionality, reliability, usability, efficiency, and maintainability. Results from the Likert-scale evaluation revealed high satisfaction levels across all dimensions, confirming that the system met both user and technical expectations.

The findings demonstrate that combining prescriptive analytics and machine learning algorithms can significantly improve service industry operations, particularly in appointment-based businesses. The developed system not only digitizes booking and service management but also introduces intelligent insights for business growth and strategic planning. It also provides a framework for integrating data analytics into small and medium enterprises (SMEs), encouraging digital transformation in traditional service sectors. Overall, the project offers a scalable and innovative approach that bridges technology and customer relationship management, positioning Gold and Gorgeous Salon for improved competitiveness in the digital marketplace.

**Keywords:** Prescriptive Analysis, K-Means Clustering, Salon Website, Online Booking Management, ISO 25010, Data Analytics, Customer Segmentation, Web-Based System

## INTRODUCTION

In the modern digital economy, small and medium enterprises increasingly depend on technology to manage business operations and improve customer engagement. The salon and beauty service industry benefits from adopting online platforms that facilitate bookings, service promotion, and customer interaction. Through data-driven systems, businesses can optimize operations and make informed decisions that enhance overall service quality. This study introduces the development of a Functional Salon Website for Service Display and Online Booking Management that integrates Prescriptive Analysis and K-Means Clustering to support efficient management and customer satisfaction.

According to Chen et al. (2022), prescriptive analytics transforms data into actionable insights that help businesses determine optimal decisions by evaluating possible outcomes. Kumar and Singh (2023) emphasized that machine learning techniques such as K-Means Clustering are effective in segmenting customers based on purchasing behavior, frequency, and preferences, which enhances targeted marketing strategies. In related studies, Lopez and Rivera (2021) discussed the importance of automated booking systems in improving service accessibility and customer convenience in local enterprises. These studies support the application of prescriptive analytics and clustering models in improving business decision-making, which aligns with the goals of this research to strengthen salon operations through intelligent data analysis.

Gold and Gorgeous Salon, a local full-service salon located in Pasig City, faces challenges in digital promotion and appointment handling. The lack of an organized online platform makes it difficult for customers to book services and for the salon to consistently promote its offers. The business currently relies on walk-ins, referrals, and manual social media replies, which are time-consuming and prone to missed inquiries. Addressing these challenges requires a functional and data-driven solution that simplifies operations and improves customer interaction.

The aim of this study is to design and develop a functional salon website for Gold and Gorgeous Salon that integrates Prescriptive Analysis and K-Means Clustering to enhance operational efficiency and customer service. Specifically, it seeks to automate the booking process, generate data-based recommendations for staffing and promotions, and segment customers for personalized marketing strategies. The system aims to empower management through analytical dashboards and report generation for data-driven decision-making. This study intends to establish a digital platform that connects technology and beauty service management to support the salon's growth and competitiveness in the digital market.

## Scope

The scope of this study focuses on the design and development of a Functional Salon Website for Gold and Gorgeous Salon that integrates service display, online booking management, and data analytics features. The system enables customers to view available salon services, schedule appointments online, and receive automated booking confirmations.

For administrative users, the system includes report generation and a dashboard module that present summarized insights derived from Prescriptive Analysis and K-Means Clustering.

The report generation feature provides:

1. **Booking Reports** – summaries by day, week, month, and year; service frequency; peak hour analysis; and appointment status tracking (pending, accepted, rejected, finished, canceled).
2. **Customer Reports** – segmentation results from K-Means Clustering, visit frequency and loyalty patterns, demographic insights, preferred service combinations, and recommended promos based on spending behavior.
3. **Revenue and Promotion Reports** – daily and monthly income summaries, service revenue breakdowns, profit comparisons, and promotional suggestions based on data trends.

The dashboard displays interactive graphs, charts, and key performance indicators (KPIs) that help management make informed decisions about promotions, staffing, and operational improvements. It consists of:

