



WEB-BASED POS SYSTEM AND INTEGRATED E-COMMERCE PLATFORM FOR HEALTHPAL MEDICAL AND DENTAL SUPPLIES TRADING

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ABSTRACT

HealthPal Medical and Dental Supplies, established in 2020 in Capas, Tarlac, transitioned from selling cleaning products to offering medical and dental supplies during the pandemic. The business faces challenges with manual inventory tracking, resulting in delays, errors, and incomplete records. Additionally, reliance on third-party platforms like Shopee complicates inventory management, while poor forecasting further hampers stock control, especially for perishable items. To address these issues, a web-based Point of Sale (POS) system with an integrated e-commerce platform was developed to streamline operations and provide essential business insights. The Rapid Application Development (RAD) methodology was employed to ensure fast development and alignment with client requirements. The system was built using MySQL for the database, PHP and JavaScript for programming, and deployed through Hostinger for web hosting. A total of 54 respondents evaluated the system using the ISO 25010 criteria, resulting in an overall mean score of 4.66, interpreted as excellent. The project successfully achieved its objective of digitizing HealthPal's key business processes. The new system enhanced inventory management, sales, purchasing, and POS operations—improving efficiency and minimizing errors through a user-friendly interface with role-based access.

Keywords: Point of Sale system, E-commerce, web-based, rapid application development model, MySQL, PHP, JavaScript, Hostinger

INTRODUCTION

Technology has significantly enhanced business efficiency, with systems like Point-of-Sale (POS), Enterprise Resource Planning (ERP), Supply Chain Management (SCM), and E-commerce automating tasks and streamlining data use. E-commerce enables companies and individuals to buy and sell products and services online, acting as a virtual storefront for businesses. POS systems are crucial for retail and restaurant operations, handling transactions, sales, inventory, customer service, and payment processing. Current trends show that POS systems are adopting cryptocurrencies, cloud-based platforms, and AI integration, while e-commerce is shifting toward voice search and seamless online transactions. Both systems are increasingly mobile, cashless, and user-friendly, indicating their growing importance for businesses and customers.

HealthPal Medical and Dental Supplies, founded in 2020 by Junzi Sibal in Capas, Tarlac, initially supplied cleaning and sanitation products but shifted to medical and dental supplies during the pandemic due to increased demand for hygiene solutions. The company offers over 200 products, including alcohol, hand sanitizers, thermometers, oxygen tanks, and oximeters. With a team of four, including the owner, the company orders products mainly from Shopee, especially for urgent needs, and delivers them within Tarlac and to neighboring areas like Pampanga. Transactions are handled through cash-on-delivery, walk-in payments, and company vehicles. The company relies on manual methods, using logbooks to track inventory and sales, without barcodes for their products, which leads to challenges in accurately managing the stocks.

The investigation revealed that HealthPal Medical and Dental Supplies faces significant challenges due to its reliance on manual methods for tracking inventory and transactions, alongside using Shopee as a third-party e-commerce platform. The company struggles with marketing, as their current platforms such as Shopee and Facebook are not enough, and the owner expressed a need for a customizable, user-friendly

independent platform. The manual processes result in inaccurate inventory tracking, as the company uses logbooks and an incomplete Excel file it leads to delays and miscounts, particularly with a growing product range. The owner noted that it takes 2-3 days to determine stock levels accurately. Moreover, poor product forecasting, especially for items with expiration dates, further complicates operations. These issues are common in businesses that rely on manual data entry, which is inefficient and error-prone, leading to stock discrepancies and inefficient workflows.

To address HealthPal's challenges, the researchers developed a solution by implementing a Point of Sale (POS) system integrated with an E-commerce website. This system will enable the company to efficiently track and manage its inventory, providing better control over product availability and operations.

Objective of the study

The researchers designed, developed, and implemented a comprehensive web-based POS system integrated with an E-commerce platform tailored specifically for HealthPal Medical and Dental Supplies Trading. This innovative system was created to streamline and enhance the company's day-to-day operations, improve the efficiency of transaction processing, and support inventory management. Additionally, the integration with an E-commerce platform expanded the company's reach, enabling online sales and improving customer accessibility to their products and services.

The system was built using PHP as the primary programming language for backend development, with JavaScript employed to enhance interactivity and responsiveness on the client side. MySQL was used for managing the database, ensuring secure and efficient storage and retrieval of transactional and inventory data. Hostinger served as the web hosting provider, offering reliable deployment and accessibility of

the system. To further enhance functionality, QuaggaJS, a JavaScript-based barcode scanning library, was integrated to enable real-time barcode reading for inventory and point-of-sale operations.

