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SIMMZB: Sales and Inventory Management System for Migz Bikeshop

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ABSTRACT: This study focused on the design and development of a web-based Sales and Inventory Management System entitled SIMMZB: Sales and Inventory Management System for Migz Bikeshop. The project addressed the inefficiencies of the existing manual system, which resulted in inaccurate inventory records, time-consuming processes, and data discrepancies. The proposed system aimed to improve operational efficiency by automating sales transactions, inventory monitoring, and report generation while enhancing customer service through an online appointment scheduling feature. The system included key modules such as user management, product and inventory management, sales processing with automatic payment computation, report generation, advertisement management, and notification features for low inventory levels and scheduled appointments. It was developed using an iterative software development model and was implemented through web technologies including PHP, MySQL, HTML, CSS, and JavaScript. Security measures such as MD5 hashing were also applied to ensure data protection.

The system was evaluated using McCall's Software Quality Model for IT experts and ISO/IEC 25010 standards for end-users. Results revealed that the system achieved a satisfactory level of performance in terms of functionality, usability, reliability, and efficiency. Findings indicated that the developed system significantly enhanced accuracy, reduced manual workload, and improved overall business operations. Therefore, the system was recommended for implementation in Migz Bikeshop and similar small-scale retail businesses to support efficient and reliable management processes.

KEYWORDS: Database Management System, Inventory Control, Sales Monitoring, Small Business Automation, Web-Based System

INTRODUCTION

In today's generation, computers have become essential business tools. Most businesses used computers to manage and monitor their operations. In a survey conducted in 2020 in the Philippines by the Statista Research Department, small and medium-sized enterprises (SMEs) with efficient inventory management had 52 percent of their output delivered on time to customers. Companies with good inventory management practices delivered more of their output on time. Systems became useful, and their powerful applications made commercial transactions faster, easier, and more efficient by enabling continuous development through technology. The implementation of technology improved efficiency, speed, accuracy, planning, execution, and control, and reduced human error and risk. Implementing technology in business resulted in reduced labor costs, higher productivity, less time wasted, and more accurate inventory control.

Migz Bikeshop was an outdoor and sporting goods business that sold bicycles, bicycle parts, cycling t-shirts, and cycling jerseys. The business started on February 23, 2021, and was located at Catungan 1st, Sibalom, Antique. The shop purchased its products and supplies from Metro Manila and Iloilo City and resold them in Sibalom, Antique. The operations of Migz Bikeshop were manually handled, including inventory processes, stock recording, daily sales, and other transactions.

The problem encountered by the client was the manual process of managing inventory. Conducting inventory manually was labor-intensive and required a significant amount of time. Inaccurate data occurred due to manual recording of sales transactions and documentation of inventory. According to the proprietor, physical inventory counts had to be performed frequently to maintain control because data discrepancies were encountered during reconciliation. The client also experienced difficulty in scheduling the number of customers that could be accommodated per day for bicycle repair and assembly, since customers could only inquire through online messaging and the shop's contact number.

Every retail business aimed to maximize profit while ensuring customer satisfaction and loyalty. Taking advantage of technology made business operations easier. The need for a sales and inventory management system was identified as a solution to help Migz Bikeshop. The proposed system provided enhanced and flexible functions such as tracking items, preventing overstocking, and maintaining updated stock levels. As a result, the store manager spent less time on inventory management and focused more on daily business operations, while also improving convenience for customers.

OBJECTIVES OF THE STUDY

General Objective

To design and develop a Web-based Sales and Inventory Management System for Migz Bikeshop.

Specific Objectives

Specifically, the project aimed to:

1. Design and create a user management module that allows admin user to add, update and view user accounts.
2. Design and create sales functionality that will automatically calculate payments in sales transactions.
3. Design and create report generation module that can generate monthly, weekly and daily sales and inventory report
4. Design and create an advertisement module that will help the shop promote their business through social media platforms
5. Design and create an online appointment module that will facilitate the number of customer’s request for services.
6. Design and create a module that can notify the user on the following:
   - Notification on low inventory level
   - Notification for online scheduling
7. Create a function that will secure the information of the admin, staff and customers using MD5 hashing algorithm.
8. Design and create a product management module that will handle the inventory of products and stocks.