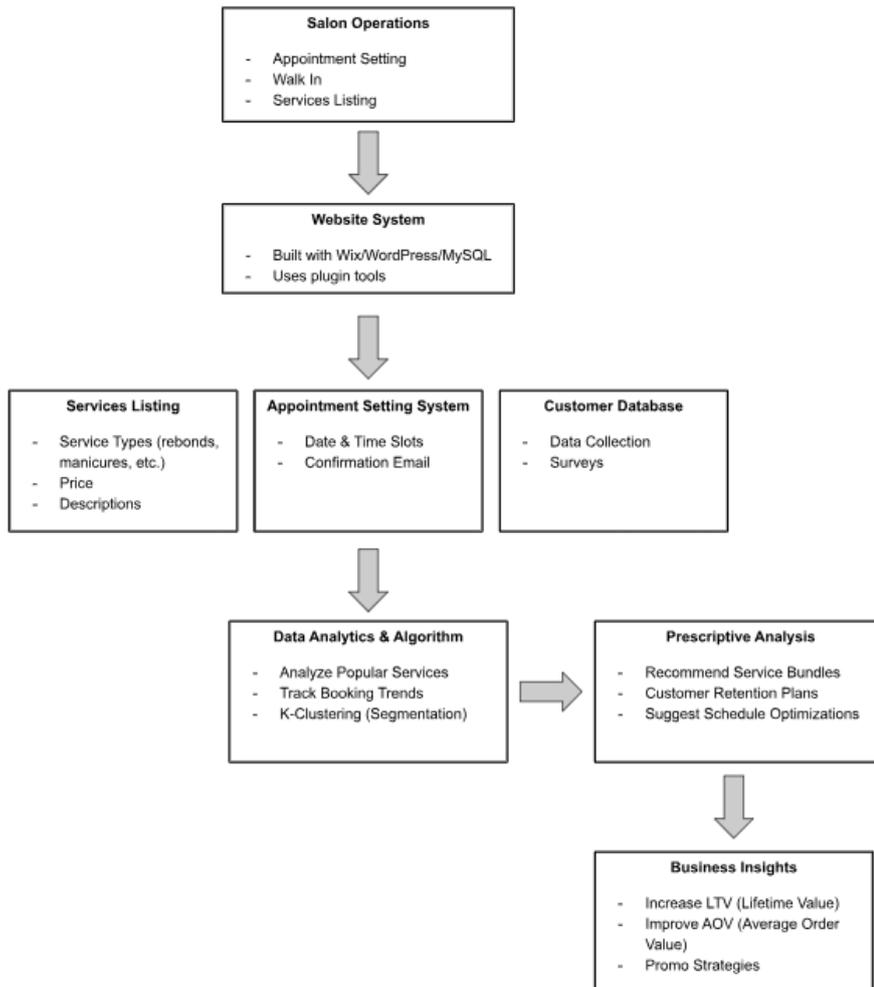
1. **Booking Overview Dashboard** – total appointments by period, booking sources, and real-time updates on upcoming bookings.
2. **Customer Insights Dashboard** – visual representation of customer clusters, loyalty rates, and spending behavior.
3. **Revenue and Business Performance Dashboard** – revenue and profit visualizations, performance comparisons, and actionable insights from Prescriptive Analysis.

## LIMITATION

The study is limited to the development and evaluation of a web-based system specifically designed for Gold and Gorgeous Salon in Pasig City. It focuses only on implementing Prescriptive Analysis and K-Means Clustering for booking management, customer segmentation, and service optimization. The system does not include additional business features such as online payment integration, inventory tracking, or employee payroll management, which could further enhance business operations.

## THEORETICAL FRAMEWORK

Figure 1: Theoretical Framework



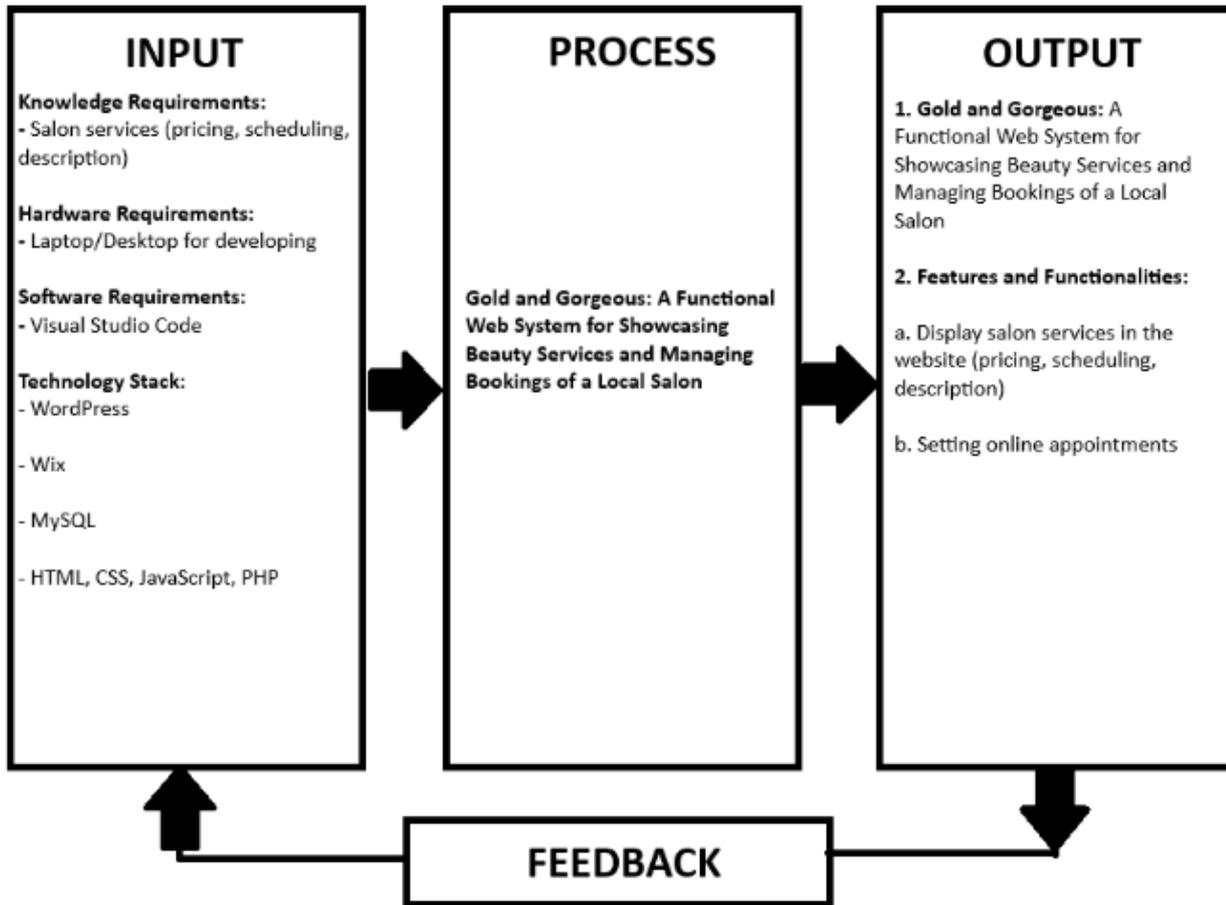
The system is anchored on the theory of prescriptive analytics, which focuses on recommending data-driven decisions to optimize business performance. Davenport and Harris (2017) explained that prescriptive analytics provides organizations with actionable strategies derived from analyzed data, while Provost and Fawcett (2013) emphasized its role in guiding operational and managerial decision-making. Raghupathi and Raghupathi (2014) highlighted that applying data analytics in business operations leads to improved efficiency and strategic planning. Liao et al. (2015) found that analytics-driven decision systems enhance customer satisfaction by enabling personalized services. These studies support the integration of prescriptive analytics in the salon system to improve appointment management, resource allocation, and service promotions.