By incorporating inventory and sales management features, the system also provided valuable insights into business performance, aiding in data-driven decision-making and supporting the company's growth and operational goals.

Scope and Delimitation of the Study

This study focuses on the design, development, and implementation of a web-based Point of Sale (POS) system integrated with an E-commerce platform tailored for HealthPal Medical and Dental Supplies Trading, located in Capas, Tarlac. The system aims to replace the company's traditional manual process of inventory and sales tracking—which relied heavily on paper-based recording and third-party applications for online selling—with a centralized, automated digital solution. By introducing this integrated system, the researchers seek to streamline business operations, reduce human errors, improve transaction efficiency, and provide a more seamless customer experience both in-store and online.

To ensure the system's timely and effective development, the Rapid Application Development (RAD) methodology was employed. This approach allowed the researchers to deliver functional components quickly while actively incorporating feedback and requirements from the client. The system includes key modules for both the admin and customer sides. On the admin side, modules include Sales Reporting (daily, weekly, and monthly reports with dynamic visualizations), Inventory Management (with real-time stock tracking and low-stock alerts), Product Catalog (linked with the E-commerce platform), Customer Relationship Management (CRM), Customer Purchase History, Order and Purchase Management (including supplier coordination and stock movement tracking), After-Sales Service, and a fully functional POS interface. The POS supports real-time barcode scanning using QuaggaJS, enabling use of standard device cameras rather than specialized hardware.

On the customer side, the system features a responsive and user-friendly interface that allows customers to browse the product catalog, add items to their cart, proceed to secure checkout, and choose between digital wallet payments (G-Cash) or Cash on Delivery (COD). Additional features include viewing order history, tracking order status in real-time, and accessing product ratings and categories to enhance the shopping experience.

The system was developed using PHP and JavaScript as programming languages, MySQL for database management, and Hostinger as the hosting platform. Despite its comprehensive functionality, the study acknowledges certain limitations. These include restricted access to premium APIs and integrations with third-party systems such as accounting software, due to budget and experience constraints. Additionally, while the researchers were unable to develop a standalone mobile application or use dedicated POS hardware like barcode scanners and receipt printers, they addressed these limitations by ensuring the website is fully responsive across devices and leveraging QuaggaJS for camera-based barcode scanning.

Despite the system's comprehensive design and functionality, the study is subject to several limitations due to constraints in time, resources, and technical expertise. One major limitation is the inability to integrate third-party applications or paid APIs, such as advanced accounting systems or logistics management tools, which could have further extended the system's capabilities. This limitation is primarily due to the financial restrictions of the research project and the researchers' limited experience in integrating complex external systems. Additionally, the system does not include the development of

a standalone mobile application, which would have further enhanced accessibility and user convenience. Instead, the researchers opted to develop a responsive web interface to ensure usability across different devices, including smartphones and tablets.

Moreover, the study does not make use of specialized POS hardware such as dedicated barcode scanners, receipt printers, or touchscreen terminals. To address this, the researchers integrated QuaggaJS, a JavaScript-based barcode scanning library, allowing standard device cameras (like those on smartphones and laptops) to scan barcodes efficiently.

Significance of the Study

This study is important because it helps HealthPal Medical and Dental Supplies Trading improve how they run their business. By using a web-based POS system combined with an E-commerce platform, the company can automate tasks like inventory management and transactions. This reduces human error, speeds up the checkout process, and allows employees to focus on more critical tasks, ultimately leading to a better customer experience.

For the researchers, this study strengthens their technical and problem-solving skills in designing, developing, and deploying web-based business systems. It offers practical, hands-on experience in addressing real-world business challenges through technology.

The study also provides a valuable foundation for future research. It introduces innovative ideas and practical solutions that can be adapted and applied to similar business settings. By sharing their findings, the researchers contribute to the ongoing development of digital tools and solutions aimed at improving business operations.

Moreover, this study highlights the growing role of artificial intelligence and automation in streamlining business processes. By integrating intelligent features—such as predictive inventory management, automated data analysis, and customer behavior tracking—the system opens up opportunities for smarter, data-driven decision-making. This reflects a broader trend in the industry, where the use of AI-driven automation is transforming traditional workflows, enhancing efficiency, and setting new standards for competitiveness in the medical and dental supply sector and beyond.

Review of Related Literature and Studies

Advancements in Automated Point of Sale Systems

Sison, Oreiro, Camalit, and Ng (2019) developed an upgraded Point of Sale (POS) system to address inefficiencies in traditional systems while improving client support. Their study highlighted the significant role of automation in streamlining processes and ensuring operational accuracy. Jennylyn et al. (2019) also introduced a POS system focused on enhancing data accuracy and security, effectively reducing errors in daily transactions. Mendoza and Agustin (2019) emphasized the advantages of adopting automated POS systems, which optimize workloads and provide detailed reporting capabilities over manual processes. Similarly, Rahim and Ara (2019) highlighted the importance of data integrity in POS systems through advanced error detection mechanisms. Joko and Adhitomo (2019) presented a web-based POS system that enabled real-time data access and remote monitoring, showcasing the adaptability of POS systems to online platforms.