MATERIALS AND METHODS

Methodology is the study of research methods is a structured procedure for bringing about a certain goal. To discover new knowledge or to verify pre-existing knowledge claims. This normally involves various steps, like choosing a sample, collecting data from this sample, and interpreting this data. It includes evaluative aspects by comparing different methods to assess their advantages and disadvantages relative to different research or goals and situation. When understood in the widest sense, methodology also includes the discussion of these more abstract issues.

The model used was Iterative software development. The Iterative model is repetition incarnate. Instead of starting with fully known requirements, you implement a set of software requirements, then test, evaluate and pinpoint further requirements. One advantage over other SDLC models: This model gives you a working version early in the process and makes it less expensive to implement changes.

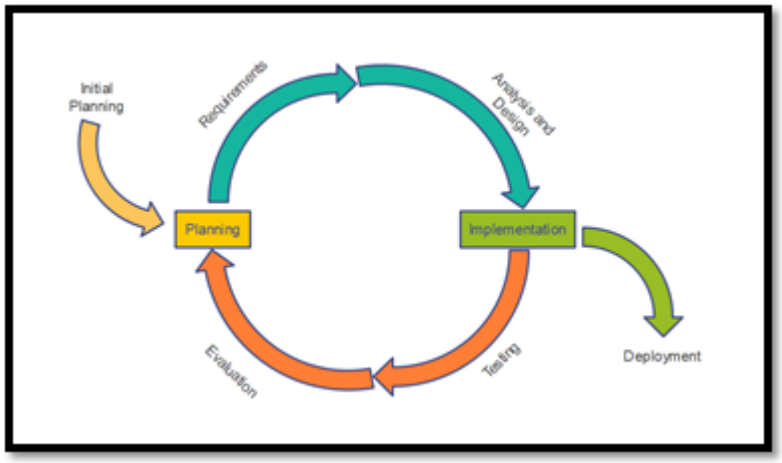

Figure 1. Iterative Model

Initial Planning

As with most any development project, the first step was to go through an initial planning stage to map out the specification documents, established software or hardware requirements, and generally prepared for the upcoming stages of the cycle.

Planning

In this phase, the project manager determined the project's slope, time and cost, Organized the team that will developed the system and assigned specific roles and responsibilities to each member of the team. The project manager also defined the project requirements in detail, including the answers to the questions of what to build, how to build it, and when it would be developed

Requirements

The researchers applied this phase by gathering some requirements and information about the process of the sales and inventory system of the business that helped the researchers produce a system. These included the observation of the proponents in the shop and interviewing the manager or the owner of the business.

Analysis & Design

Once planning is completed, an analysis was performed to nail down the appropriate business logic, database models, and the like that were required at this stage in the project. The design stage also occured here, establishing any technical requirements (languages, data layers, services, etc.) that were utilized in order to meet the needs of the analysis stage.

In this phase, the researchers will examined the need for possible software automation in the given manual system. In design, the database design and the data structure design were required. The researchers created an appropriate design solution for the problem that they encountered.

Implementation

With the planning and analysis completed, the actual implementation and coding process began. All planning, specification, and design docs up to this point were coded and implemented into this initial iteration of the project.

Testing

Once this current build iteration was coded and implemented, the next step was to go through a series of testing procedures to identify and locate any potential bugs or issues that occurred.

The researchers tested the developed system to reveal some errors and bugs and to ensure that the developed system met the expected output.

Evaluation

Once all prior stages were completed, it was time for a thorough evaluation of development up to this stage. This allowed the entire team, as well as clients or other outside parties, to examine where the project was, where it needed to be, and what could or should be changed.

Deployment

This was the stage where the Sales and Inventory Management System was completed and was installed.

Technical Background

As the team conducts preliminary investigations and performs fact finding and data gathering, the need for sales and inventory management system have come to conclusion. In the manual process in client's shop, the client uses calculators for the computation of sales. Walk in customers who purchased an item, upon receipt of payment, an official receipt is being issued and the inventory book is also being updated for the items sold. Basically, retail shop sells a variety of goods and services through a wholesaler or supplier to the end user which implies that the nature of retail business requires a good management of inventory level in order to meet the demand of the customers.

Hardware

The hardware used for Web-based Sales and Inventory Management System required (2) two sets of Personal computers for the use of Admin and Staff with 64-bit operating system, x64-based processor with 8.00 GB installed Random Access Memory (RAM) and a printer. The printer had a Print Resolution of 360 x 300 dpi, to produce high-quality prints, and allowed faster printing of documents and Reports.