The study also applies the K-Means Clustering algorithm to group customers based on booking behavior, preferences, and spending patterns for better service personalization. Jain (2010) noted that clustering enables businesses to identify customer segments effectively, and Han, Kamber, and Pei (2012) explained that it simplifies large datasets for deeper business insights. Xu and Wunsch (2005) supported that K-Means Clustering is efficient for customer analysis and behavioral prediction, and Chiu et al. (2017) demonstrated that

segmentation improves customer retention and targeted marketing. These references form the basis for using clustering in the system to generate insights that strengthen customer relationships and enhance salon management decisions.

## CONCEPTUAL FRAMEWORK

Figure 2: Conceptual Framework



The conceptual framework of this study illustrates the integration of Prescriptive Analysis and K-Means Clustering within the Functional Salon Website to improve service management and customer engagement. The system begins with the input phase, where customer booking data, service preferences, and staff availability are collected through the online platform. These data serve as the foundation for analysis and allow the system to generate meaningful insights for managerial decisions. Through prescriptive analytics, the system processes historical and current data to recommend optimal staffing schedules, marketing promotions, and operational improvements. This analytical process enables Gold and Gorgeous Salon to make data-driven decisions that enhance efficiency and customer satisfaction.

In the processing and output phase, the K-Means Clustering algorithm groups customers into segments based on their booking frequency, preferred services, and spending behavior. These clusters are used for personalized marketing strategies and loyalty programs. The results are displayed through a dynamic dashboard and automated reports that visualize patterns, trends, and system recommendations. Administrators can use these outputs to monitor business performance, track service demand, and identify areas that require operational adjustments.

The system also includes a feedback feature that supports continuous improvement and ensures customer satisfaction. After each completed service or appointment, customers are encouraged to provide feedback through the website regarding their experience, service quality, and staff performance. This feedback serves as additional input to refine system recommendations and improve salon services.

## Significance of the Study

### For the Salon Owner and Management

- Provides a data-driven tool for managing bookings, staffing, and promotional decisions efficiently.
- Reduces manual workload by automating appointment handling and generating insightful reports.
- Enhances decision-making through prescriptive analytics that suggest optimal operational strategies.

### For the Employees and Staff

- Improves work scheduling through automated and balanced staffing recommendations.
- Allows better coordination of services by viewing real-time booking updates and customer preferences.
- Reduces scheduling conflicts and ensures fair distribution of work hours based on predicted demand.

### For the Customers

- Offers a convenient and accessible online booking platform available at any time.
- Provides personalized promotions and service recommendations based on customer preferences and visit history.
- Minimizes waiting time and enhances the overall salon experience through organized appointment management.

### For Future Researchers

- Serves as a reference for integrating Prescriptive Analysis and K-Means Clustering in small business systems.
- Provides a foundation for future studies focused on data-driven service optimization.
- Encourages the exploration of advanced analytics to improve customer service and operational efficiency in the beauty and wellness industry.

## REVIEW OF RELATED LITERATURE

Chen et al. (2022) explained that prescriptive analytics helps businesses make better decisions by generating data-based recommendations for operations and planning. Their study showed that analytics-driven systems improve efficiency through automated resource management.

Lopez and Rivera (2021) developed an online appointment system for local service businesses and found that automation minimizes scheduling errors and missed bookings. They concluded that web-based booking platforms enhance accessibility and service efficiency, especially for small businesses in the Philippines.