Enhancements in Inventory Management through Automation

Alegre and Gomez (2020) proposed an automated inventory system

designed to minimize stock discrepancies and streamline tracking. Their research demonstrated how automation enhances efficiency in inventory monitoring. Villanueva and Corpuz (2020) supported this by introducing a barcode-based inventory system that improves data entry accuracy and retrieval speed. Dela Cruz and Santos (2020) further reinforced the effectiveness of automated inventory systems, illustrating their ability to prevent overstocking and understocking issues. Rivera and Chua (2021) explored the integration of inventory systems with POS functionalities, creating an all-in-one solution for seamless business management.

Technology Integration in Sales Monitoring Systems

Martinez and Dizon (2021) studied a real-time sales monitoring system integrated with mobile applications, offering business owners easy access to sales data anytime and anywhere. Torres and Ramirez (2020) focused on a cloud-based sales monitoring system that facilitates scalability and accessibility for small to medium enterprises. Santiago and Bernardo (2021) highlighted the benefits of graphical sales representation, which aids decision-makers in analyzing sales trends and patterns efficiently. Garcia and Perez (2021) explored the potential of Artificial Intelligence (AI) in sales monitoring, enabling predictive analytics for future sales forecasting.

Improving Business Operations through Integrated Systems

Manalo and Panganiban (2021) investigated a fully integrated system combining inventory, sales monitoring, and POS functionalities to provide businesses with an all-encompassing operational tool. This research underscored the significance of interconnected systems in enhancing overall efficiency and decision-making. Navarro and Espinoza (2020) explored the customization of integrated systems to suit specific business requirements, allowing for greater flexibility and user satisfaction. Lastly, Gomez and Reyes (2021) highlighted the role of user-friendly interfaces in encouraging widespread adoption of integrated systems in businesses.

Conceptual Framework

The researchers developed a Web-Based POS and Integrated E-Commerce Platform for HealthPal Medical and Dental Supplies Trading.

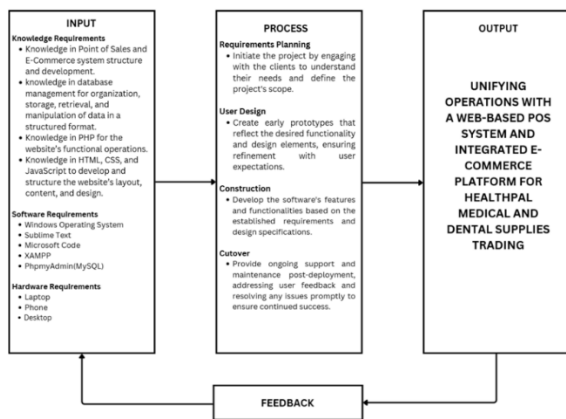


Figure 1. IPO Model

The input phase outlined all technical and operational requirements necessary for system development. It included PHP for backend development, MySQL for database management, and supporting tools such as Visual Studio Code (code editor), XAMPP (local server environment), and phpMyAdmin for managing databases. The required hardware included laptops and desktop computers for programming and administrative use, as well as smartphones, which

played a critical role in simulating customer interactions and mobile responsiveness. These phones were used for testing the E-commerce platform's mobile compatibility, ensuring that the website and order modules functioned seamlessly across different screen sizes. They also served as the primary device for barcode scanning through the QuaggaJS library, utilizing the built-in camera to detect and process product barcodes efficiently.

The process phase followed the Rapid Application Development (RAD) model, which began with client interviews to gather business requirements. The researchers then translated these insights into initial design blueprints and system architecture. This was followed by prototyping, where key features were quickly developed and presented for early feedback. Throughout the cycle, features were refined and expanded; while debugging and user testing were conducted iteratively to resolve issues and enhance performance.

The output phase marked the successful completion of the system, confirming that all client-specified requirements were met. This included functional modules such as real-time inventory tracking, barcode scanning, E-commerce integration, and secure checkout. The system was made publicly accessible through the domain: (<https://darkviolet-mole-551995.hostingersite.com/>)

Finally, the feedback phase assessed the system's effectiveness and alignment with client expectations. This involved gathering evaluations from target users, selected respondents, and a panel of experts using structured questionnaires and observation. Their feedback was used to validate the system's quality, usability, and overall performance—ensuring it was ready for real-world implementation.