Software

For Operating System, a Windows 11 version 21H2 was used with 64-bit Operating System. For the Antivirus software the system used the built-in windows security aka Microsoft Defender on windows 11. It was considered one of the best free antivirus programs in the market. It performed functions such as real-time scanning, malware removal, reputation-based blocking of malicious apps, and more. In the development of the application, the developers used Visual Studio Code. Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. For the modelling tools, the researchers used MS Visio diagramming tool which provided a user-friendly flowchart platform loaded with multiple features and capabilities that helped in diagram creation. For web design, Adobe Photoshop CC was used to edit photos, graphics, text, videos, and 3D models. With Adobe Photoshop, the researchers created web design mock-ups that were later converted to

a functional HTML/CSS template. PHP (Hypertext Preprocessor) was used as a server-side scripting language for web development. MySQL, a relational database management system (RDBMS), was used for database management. The latest version of XAMPP 8.1.6 was also used as a free and open-source cross-platform local web server. HTML (Hypertext Markup Language) was used for structuring web content, while CSS (Cascading Style Sheets) was used to design visually appealing web pages. For the domain, a .com extension was used because it was the most recognized and accessible. For editing video advertisements, FlexClip video ad maker was used, which helped the team create appealing advertisements.

Peopleware

The users of the system were the Admin and Staff. The Admin was responsible for overseeing the day-to-day operations of the business. The Staff had basic computer skills and monitored and forecasted inventory levels. Their duties included assisting customers with purchases, monitoring inventory, and maintaining appropriate stock levels. The Staff also processed purchase orders, tracked orders, and investigated any problems.

Networkware

A wireless network was used as the network connectivity of the client. It was a type of computer network that used wireless connections to connect network nodes for data transfer. Wireless networks were useful, inexpensive, and widely used, and they were easy to set up without requiring cable installation. The researchers used Wi-Fi (Wireless Fidelity) with an internet speed of 150 Mbps to support website development. This allowed the transfer of files to the online server hosting the website. The domain used in the system was .com. A router was used to communicate between the internet and connected devices. The built-in firewall of Microsoft Windows 11 was used to restrict internet traffic within the network.

Test Plan

The test plan for the system was to evaluate its software quality by assessing information quality and system acceptability. The system was tested by IT experts and random students, and the testing was conducted at the University of Antique. The questionnaire instrument used was based on McCall's Software Quality Model. This was used by IT experts to evaluate the system based on criteria such as correctness, reliability, efficiency, integrity, usability, maintainability, testability, flexibility, portability, reusability, and interoperability. For non-technical respondents, ISO 25010 standard questionnaires were used, covering criteria such as functionality, efficiency, compatibility, usability, reliability, security, maintainability, and portability. A five-point rating scale was used, where 5 indicated Very High and 1 indicated Very Low. Tables 1 and 2 described the rating scales used in the study. After testing, the results were summarized and examined to determine if the system was acceptable.

Instruments Used

Table 6. ISO 25010 Rating Scale

Rating	Description
5	Very High
4	High
3	Moderate
2	Low
1	Very Low

Note: The rating scale used ranges from 1 to 5, where 5 indicates Very High and 1 indicates Very Low.

Table 7. McCall's Rating Scale

Rating Range	Description
4.21 – 5.00	Very Good (5)
3.61 – 4.20	Good (4)
2.61 – 3.60	Average (3)
1.81 – 2.60	Fair (2)
1.00 – 1.80	Poor (1)

Note: The rating scale interpretation is based on McCall's Software Quality Model.

RESULTS AND DISCUSSION

The study was tested at the University of Antique, College of Computer Studies building. The testing was organized last December 01, 2022. The first evaluation was conducted using the McCall's Software Evaluation tool among 7 identified IT experts. Table 7 describes the result of the evaluation using the said instrument.