### Synthesis

Both foreign and local studies agree that integrating technology into business operations improves service delivery and customer satisfaction. Chen et al. (2022) highlighted the importance of analytics for decision support, while Lopez and Rivera (2021) emphasized the effectiveness of online booking systems in improving service processes.

These findings support the current study, which combines a functional salon website with Prescriptive Analysis and K-Means Clustering. The reviewed literature shows that automated booking and data-driven insights are effective tools for improving business operations, which aligns with the objectives of this system developed for Gold and Gorgeous Salon.

## METHODOLOGY OF THE STUDY

This study employs an Applied Research design because it focuses on creating a practical technological solution to address real-world business challenges. It develops a functional salon website that uses Prescriptive Analysis

and K-Means Clustering to improve service management, booking efficiency, and customer engagement. The research applies theoretical data analytics concepts to an actual salon setting and transforms them into a functional system that enhances operational decision-making.

### Software Development Methodology

The study adopts the Agile Software Development Methodology, which emphasizes flexibility, collaboration, and iterative progress in system creation. Agile is suitable for this project because it allows continuous testing, feedback integration, and refinement throughout the development of the Functional Salon Website for Service Display and Online Booking Management. This approach ensures that both functional and analytical components, such as Prescriptive Analysis and K-Means Clustering, are properly evaluated and improved based on user feedback and performance testing. The iterative nature of Agile promotes adaptive planning and enables the development team to address changes in salon requirements and user needs effectively.

Figure 3: Agile Software Development Methodology



#### Planning Stage

This phase involves defining the system requirements, identifying user needs, and setting the objectives of the salon website. The researchers gather data from the salon management to determine key functions such as service display, booking, reporting, and analytics integration.

#### Design Stage

In this stage, the system architecture, interface layout, and database structure are designed. The design includes modules for customer booking, administrative dashboards, report generation, and analytics algorithms. Wireframes and mockups are also created to visualize system flow and user interaction.

#### Development Stage

The actual coding and integration of system modules take place in this stage. Developers build the front-end user interface and the back-end components that include the database and analytics engine. The Prescriptive Analysis and K-Means Clustering features are implemented to handle data processing and generate intelligent insights.

## Testing Stage

The system undergoes multiple testing cycles to ensure functionality, accuracy, and usability. Each sprint delivers a working feature that is reviewed and refined based on feedback from salon users and system evaluators. This stage ensures that booking, analytics, and reporting modules perform as expected.

## Deployment and Maintenance Stage

After successful testing, the system is deployed for actual use by Gold and Gorgeous Salon. The development team monitors performance, gathers user feedback, and makes updates or improvements as needed. Continuous maintenance ensures system stability, data accuracy, and user satisfaction.

## Survey Instruments

Before creating the system, structured questionnaires are used to collect data from salon staff and customers to understand their needs, preferences, and challenges in booking and managing appointments. The survey focuses on identifying common issues such as scheduling conflicts, slow response times, and lack of digital accessibility. The gathered information serves as the foundation for designing system features that address user requirements and improve overall salon management.

After the system implementation, a survey questionnaire based on the ISO 25010 quality model is used to evaluate five key characteristics: functionality, reliability, usability, efficiency, and maintainability. Respondents rate each characteristic using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), providing quantitative data on the system performance and user satisfaction.

## Respondents of the Study

A total of 150 participants were involved in evaluating the system using the ISO 25010 Software Quality Model, which includes the characteristics of Functionality, Reliability, Usability, Efficiency, and Maintainability. The evaluators were composed of 1 salon owner, 10 employees or staff, 100 customers, 12 IT professionals, and 27 IT students. Each participant assessed the system using a 5-point Likert scale questionnaire ranging from 1 – Strongly Disagree to 5 – Strongly Agree. Their evaluation provided insights into how well the salon website met quality standards in terms of technical performance and user satisfaction.

## Development and Evaluation Procedure

The Gold and Gorgeous Salon Web System was developed using a structured web development process to ensure functionality, usability, and maintainability. The frontend was created using HTML for structure, CSS for design, and JavaScript for interactivity to provide a responsive user interface. PHP was used for server-side scripting, while MySQL handled the database operations for storing customer, booking, and service records. Development and testing were conducted locally using the XAMPP server.

The system also includes analytical features through the integration of the K-Means clustering algorithm, which helps analyze customer booking patterns for personalized service recommendations. Additional features such as social media links, contact forms, and Google Maps integration were added to enhance user accessibility and engagement.

The system was evaluated based on the ISO 25010 software quality model, specifically focusing on Functionality, Reliability, Usability, Efficiency, and Maintainability. Evaluation was conducted through user testing and expert validation to ensure performance accuracy and system quality before deployment.

