JONES POINT OF SALE AND INVENTORY MANAGEMENT SYSTEM FOR TRIPLE J ENTERPRISE

RYAN A. ARRIESGADO
JOSEFINA R. SARMIENTO

AEMILIANUM COLLEGE INC.
Rizal St., Piot, West District, Sorsogon City, Sorsogon, Philippines

Abstract. Triple J Enterprises uses DOS based FoxPro application in their retail and wholesale business for years ever since it was established. The system that they used currently was so outdated that even Microsoft discontinued its support of it. Their current system was not stable enough, there were bugs that occasionally occurred and it has very limited system features for a retail and wholesale business. The main problem with it was cannot be installed and run on major versions of windows operating systems like windows seven (7) 64bit, windows eight (8), and windows ten (10). Moreover, as the company progressed the number of purchases and sales records was growing fast, and archiving the old records of it was not enough. The maximum number of records that they can store in their system's database was roughly two (2) gigabytes per table; this size was not enough to hold at least two (2) or three (3) years of accumulated records.

To solve this problem of Triple J Enterprise, the researcher develops a more stable and more efficient point of sales and inventory management system. The proposed system was designed to meet the business requirements. The proposed system can be installed and run on any version of the Windows operating system and it has the capability to manage and hold terabytes size of accumulated records.

The interviews conducted with the Triple J management became the primary source of information for the study to obtain valid and accurate data which are not often found in books, magazines, journals, and others. On the other hand, secondary data were collected from printed materials like research studies related books and internet sources. The study over conducted a period of 6 months, from the planning of the system to design up to the finalization of the paper and the program interface itself.

Key Words: Business System, Inventory System, Point of Sale, Sales System

INTRODUCTION

The researcher aimed to develop a point of sale and inventory management system for Triple J Enterprise to automate the process that they need and give them a reliable system for monitoring the movement of their inventory. The system will be the solution for the problems mentioned above and also offers a scalable setup that can adapt to any enhancement that the company required.

Point of Sale and Inventory Systems are used for accurate business reports and for consistent and secured data storage. It will aid the existing problems regarding the Point of Sale, Inventory, and Monitoring of the business. It will lessen the time and effort of both employees and managers in storing, retrieving, and monitoring records of the business. The system's database is more secure and reliable than the DOS-based system that the company currently used.

The users can access the systems through their usernames and password. The System Administrator account will be the default user in the system and he can change its password if he wants to. Cashier and other Employee accounts should be created by the System Administrator.

The developed system will be a big help, especially in the sales transaction and monitoring of the business. It will also speed up the processes and will help its employees by saving their time and effort in preparing sales records and transactions for the day.

The developed system will give Point of Sale and Inventory functions such as searching through a list of products from the inventory and automatically computing its price and total value based on the quantity being sold. The Manager can add, update, and delete products in the inventory and also add stocks to products when receiving stocks of the said product.

The system will generate a sales report to be viewed by the manager of the business along with the inventory and transaction record of the system to have data transparency between the management of the Triple J Enterprise.

Specific Objectives

Specifically, the study aimed to:

1. develop a Point of Sale and Inventory Management System for all branches of Triple J Enterprise with the following modules:
    1.1. Administrator Module
    1.2. Cash Register Module
    1.3. Inventory Module
    1.4. Reports Module

2. validate the effectiveness of the Point of Sale and Inventory Management System for Triple J Enterprise in terms of:
    2.1 functionality
    2.2 reliability
    2.3 usability
    2.4 efficiency
    2.4 maintainability
    2.5 portability

Project Planning

Project planning is the first phase of the development process. The researcher gathered all the necessary data to identify the existing problem and come up with a feasible and workable solution. The researcher prepared questionnaires and conduct interviews with Triple J Enterprise management in order to clearly understand the present flow of the business operation and identify the existing problem encountered. The managers and other employees play a big part in the process of gathering data, they gave inputs and suggestions to the researcher to help him develop a system that meets their business needs and requirements. The researcher also does extensive browsing on the internet and research on various websites to gather data that are significant to the study. All references, studies, articles, and existing applications provided by the internet will be vital to the conducted study.