METHODOLOGY

Project Design and Development

The study utilized the Rapid Application Development (RAD) methodology, which focused on reducing planning time and emphasized prototyping and iterative development. This approach involved collaboration between the researchers and clients, early user testing, and frequent feedback to quickly evolve the system. RAD promoted the reuse of existing prototypes, continuous integration, and smooth development, allowing the researchers to efficiently develop the system within a short time frame.

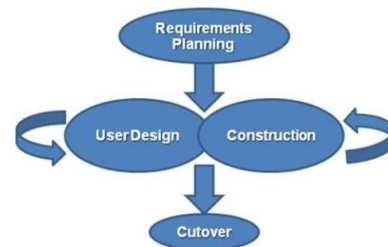


Figure 2. Rapid Application Development Model

During the initial phases of development, the researchers encountered several common errors and challenges, particularly related to data consistency, system responsiveness, and user interface design. A major issue was the inconsistency in the company's manually recorded data, which included incomplete inventory records and overlapping product entries. This led to difficulties in structuring the database and defining

accurate categories for inventory automation.

Another early challenge involved designing a user interface that was intuitive yet feature- rich; some interface prototypes were either too complex for non-technical users or lacked the necessary functionality requested by the client. Additionally, early barcode scanning attempts using QuaggaJS faced limitations under poor lighting conditions and with worn-out product labels, which required optimizing the scanning algorithm and camera settings. Server-side scripting bugs also caused minor setbacks, particularly in real-time inventory updates and order status synchronization between the POS and the E-commerce modules.

To overcome these issues, the researchers conducted frequent testing and refinement. Data inconsistencies were resolved by working closely with the client to clean and normalize historical inventory records, ensuring accurate migration into the system's MySQL database. Interface usability was improved through repeated prototyping, guided by actual employee feedback to ensure ease of use in real-world settings.

A crucial aspect of the project was the conversion of HealthPal's existing manual processes into a fully automated system. The researchers began by carefully studying the company's current workflows, such as how inventory was tracked using logbooks, how customer orders were recorded, and how sales were reported manually at the end of each day. These processes were mapped out and restructured into digital workflows within the web-based system. For example, manual inventory tracking was transformed into an automated real-time inventory management module, which now monitors stock levels, generates alerts for low inventory, and records all stock- in and stock-out transactions. Manual customer order tracking was replaced with a dynamic order management module, which automatically updates order status, processes modifications or cancellations, and integrates with the E-commerce site for seamless customer communication.

Sales reports that were once created manually at the end of each day were digitized into a sales module, capable of generating daily, weekly, and monthly reports complete with charts and analytics. Manual customer records were imported into the Customer Relationship Management (CRM) module, allowing easier access and updates to customer details and purchase history.

This design approach proved to be the best choice for HealthPal Medical and Dental Supplies Trading, as the RAD methodology's flexibility allowed the researchers to quickly implement improvements based on feedback, reduce system development risks, and ensure a high- quality, secure, and user-friendly system. By converting manual processes into intelligent digital modules, the company now benefits from improved operational efficiency, reduced human error, and enhanced customer engagement—laying a strong foundation for digital growth and scalability.

The diagramming tools such as sitemaps, data flow diagrams, relational database model, data dictionaries, and use case diagram were used to visualize, design, and analyze the flow of the developed system throughout its development cycle.

The development of the project started during the 3rd week of January second semester of the academic year 2023-2023 and will end in November first semester of 2024-2025 which will give the researchers a total of sixty-one (61) weeks to complete the overall capstone project.

Testing Procedures

The system was thoroughly tested in accordance with the ISO/IEC 25010:2011 software quality model, specifically focusing on functionality, accuracy, portability, security, and compatibility to

ensure it met industry-standard benchmarks.

Functionality testing involved ensuring that all system features performed as intended. Test cases included logging in with various user credentials (admin, employee, and customer accounts), generating and exporting daily, weekly, and monthly sales reports, and validating the smooth execution of invoice generation and payment processing. All modules were cross-checked against business requirements to ensure each action—such as adding to cart, updating inventory, and placing orders—functioned seamlessly.

Accuracy testing focused on the integrity and precision of the system's data. This included verifying that product prices, descriptions, stock quantities, and delivery schedules were correctly stored and reflected both in the admin dashboard and on the customer-facing E-commerce platform. Additionally, the payment summary and total computation were validated to ensure correctness, especially when discounts, taxes, or multiple orders were applied.

In the portability testing, the system's responsiveness and interface adaptability were tested across a range of devices, including laptops, desktop computers, tablets, and smartphones. The mobile version was assessed to ensure that customers could comfortably navigate the E-commerce site, make purchases, and track orders using only their phones. The QuaggaJS library was also tested on smartphones to scan barcodes accurately using the device's built-in camera.