## Data Analysis Plan

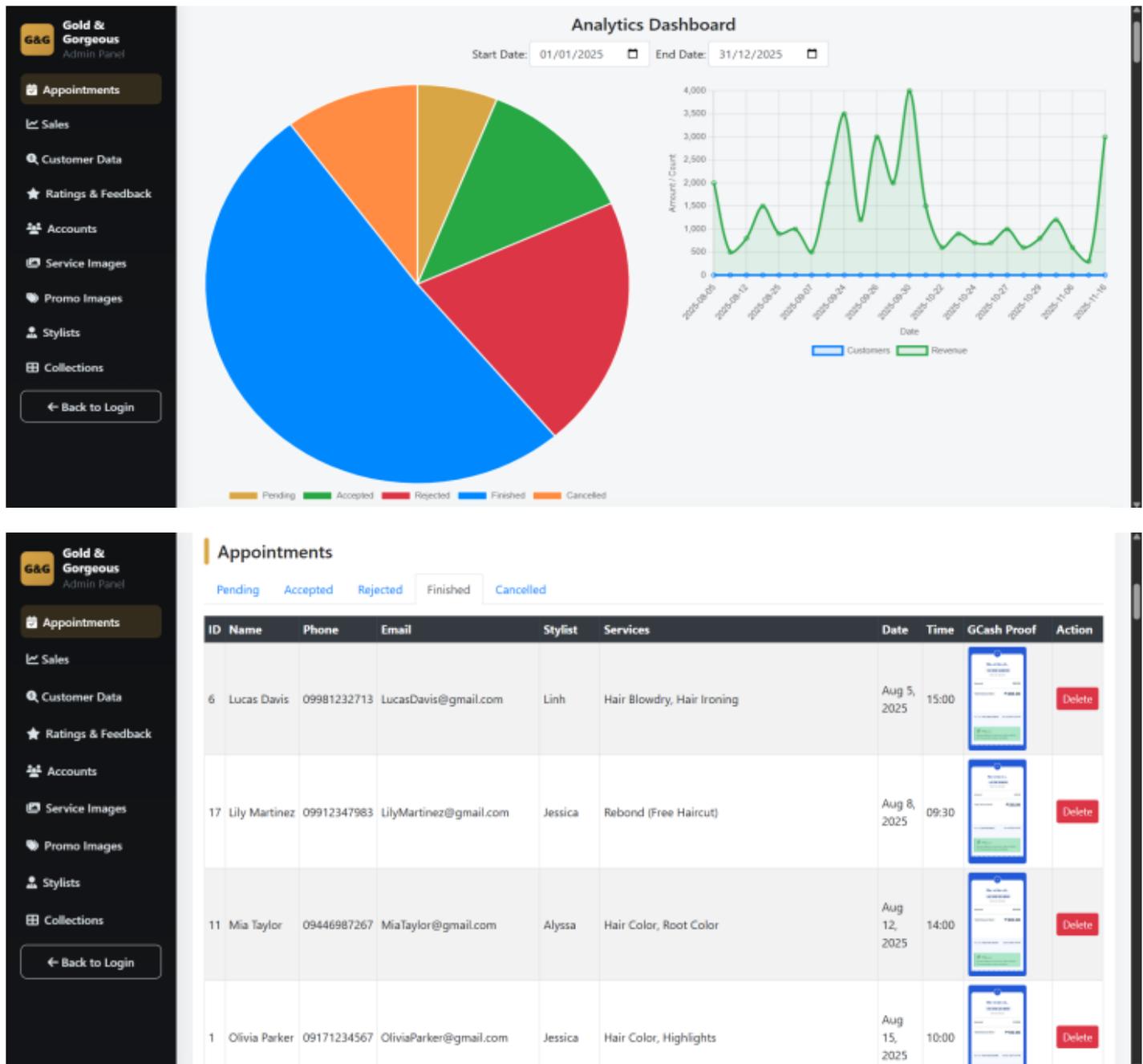
The study used descriptive statistics to analyze the evaluation results of the Gold and Gorgeous Salon website. Frequency and percentage distribution were used to summarize the demographic profile of the respondents. The weighted mean was applied to determine the overall assessment of the system based on the ISO 25010 software

quality characteristics using a 5-point Likert scale. The results were interpreted to identify the level of functionality, reliability, usability, efficiency, and maintainability of the system.