Triple J Enterprise is currently using an obsolete DOS-based application for its daily business operation. The said system can only do the least basic needs for a retail and wholesale business furthermore there are a lot of business processes that are being done manually. The researcher does thorough testing on the old system and explores its sub-modules to get additional information that will help him to determine which part in old system will be carried out to the new system. All processes adapt from the old system are subject for enhancement for a better user experience for each employee that will directly use the proposed system.

Project Requirements

Table 3.1 - Hardware and Software Requirements for Server and Client Computers

HARDWARE	MINIMUM REQUIREMENTS	RECOMMENDED
SERVER		
Operating System	Windows Server 2012 R2	Windows Server 2016
Database	MySQL 5.6	MySQL 5.6
Database Tool and Framework	.NET Framework 4.5, MySQL Workbench 6.3	.NET Framework 4.6 or higher, MySQL Workbench 6.3
Processor	Intel Xeon® CPU X5650	Intel Xeon® CPU-2620 V4
Memory	32 GB	64 GB
Disk Drive	1TBSSD - RAID 0	5TB SSD - RAID 5
Peripherals	17Inch Monitor, Mouse, and Keyboard (USB PORT), UPS, AVR	21Inch Monitor, Mouse, and Keyboard (USB PORT), UPS, AVR

Table 3.1 showed the hardware requirements for Server and Client computers. The minimum requirement of the Server's Operating System is Windows Server 2012 R2 but Windows Server 2016 is highly recommended. On the database side, the researcher will use MySQL 5.6, and .NET Framework 4.5, MySQL Workbench 6.3 as the Database tool and frameworks. The Processor for the proposed project is Intel Xeon® CPU X5650 or Intel Xeon® CPU-2620 V4. The Memory is 32 GB or may use higher bytes. The Disk Drive is 1TBSSD - RAID 0 or 5TB SSD - RAID 5. The computer peripherals may use a 17-inch monitor or 21-inch monitor, mouse and keyboard (USB PORT), UPS, and AVR.

Table 3.2 - Hardware and Software Requirements for Onsite Backup Server

ONSITE BACKUP SERVER		
Operating System	Windows Server 2012 R2	Windows Server 2012 R2
Database/Framework	MySQL 5.6	MySQL 5.6
Database Tool and Framework	.NET Framework 4.5, MySQL Workbench 6.3	.NET Framework 4.6 or higher, MySQL Workbench 6.3
Processor	Intel Xeon® CPU X5650	Intel Xeon® CPU X5650
Memory	16 GB	16 GB
Disk Drive	1TBSSD - RAID 0	1TBSSD - RAID 0
Peripherals	17Inch Monitor, Mouse, and Keyboard (USB PORT), UPS	17Inch Monitor, Mouse and Keyboard (USB PORT), UPS

Table 3.2 displayed the hardware and software requirements for Onsite Backup Server. The requirements are almost the same, only it does not recommend a much higher version unlike Server and Client's computer.

Table 3.3 - Hardware and Software Requirements for Offsite Backup System Unit

Operating System	Windows 7 64x Professional	Windows Server 2012 R2
Database	MySQL 5.6	MySQL 5.6
Database Tool and Framework	.NET Framework 4.5 , MySQL Workbench 6.3	.NET Framework 4.6 or higher, MySQL Workbench 6.3
Processor	Intel Core i3	Intel Core i7
Memory	4 GB	8 GB
Disk Drive	1TB HDD	1TB SSD

Peripherals	17Inch Monitor, Mouse and Keyboard (USB PORT), UPS	17Inch Monitor, Mouse and Keyboard (USB PORT), UPS

The hardware and software requirements for the offsite backup system unit are displayed in Table 3.3. The operating system is Windows 7 64x Professional, the database is .NET Framework 4.5, MySQL Workbench 6.3, the processor is Intel Core i3, a 4-gigabyte memory, 1TB HDD for a disk drive, 17Inch monitor, mouse and keyboard (USB PORT), and a UPS.

Table 3.4 - Hardware and Software Requirements for Office System Unit

Operating System	Windows 7 64x Professional	Windows 10 64x Professional
Database	MySQL 5.6	MySQL 5.6
Database Tool and Framework	.NET Framework 4.5	.NET Framework 4.6 or higher
Processor	Intel Core i3	Intel Core i7
Memory	4 GB	8 GB
Disk Drive	1TB HDD	1TB SSD
Peripherals	17Inch Monitor, Mouse and Keyboard (USB PORT), UPS, Printer	21Inch Monitor, Mouse and Keyboard (USB PORT), UPS, Printer

Table 3.4 showed the hardware and software requirements for the Office System unit. To run this, it will need a Windows 7 64x Professional operating system, MySQL 5.6 database, .NET Framework 4.5 Database Tool and Framework, Intel Core i3 processor, 4 GB memory, 1TB HDD disk drive, 17Inch Monitor, Mouse and Keyboard (USB PORT), UPS, and a Printer.