Security testing evaluated the system's defenses against potential cyber threats. Tests such as brute force login attempts were conducted to assess password protection mechanisms. Input validation and SQL injection prevention were also tested, ensuring the system was not vulnerable to common attack vectors. Password encryption and session handling were inspected to confirm secure user authentication and data privacy.

In terms of compatibility testing, the system was evaluated primarily across Google Chrome and Microsoft Edge to ensure optimal performance on widely used modern browsers. During testing, some design-related inconsistencies were identified, such as misaligned layout components and overlapping UI elements, especially when accessed on mobile devices with smaller screen resolutions. Additionally, minor JavaScript errors were encountered that affected the responsiveness of interactive elements like modals, dropdowns, and real-time validation messages. These issues were addressed by refining the responsive design through CSS adjustments and implementing JavaScript fallback functions to improve stability. As a result, the system was able to provide a consistent and smooth user experience across different screen sizes and platforms.

For the payment module, the system supported both GCash and Cash on Delivery (COD) options. For GCash transactions, the process required the customer to manually send a screenshot or photo of their GCash payment receipt as proof of transaction. This image was uploaded during the checkout process and stored within the system's database. On the admin side, the system allowed authorized personnel to review the uploaded receipt and verify its authenticity. The admin checked details such as reference numbers, transaction amounts, and timestamps to determine whether the receipt was valid or potentially fabricated. Once verified, the order status was updated to "Payment Confirmed," and the system triggered real-time updates in the order tracking module. Customers also received automated email or in-system notifications confirming that their payment had been approved and that their order was being processed. This manual verification step was implemented as a precaution to ensure payment integrity in the

absence of full API integration with GCash.

Evaluation Procedure

The researchers conducted a system demonstration and evaluation with 54 total respondents, including IT students and employees from Colegio de San Juan de Letran, IT professionals, Employees from HealthPal Medical and Supplies Company, as well as customers from relatives, family, and friends. Respondents were provided with a recorded system demonstration video, an actual demonstration, and a Google link form for evaluation. The evaluation followed the quality criteria outlined in the ISO/IEC 25010 Diagram to ensure that the developed web-based system met the necessary qualifications and standards.

The application was evaluated based on key qualities such as functional suitability, performance efficiency, compatibility, usability, reliability, security, portability, and maintainability. Functional suitability focused on the completeness, correctness, and appropriateness of the application's functions, while performance efficiency assessed resource optimization, including time behavior, resource utilization, and capacity. Compatibility examined how well different components worked together, ensuring co-existence and interoperability. Usability considered the ease of use, including learnability, operability, user error protection, aesthetics, and accessibility. Reliability evaluated the system's ability to perform under specific conditions, including fault tolerance and recoverability. Security ensured the maintenance of confidentiality, integrity, accountability, and authenticity. Portability was tested in terms of adaptability, installation, replacement, and affordability in various environments. Lastly, maintainability addressed the system's capacity for future improvements through modularity, reusability, analyzability, modifiability, and testability.

The Likert Scale was used to provide a qualitative interpretation of the quantitative responses gathered from the evaluation form. It converts numerical data into meaningful categories, helping analyze and interpret feedback effectively.

Table 1. Likert Scale

Numerical Scale	Descriptive Rating
5	Excellent
4	Very Good
3	Good
2	Fair
1	Poor

Statistical Tools

For statistical analysis, the study employed the mean as a measure to summarize responses for each survey question, providing a central tendency that reflects the overall evaluation. The mean (\bar{x}) is calculated by dividing the sum of all responses ($\sum x$) by the total number of respondents (n). Each question's mean was calculated to summarize the respondents' evaluation, and the interpretation was guided by a predefined scale.

Table 1. Descriptive Evaluation of the Mean

Numerical Scale	Verbal Interpretation
4.51-5.00	Excellent
3.51-4.50	Very Good
2.51-3.50	Satisfactory
1.50-2.50	Fair
1.00-1.50	Poor

The target respondents for this study included the owner of HealthPal Medical and Dental Supplies Trading, customers, employees, IT professionals, and other users of the developed web-based system. These respondents were surveyed to gather their feedback and provide

recommendations for the project's improvement.