## The System

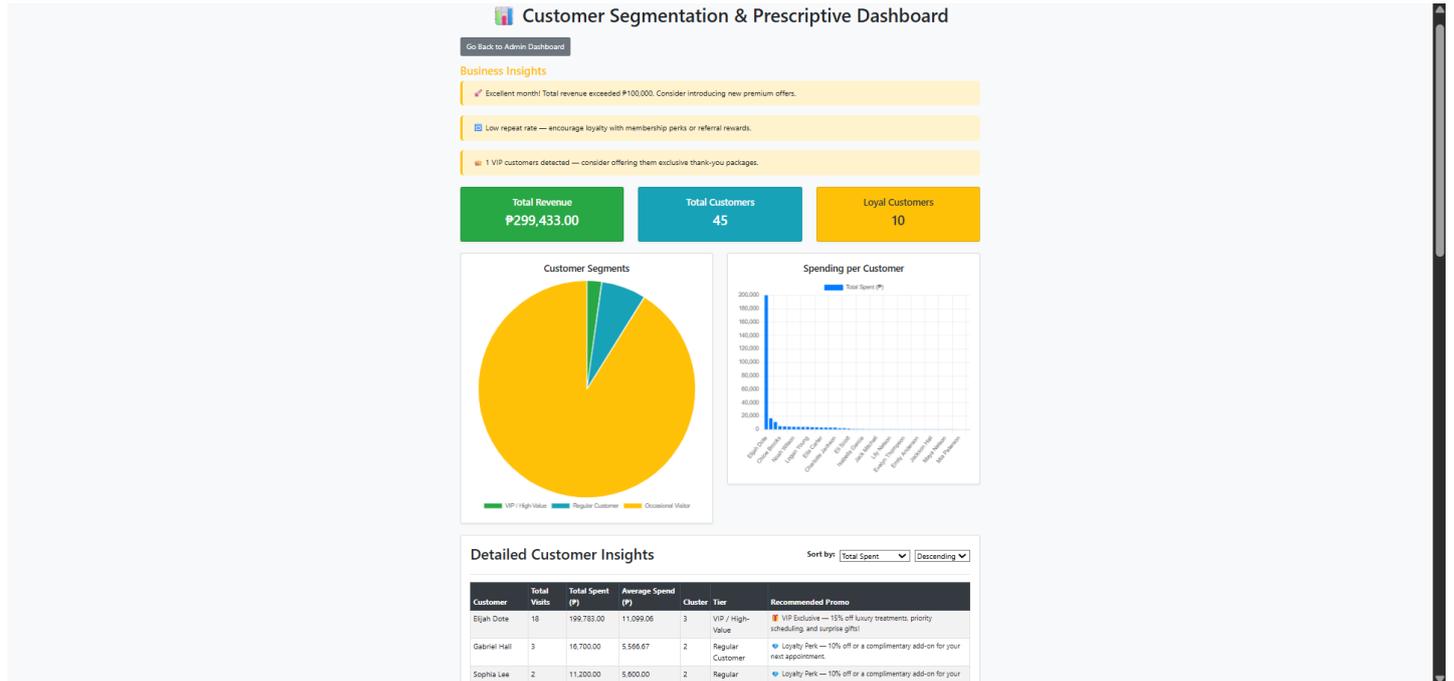
Development tools such as PHP, MySQL, HTML, CSS, and JavaScript were used in creating the Gold and Gorgeous Salon website. The front-end provides a user-friendly interface for customers and an admin dashboard for salon employees, while the back-end manages reservations, inquiries, and content updates. The system was developed iteratively to allow continuous improvement based on user feedback. Key features include an online booking system, customer reviews, and gallery updates, all of which function efficiently across different devices.

Figure 4: Booking Analytics



The Booking Analytics section provides detailed insights about salon appointments. It shows daily, weekly, monthly, and yearly booking summaries so the admin can track booking volume over time. It also analyzes which types of services are booked most often and identifies peak hours when bookings are highest. In addition, it monitors appointment statuses such as pending, accepted, rejected, finished, or canceled, making it easier for the admin to manage scheduling performance and customer activity.

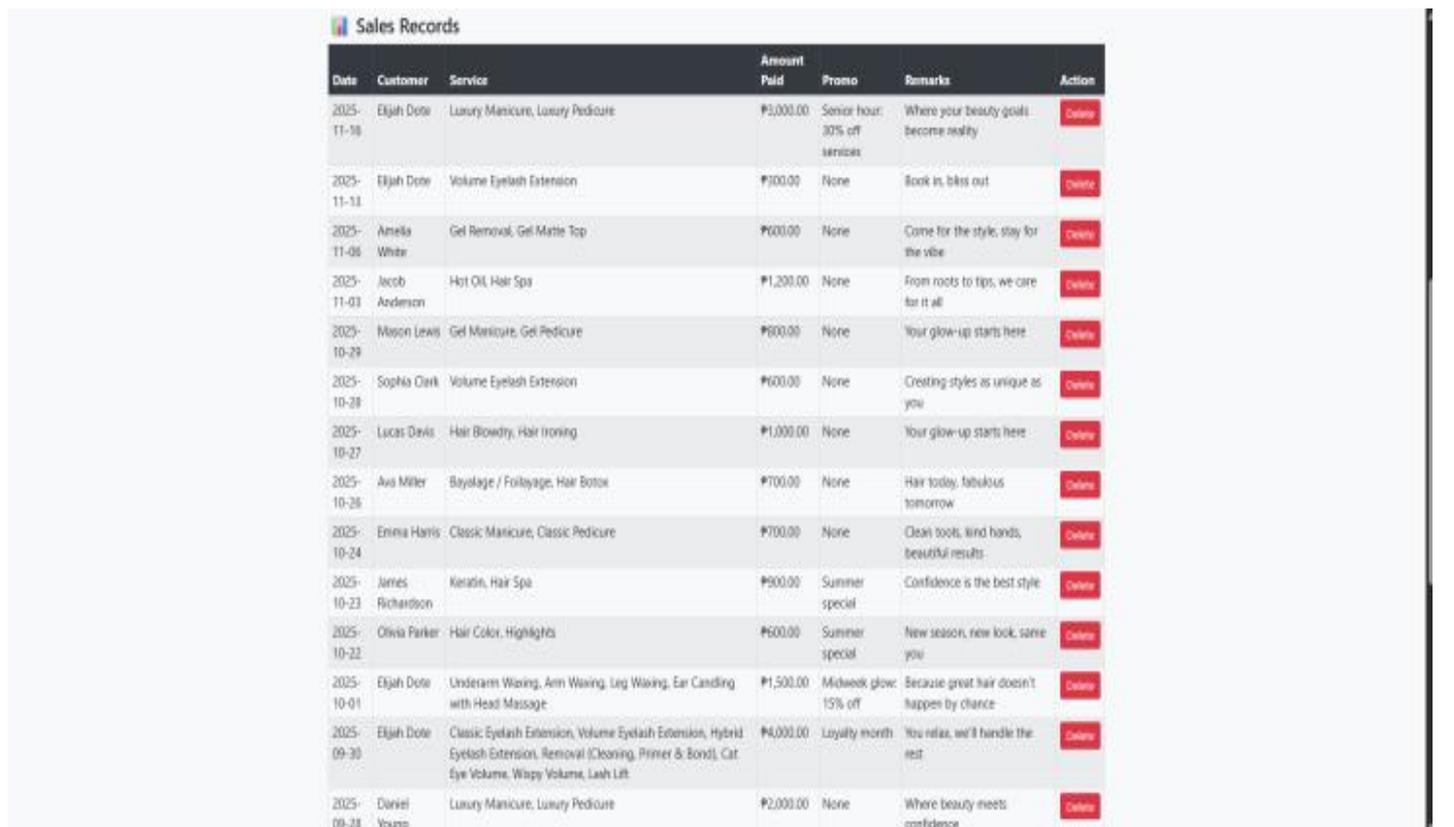
Figure 5: Customer Segmentation and Prescriptive Insights