Table 3.5 - Hardware and Software Requirements for POS System Unit

Operating System	Windows 7 64x Professional	Windows 10 64x Professional
Database	MySQL 5.6	MySQL 5.6
Database Tool and Framework	.NET Framework 4.5	.NET Framework 4.6 or higher
Processor	Intel Core i3	Intel Core i7
Memory	4 GB	8 GB
Disk Drive	1TB HDD	1TB SSD

| Peripherals | 17Inch Monitor, Pole Display, Digital Weighing Scale, Mouse and Keyboard (USB PORT), UPS, Receipt Printer, Barcode Scanner | 19Inch Touch Screen Monitor, 15Inch Second Monitor, Pole Display, Digital Weighing Scale, Mouse and Keyboard (USB PORT), UPS, Receipt Printer, Barcode Scanner |

Table 3.5 showed the hardware and software requirements for the POS system unit. All the tables shown are displayed the hardware and software requirements for all servers and system clients. The minimum requirement column listed the least computer hardware and software version required to run the proposed system. The researcher also provided a recommended column to show what are the best hardware and compatible software version needed to achieve the maximum performance of the system.

Project Design

Jones Point on Sale and Inventory Management was developed in such a way that it became very easy even for a person with less technical knowledge to operate it. The software is designed to be user-friendly and does not require a highly skilled individual to operate the system. The proposed system has the features of the basic procedures of the operations that will help each user easily understand the usage of each menu and its modules of it. The use of the proposed POS & Inventory System for the operation is an advantage in most business aspects. Being equipped with the necessary features and user-friendly design makes the proposed system more operationally feasible and beneficial to Triple J Enterprise.
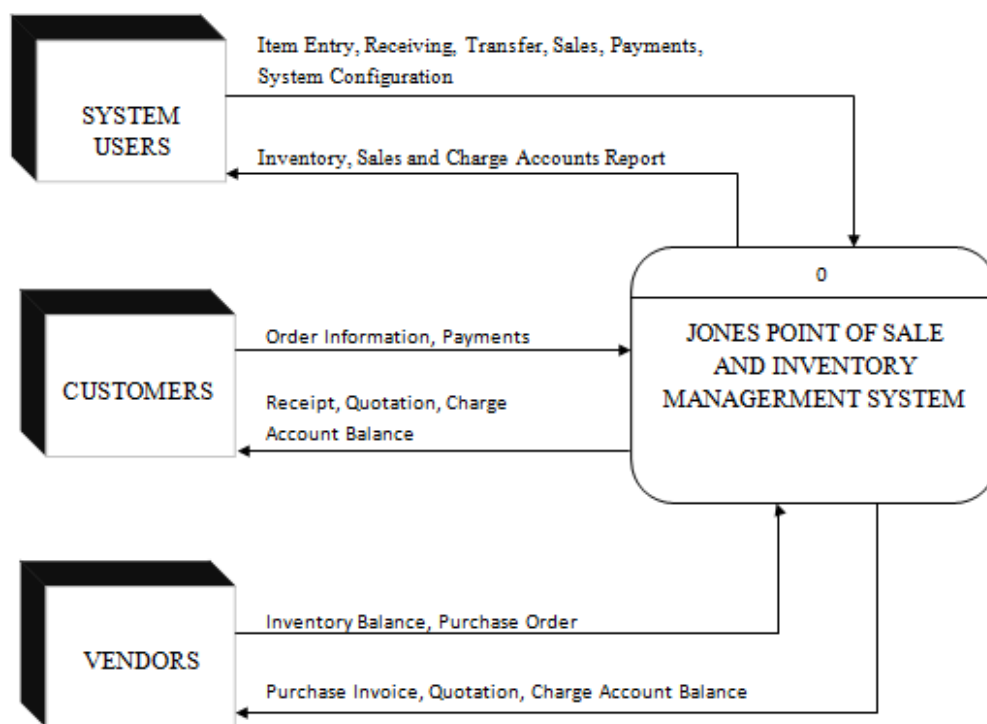
Figure 4.1 Context Flow Diagram Level 0