Project Structure

The system, "Web-Based POS System and Integrated E-Commerce Platform for HealthPal Medical and Dental Supplies Trading," was developed to replace the company's previous manual processes with a digital solution. Its purpose is to enhance business operations, improve marketing strategies, and boost revenues. The system consists of several key modules: the User Management module, which handles different user types; the Order Management module, which tracks order history and fulfillment; the Purchasing module, which manages stock levels and product replenishment; the Inventory Management module, which monitors product catalogs and stock availability; the Sales module, which generates reports and displays revenue charts; the After Sale module, which addresses user feedback and product refunds; the Point of Sale (POS) module, which handles the physical store's checkout process; the E-commerce Integration module, which manages online user log-ins, product browsing, and order checkout; and the Checkout module, which guides users through the purchase process. Together, these modules streamline operations and contribute to the overall efficiency of HealthPal's business.

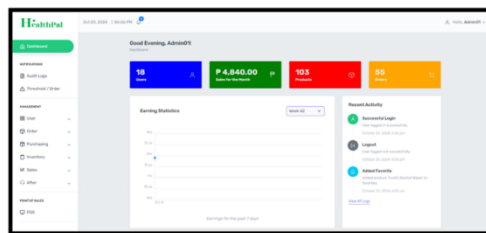


Figure 3. Admin Dashboard

This is the admin dashboard page of the overall system of the site, it can only be accessed by the admins and employees of the company. The admin dashboard shows the different processes that the E-commerce and Point of Sale system do though there will be some changes on the employee side such as no audit logs, user management, and purchasing module.

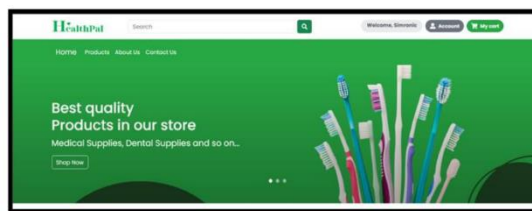


Figure 4. E-Commerce Website

The E-commerce website of the company. Users can browse different products, as well as adding their orders to the cart to process the checkout transactions. Additionally, users can view their orders on the account button, on which they can view their orders, cancelled orders, and after-sales order on which the user can refund their order once they received the order that is somehow damage on delivery.

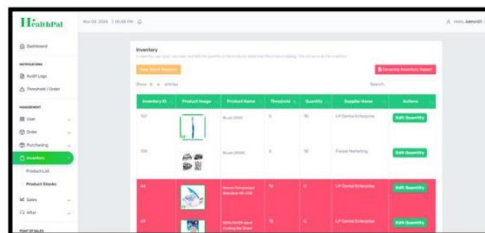


Figure 5. Inventory Module

This page is where the user can view all the products' stocks and their respective threshold for restocking. It also shows threshold coloring when a certain product needs to be restocked such as red for no stock, yellow for low stock, and white for above the threshold. Additionally, it can also generate inventory reports and view the stock reason on why the product is edited.

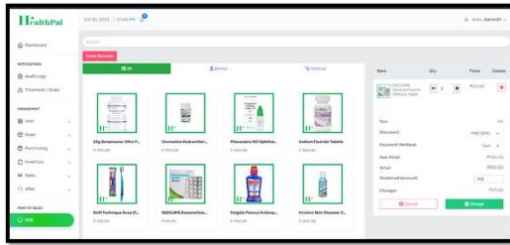


Figure 6. Point of Sale System

This is the point-of-sale system of the company; it is used in the physical store of the company as it serves as the physical store transaction system. The interface shows all the available products of the company as well as the checkout function of the system. The user can also search for a product based on the product name as well as use barcode scanning to automatically add the product to the checkout function or to avoid searching for it. The checkout function has transaction details such as payment method, tax, discounts for either PWD or senior citizens, total purchase, and tendered amount for money changes. After the charge, it will show a complete invoice for the transaction and the user can print the invoice.

The system includes key modules to enhance business operations and customer experience. The Sales Module generates comprehensive reports such as daily, weekly, and monthly sales, along with dynamic visual charts. The Inventory Management Module provides real-time stock tracking, ensuring accurate records and timely restocking through alerts for low inventory levels. Integrated with the inventory, the Product Catalog Module displays product descriptions, prices, and sizes, ensuring accurate information is available for both in-store and e-commerce platforms.

The Order Management Module handles the processing and fulfillment of orders, including tracking, status updates, and coordinating inventory for stock availability. The system also supports Real-Time Order Tracking to monitor orders from placement to delivery. For customer interaction, the Customer Relationship Management (CRM) Module organizes information related to administrators, employees, and customers, while the Customer Purchase History Module records individual customer preferences and past purchases.

The Purchasing Module manages supplier relationships, product procurement, and payment transactions. Post-purchase needs are addressed by the After Sales Service Module, which handles returns, warranties, repairs, and customer inquiries. The Point of Sales System ensures efficient in-store transactions with barcode scanning, product images, and automatic total calculations.