Table 8. McCall's Evaluation Result

Criteria	mean	Description
Auditability	3.71	Good (4)
Accuracy	3.28	Average (3)
Completeness	3	Average (3)
Communication Commonality	3.71	Good (4)
Conciseness	3.42	Average (3)
Consistency	3.14	Average (3)
Operability	3.71	Good (4)
Security	2.71	Fair (2)
Self-Documentation	3	Average (3)
Simplicity	3.71	Good (4)
Traceability	3.71	Good (4)
Training	3.57	Average (3)
Controllability	3.71	Good (4)
Decomposability	3.14	Average (3)
Error Tolerance	3.14	Average (3)
Execution Efficiency	3.85	Good (4)
Hardware Independence	3.57	Average (3)
Instrumentation	3.14	Average (3)
Modularity	3.57	Average (3)
Over-all	**3.41**	**Average (3)**

The next evaluation was conducted using the ISO/IEC Evaluation tool. Table 9 describe the summary of the evaluation result per group of Random students.

Table 9. ISO/IEC Evaluation Result

Characteristics	mean	Description
Functional suitability Characteristics		
Functional completeness	4.3	High
Functional correctness	4.33	High
Functional appropriateness	4.36	High
Performance Efficiency Characteristics		
Time behavior	4.43	High
Resource utilization	4.5	High
Capacity	4.43	High
Compatibility Characteristics		
Co-existence	4.33	High
Interoperability	4.36	High
Usability Characteristics		
Appropriateness recognizability	4.53	High
Learnability	4.5	High
Operability	4.5	High
Use error protection	4.4	High
User interface aesthetics	4.43	High
Reliability Characteristics		
Maturity	4.43	High
Availability	4.23	High
Fault Tolerance	4.26	High
Security Characteristics		
Confidentiality	4.7	High
Integrity	4.5	High
Accountability	4.53	High
Maintainability Characteristics		
Reusability	4.43	High
Analyzability	4.36	High
Modifiability	4.36	High
Testability	4.53	High
Portability Characteristics		
Adaptability	4.33	High
Installability	4.4	High
Grand Mean	**4.42**	**High**

Table 9 shows the evaluation result among 30 random students. The random students were able to rate the system with a general mean of 4.42 which describes it as “High”.

Figure 35. IT Expert Evaluation Result

Figure 36. End-User Evaluation Result

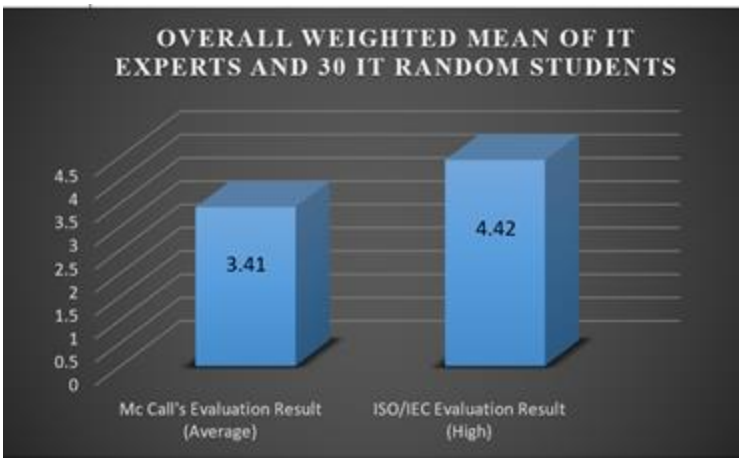

Figure 37. Overall End-User and IT Experts Evaluation Result

The general weighted mean of the system according to the two correspondents the IT Experts and the 30 Random students is 3.92.

CONCLUSION AND RECOMMENDATION

In current system of Migz Bikeshop, when it comes to inventory, because it is done manually, it causes confusion in counting available stocks and stocks sold. When it comes to sales transactions, because it is also done manually, slow process in sales transaction is one of the main problem. As a result, the team recommended that they implement a sales and inventory management system that allows them to create a user management module based on their role, which can help secure the admin and staff account. A sales function that can automatically calculate payments and generate receipt during transaction, an inventory module that allow the user to input the correct quantity of stocks. Therefore, SIIMZB: Sales & Inventory Management System for Migz Bikeshop can perform sales transaction and daily accurate Inventory. The system is designed and capable of performing sales, storing data, keep the inventory updated, generate reports, Product management and make it secure.

The system is designed to make the transactions of the shop a lot easier. It can be used for faster and efficient costumer service. The system is recommended for the SIMMZB: Sales and Inventory Management system and to other business in need of faster sales and inventory.

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