Figure 4.1 showed the context flow diagram of the developed system. The system users are the Triple J employees that will directly use the system and they are grouped depending on their Job description. The I.T. will be considered the system administrator and has full access to all system modules. He is in charge of giving the user access to a certain system module and performs timely backups for all files related to the system. He is also responsible for monitoring and documenting all system errors that might occur while the system is actively in production. An accountant is a person that accepts and enters charge payments into the system, they are also responsible for generating sales reports and inventory balances. Managers are a group of people that controls the flow of the product inventory; they are in charge of reordering and receiving all products into the system. Cashiers are a group of people that handles and process customers' order. There are also other Triple J employees that are considered ordinary users, these employees are responsible for printing signage and transferring items from the warehouse to retail.

A customer is a person or organization that buys goods and services from Triple J Enterprises. The sales transaction made by the customers will be entered into the system by the cashiers and processed it for cash or charge payments and printed on the receipt. Customers can apply for a charge account in order to have the privilege to purchase items and pay them within a certain period. Triple Enterprises is giving a maximum of 30 days term to each customer that will apply for charge accounts. All customers will fail to pay their duties upon a given period will no longer consider in their future transactions because the system will automatically lock their account if no payments are recorded.

A vendor is a person or Company that receives purchase orders and sells products or services to Triple J Enterprises. The manager in charge of buying goods will use the system to create an electronic purchase order and send it to the Vendors. The company will receive an electronic invoice, quotation, and updated charge account balance after the order was processed.
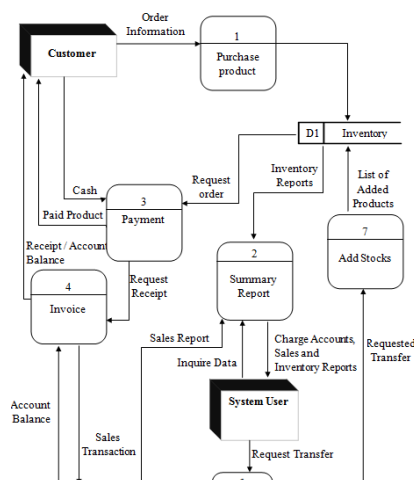
Figure 4.2 Retail Data Flow Diagram Level 1

The customer will get items on the shelves and proceed to the cash register to pay the total purchase. The cashier will input all the items purchased by customers in the system and process the sales transaction. The system will record all purchases and update the accounts, inventory, and sales database then print a receipt for customers. The account and general manager can generate and print the sales report in any given period anytime. On the Other hand, the retail manager will check both the physical and system inventory of the items and request transfer from the warehouse if needed. The transfer clerk will input all requested transfers into the system and process them. The system will update the retail and warehouse inventory database after the transfer is complete.
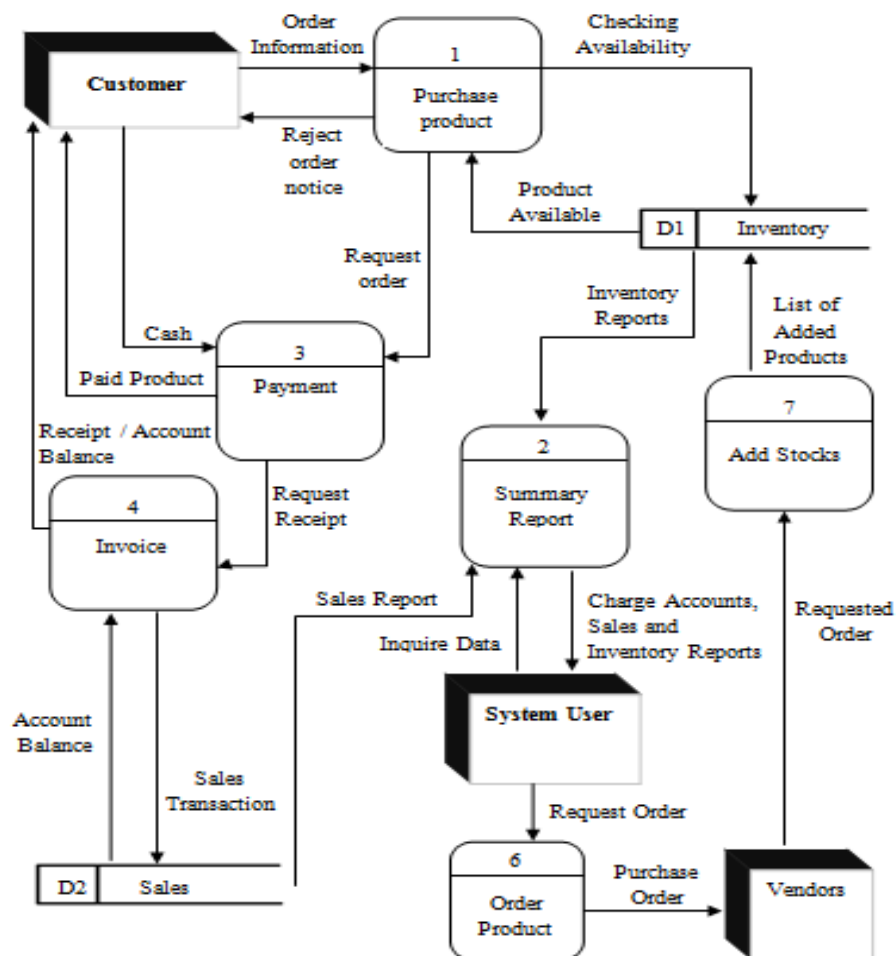
Figure 4.3 Wholesale Data Flow Diagram Level 1