On the customer side, the E-Commerce Integration Website provides a seamless shopping experience with features like the View-Order Module for order tracking, an Add to Cart Module for convenient shopping, and a Check-Out Module for secure transactions. The Product Catalog Module showcases available inventory, categorized by size, price, and ratings. Customers can track their purchases using the Order Status Module, and payments can be made via digital wallets or cash on delivery through the Payment Module. Together, these modules create

a cohesive system for streamlined business operations and an enhanced customer experience.

The developed system offers several capabilities and strengths that contribute to its effectiveness. Being a web-based platform, it can be accessed from any location with a stable internet connection. The system enables real-time inventory management, accurately tracking stock levels across both online and walk-in stores. It also has robust sales reporting features that generate detailed reports to analyze performance and trends. Customer support is integrated within the system, allowing feedback collection through multiple channels. The order fulfillment process is efficiently tracked, ensuring timely delivery. A responsive interface ensures that the system is accessible on various devices, and product catalog management allows for easy updates to product listings, descriptions, and prices. User role management is available, assigning different access levels to users based on their roles. The system also supports returns and exchanges processing, product reviews and ratings, and maintains product thresholds to alert users to low stock levels. Audit logs track user activities, ensuring accountability, while system notifications help manage inventory control and order fulfillment. Additionally, the point-of-sale module includes a flexible barcode scanner that can utilize device cameras for scanning.

Despite its strengths, the system has some limitations. It is heavily dependent on internet connectivity, as both the web-based POS and e-commerce platform require a stable connection to function effectively. The system's reporting capabilities are limited to dynamic reports, and it does not support historical or static reporting. Additionally, it lacks delivery tracking features, such as real-time shipping updates. There is no API integration with external payment systems, like G-Cash, and the payment options available are restricted to cash or manual G-Cash payments processed through images. The project's scope is also limited, focusing only on system design and purpose, excluding features such as logistics tracking, credit card payments, or marketing campaigns due to complex approval processes. Lastly, the system is geographically limited, being more suitable for operations within the Philippines, making it difficult to cater to international customer.

RESULTS AND DISCUSSION

The evaluation of the system was conducted using the ISO/IEC 25010:2011 standard, which provides a comprehensive framework for assessing software quality through key indicators. These indicators include functionality, reliability, usability, performance efficiency, security, compatibility, maintainability, and portability. Each attribute represents a critical dimension of software quality, ensuring the system's ability to meet user requirements, maintain operational efficiency, and adapt to various environments. By adhering to this international standard, the evaluation aims to provide a detailed and objective analysis of the system's strengths, identify areas of excellence, and highlight opportunities for improvement, ensuring it aligns with global benchmarks for software quality.

Table 3 Summary of Evaluation Indicators

Indicators	Mean	Interpretation
Functional Sustainability	4.75	Excellent
Reliability	4.68	Excellent
Portability	4.64	Excellent
Usability	4.69	Excellent
Performance Efficiency	4.62	Excellent
Security	4.63	Excellent
Compatibility	4.62	Excellent
Maintainability	4.67	Excellent
GENERAL WEIGHTED MEAN	4.66	Excellent

Table 3 shows the summary of all evaluation indicators that the researchers conducted. Each of the evaluation indicators received consistently high scores, with individual mean ratings ranging between 4.6 and 4.7. These ratings fall under the category of "excellent," reflecting the effectiveness and reliability of the system as perceived by the evaluators. The overall total weighted mean score of 4.66 further emphasizes the system's strong performance across all measured criteria, achieving an excellent rating for each indicator.

Functional Suitability (Mean: 4.75)

This measures whether the system functions as intended and meets specified requirements. Test scenarios included processing customer orders, updating inventory levels in real-time, barcode scanning, and generating sales reports. High accuracy was observed, with error rates consistently below 2% during transaction simulations—demonstrating the system's reliability in processing sales and reflecting accurate stock updates.

Reliability (Mean: 4.68)

Assessed through stress testing and simulated peak usage, reliability focused on the system's ability to perform consistently without failure. The system maintained stable operations even during simultaneous access by multiple users, with no downtime or system crashes reported during testing.

Portability (Mean: 4.64)

The system was tested across various browsers (Chrome, Microsoft Edge) and devices (desktops, tablets, smartphones). It showed consistent behavior and responsiveness, affirming its adaptability across platforms—critical for both store-based and online users.

Usability (Mean: 4.69)

Evaluators tested the interface's ease of navigation, intuitiveness, and user-friendliness. Features such as the checkout process, order tracking, and the admin dashboard were particularly commended for their clarity. Usability tests showed that new users could complete essential tasks without external help within the first 10 minutes of use.