The Customer Segmentation and Prescriptive Dashboard presents results from the K-Means Clustering model, which groups customers based on total spending, visit frequency, and average spend per visit. It classifies customers into three clusters: VIP/High-Value, Regular, and Occasional Visitors.

Each cluster’s performance is visualized through customer segment and spending charts, validating the accuracy of the model. The system also provides recommended promos based on customer tier and spending behavior, such as exclusive rewards for VIPs and loyalty perks for regular customers. This helps the admin identify high-value clients and apply personalized marketing strategies effectively.

Figure 6: Revenue and Promotion Performance Overview



The Revenue and Promotion Performance Overview section focuses on the salon’s overall income and promotional performance. It provides daily and monthly income summaries to help track financial growth. It also breaks down revenue by service type to show which services generate the most profit. Based on trends in the data, the system suggests promotional offers that could increase customer engagement and boost sales.

**Assessment: Summary of Respondents on The System**

The distribution of respondents along with their size (n) and percentage are shown in the following tables. Additionally, a combined summary of the participants' evaluations is presented. The ISO 25010 Software Quality Model was used to assess the system based on Functionality, Reliability, Efficiency, Usability, and Security. Feedback from both user respondents and technical specialists was gathered to determine the overall effectiveness and user satisfaction of the developed system.

Table 1: Distribution of Respondents

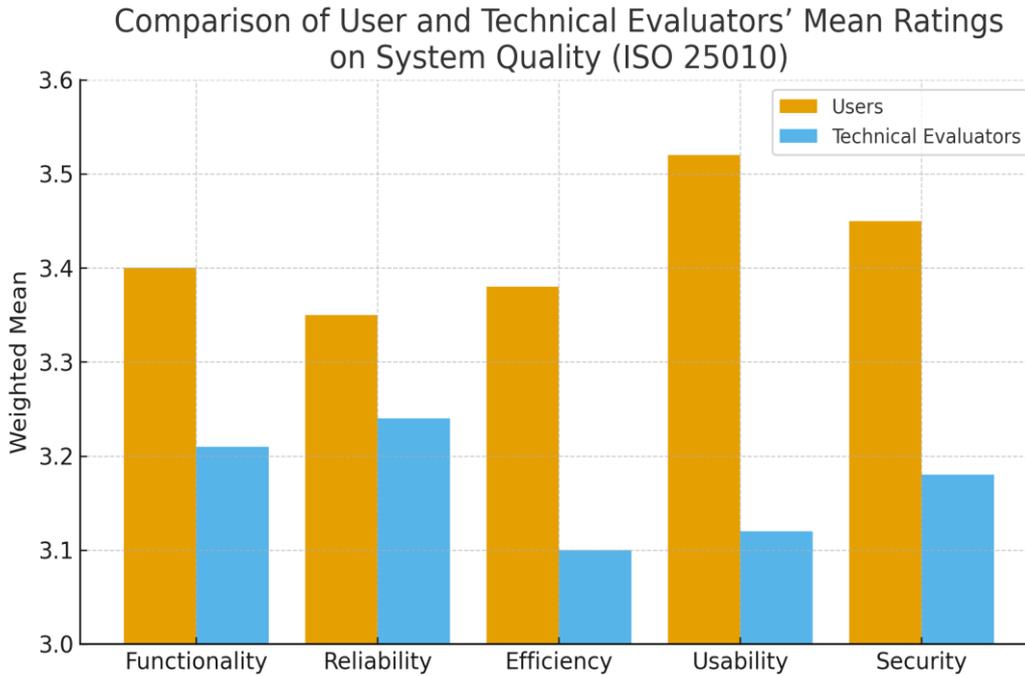
Type of Respondents	Frequency (n)	Percentage (%)
Salon Owner	1	0.67%
Employees/Staff	10	6.67%
Customers	100	66.67%
IT Professionals	12	8.00%
IT Students	27	18.00%
Total	150	100%