Figure 4.3 showed the data flow of the proposed system for warehouse operation. The customer will give his order information to the cashier; this includes the item description and order quantity. The cashier will check the availability of the requested product in the system and process the sales transaction if the products are available.

The process of generating the warehouse sales and inventory report is the same as in retail. The only noticeable difference is the way the warehouse adds stocks to its inventory. The purchase manager will issue a purchase order to the vendor and receive it in the system once the items arrived and are thoroughly checked in the warehouse.

Project Development

This phase is all about creating the Jones Point of Sale And Inventory Management System, with the Agile Methodology used by the developer. The developed Jones Point of Sale And Inventory Management System with its screenshots shown below:
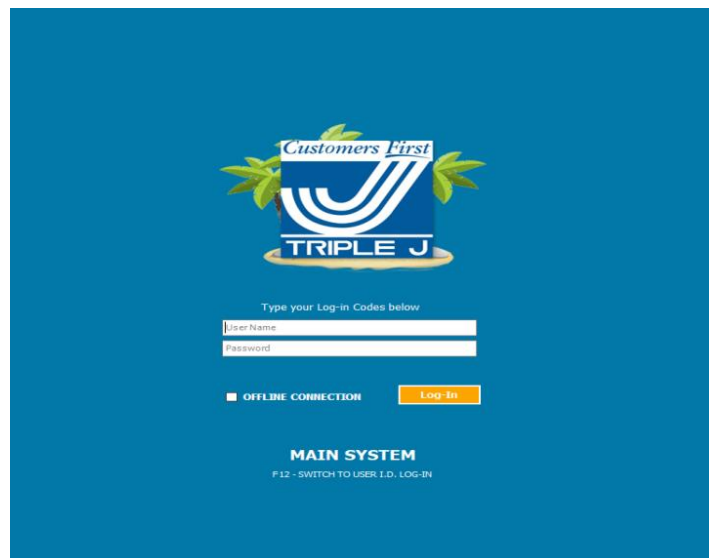
Figure 4.4 Log-in