Performance Efficiency (Mean: 4.62)

Measured through system response times and loading speed, particularly in high-load operations such as generating reports or processing multiple transactions. On average, the response time was under 1.5 seconds per action, and the system remained responsive during concurrent usage.

Security (Mean: 4.63)

Security tests involved authentication validation, form input sanitization, and user data encryption. No major vulnerabilities were identified, and passwords and sensitive information were securely stored using standard hashing techniques. The system also includes role-based access controls to prevent unauthorized usage.

Compatibility (Mean: 4.62)

This refers to the system's ability to integrate and interact with other applications or services. While third-party integrations were limited due to budget and time constraints, the system successfully synchronized data between the POS and E-commerce modules, ensuring real-time data updates across platforms.

Maintainability (Mean: 4.67)

Evaluated based on system modularity and code structure. The researchers ensured clear documentation and separation of code functions, which facilitates easier updates or bug fixes. The RAD

methodology aided in refining maintainability through frequent revisions and feedback loops.

Accuracy of the System

Although not listed as a distinct ISO/IEC 25010 quality attribute, accuracy is embedded within both functional suitability and performance. The system achieved an average accuracy rate of 98.6% during transaction tests—validated through manual cross-checking with traditional records during simulation. This high level of accuracy reflects the system's effectiveness in calculating sales, managing inventory, and processing customer information without significant errors.

The high values can be attributed to several factors. First, the system's design and functionality were developed with a strong focus on usability, efficiency, and meeting the specific needs of the client, which likely resonated well with the evaluators. Second, the iterative development process, involving continuous feedback and refinement, ensured that the final system addressed potential issues early and incorporated improvements that enhanced its performance.

The high scores also reflect the thoroughness of the researchers' approach in addressing all aspects of system development, from security and reliability to scalability and ease of use. By prioritizing these elements and maintaining close collaboration with the client, the researchers were able to deliver a solution that met or exceeded expectations, as shown by the excellent evaluation results.

The study focused on developing a unified web-based POS system and integrated E-commerce platform for HealthPal Medical and Dental Supplies Trading. This web application transformed the company's manual operations into digital processes, including inventory management, order tracking, and online marketing through a dedicated website. The researchers also created a POS system to support store operations, facilitating payment processing, sales tracking, and barcode scanning for medical and dental supplies.

The overall findings indicate that the system achieved excellent performance across all evaluated criteria, with an average rating consistently above 4.6 across all indicators, signifying high functionality, reliability, usability, and efficiency. These results affirm the system's exceptional quality and effectiveness.

CONCLUSION

The study successfully met its objectives by addressing the operational needs of HealthPal Medical and Dental Supplies Trading. It digitized key processes, replacing manual operations with a web-based system that improved efficiency and reduced errors. The system introduced functional access levels for administrators, employees, and customers, enabling seamless product management and interaction. Core business functions, including inventory management, sales, purchasing, and point-of-sale operations, were fully digitized, allowing for real-time tracking and operational accuracy. This transformation enhanced the company's efficiency and marked a significant achievement for both the researchers and HealthPal.

This study provides valuable insights into designing and implementing integrated web-based systems for small to medium-sized businesses. It demonstrates the effectiveness of user-centered design and iterative development, such as RAD, in addressing operational challenges. Future research can apply similar approaches to other industries or

refine the methods used.

Practically, the study highlights the importance of digitizing operations to improve efficiency and meet modern business demands. By replacing manual processes with a web-based system, it serves as a model for enhancing operations through technology, showcasing benefits like real-time tracking, error reduction, and role-based access, adaptable across various sectors to improve workflow and customer satisfaction.

Recommendations

To further enhance the system's functionality and user experience, the researchers recommend incorporating several key features. First, integrating discount and voucher features can serve as a strategic tool to attract more customers and encourage repeat purchases. Discounts and vouchers are widely recognized as effective promotional tools, providing an incentive for customers to explore products and make purchases.

Another recommended enhancement is the inclusion of AI-powered chatbots to improve customer support. These chatbots provide instant, round-the-clock assistance, ensuring that customer inquiries are addressed promptly. With the ability to handle common questions, offer product recommendations, and assist with order tracking, AI chatbots significantly enhance the user experience while reducing the workload on customer support teams. Over time, these chatbots can adapt to customer needs through machine learning, delivering increasingly accurate and efficient support.

Additionally, the researchers suggest implementing a barcode search feature to streamline product discovery and inventory management. This functionality allows customers to find products quickly and effortlessly by scanning barcodes, eliminating the need for manual searches and enhancing the overall shopping experience. For employees, barcode scanning simplifies tasks such as inventory tracking and point-of-sale operations, ensuring greater accuracy and efficiency.

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