A total of 150 participants evaluated the system. Out of these, 111 were system users (owner, employees, customers) and 39 were technical evaluators (IT professionals and students). This ensured a balanced assessment in terms of usability and technical quality.

Table 2: Summary and Comparison of Evaluations of Respondents

Criteria (ISO 25010)	Users (n=111)		Technical (n=39)		Mean Difference
	WM	VI	WM	VI	
Functionality	3.40	SA	3.21	A	0.19
Reliability	3.35	SA	3.24	A	0.11
Efficiency	3.38	SA	3.10	A	0.28
Usability	3.52	SA	3.12	A	0.40
Security	3.45	SA	3.18	A	0.27
Overall Mean	3.42	SA	3.16	A	0.26

Figure 7: Comparative Weighted Mean Ratings between User and Technical Evaluators



The results in Table 2 and Figure 7 show that user respondents strongly agreed with the overall quality of the system (Overall Mean = 3.42), while technical evaluators agreed (Overall Mean = 3.16). Both groups confirmed that the system is functional, reliable, and user-friendly.

The comparative graph highlights that user ratings were consistently higher across all ISO 25010 criteria, particularly in Usability (3.52 vs 3.12) and Efficiency (3.38 vs 3.10). This indicates that users found the system easier and more convenient to use, while technical evaluators identified areas for optimization, particularly in Security and Performance.

Overall, the assessment results affirm that the system meets the expected software quality standards, demonstrating positive feedback from both user and technical perspectives.

### Ethical Considerations

The study follows ethical research guidelines to ensure the protection, rights, and privacy of all participants. The confidentiality and integrity of all gathered data are strictly maintained, and no personally identifiable information is disclosed without consent. Participation in the study is voluntary, and respondents may withdraw at any time without any penalty. Proper data security measures are applied to prevent unauthorized access, loss, or misuse of information. The researchers also commit to presenting results honestly and accurately, avoiding any form of bias or data manipulation to maintain the credibility and reliability of the study.

### Summary

The study focused on developing a Functional Salon Website for Service Display and Online Booking Management for Gold and Gorgeous Salon using Prescriptive Analysis and K-Means Clustering. The system aimed to address common salon challenges such as unorganized bookings, missed inquiries, and inefficient promotion handling. Through the integration of Prescriptive Analysis, the system generated data-driven recommendations for staff scheduling, service optimization, and promotional strategies. The K-Means Clustering algorithm grouped customers based on booking patterns, preferences, and spending behavior, allowing personalized service offerings.

A total of 150 participants, including the salon owner, employees, customers, IT professionals, and IT students, evaluated the system using the ISO 25010 software quality characteristics. The results showed high ratings in

functionality, reliability, usability, efficiency, and maintainability. The findings revealed that the system improved customer engagement and streamlined business operations. Overall, the research demonstrated that applying data analytics in small-scale service industries can support smarter management and enhance customer satisfaction.

## CONCLUSION

Based on the results, the developed salon website successfully met its objectives of enhancing booking management, service visibility, and customer interaction. The use of Prescriptive Analysis provided actionable insights that improved decision-making in resource allocation and promotional strategies. The K-Means Clustering feature helped the salon understand customer segments and deliver personalized experiences. Evaluation using the ISO 25010 model confirmed that the system performed well in terms of functionality, reliability, usability, efficiency, and maintainability. Users found the platform easy to navigate, responsive, and beneficial for both administrative and customer use.

The analytics-driven approach gave Gold and Gorgeous Salon a competitive advantage in digital service management. It showed how data-driven technologies can transform traditional businesses into efficient and customer-focused enterprises. Therefore, the developed system serves as a practical and innovative solution for improving operational efficiency in the salon industry.

## RECOMMENDATION

It is recommended that the salon continue using and enhancing the system to automate appointment scheduling, customer tracking, and promotional campaign management. Additional features such as online payment integration, SMS or email notifications, and real-time chat support may be added to improve convenience and user engagement. Future developers may also expand the analytics module by incorporating predictive modeling for revenue forecasting and customer retention analysis.

Continuous collection of user feedback is advised to ensure that the system adapts to changing customer needs. Regular staff training must also be provided to improve system usage and data interpretation for better decision-making. For academic purposes, future researchers may explore combining K-Means Clustering with other algorithms such as Decision Trees or Neural Networks for more accurate recommendations. The system may also be tested and applied to other service industries such as spas, wellness centers, or barbershops to assess its adaptability. Maintaining system updates and integrating advanced analytics will support long-term system efficiency and effectiveness.

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