Figure 4.4 showed the Log-in. It is the main defense of the system from any intruders or unauthorized users. This module requires a correct username and password in order to access the main system.
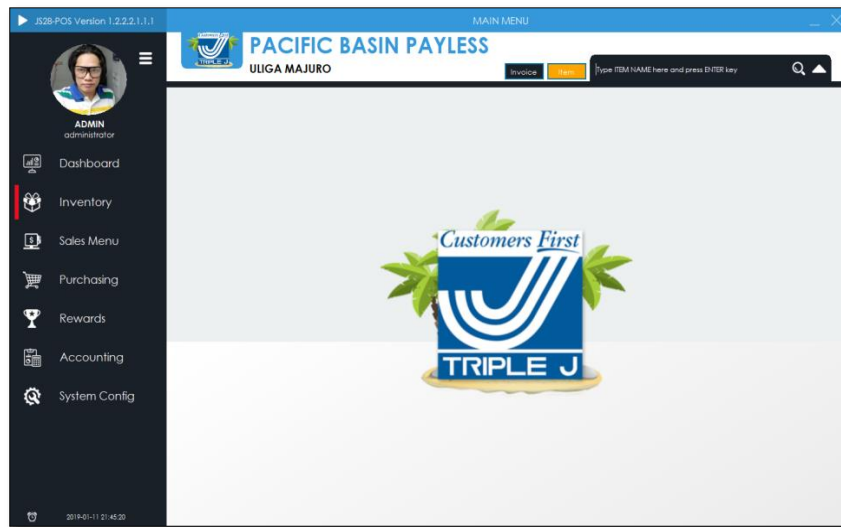
Figure 4.5 Main Menu

Figure 4.5 is the screenshot of the Main Menu. It is the docking point of the user to access all the transactions that the system is capable of. It contains a quick search box and shortcut buttons for fast and easy access to transactions.
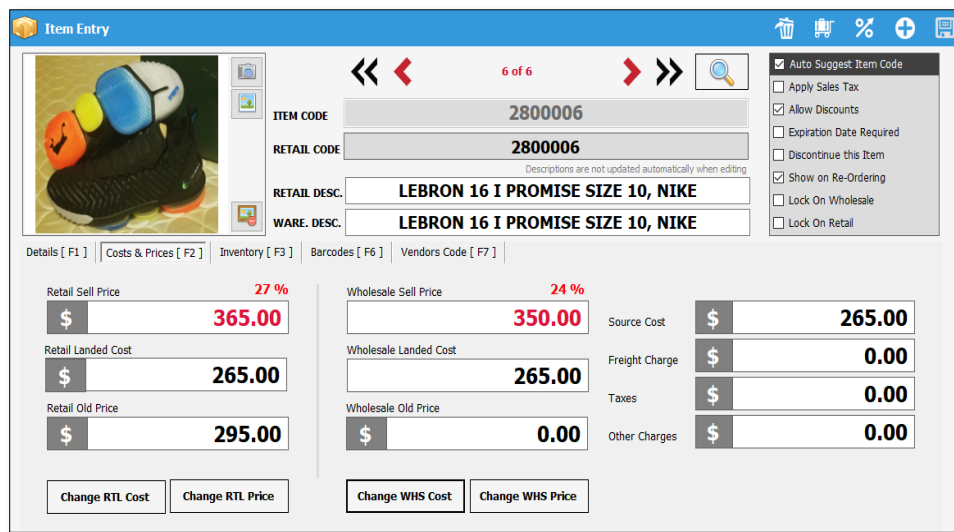
Figure 4.6 Item Entry

Figure 4.6 showed the Item Entry of the development system. It is used for entering and editing products information. It contains picture box with Browse Image Button for browsing image of the product and fields for needed information of products.

	ITEM CODE	DESCRIPTION	ORDER QTY	UNIT CODE	SOURCE COST	EXTENDED COST
▶ 1	2800004	BANNER 3FT X 5FT	2.00	EACH	5.0000	10.00
2	2800003	HAND SANITIZER 12/8 FL	10.00	CASE	0.0000	0.00
3	2800006	LEBRON 16 I PROMISE SIZE 10, NIKE	5.00	EACH	265.0000	1,325.00
4						
5						
6						
7						
8						
9						
10						
11						
12						

Figure 4.7 Purchase Order

Figure 4.7 showed the module for Purchase Order. It is used to create a purchase order for vendors. The purchasing manager has to input all necessary information for all required fields. He also has to fill the list with items needed for reordering. After inputting

all data, he has to save and print the purchase order and give to General Manager for final approval and send it to the vendor.

Figure 4.8 Vendor Entry

Figure 4.8 displayed the Vendor Entry module. This is used to input and store vendor information such as company name, company address, contact number, email, contact person, and terms. It is best to fill all fields as possible for better reference.

Figure 4.9 Receiving Entry

Figure 4.9 showed the Receiving Entry of the developed system. The Receiving Entry module is used to add stocks to warehouse inventory. It also uses for setting up prices for both retail and wholesale. The price of each product can be set up manually by clicking Change Tax and Prices button or through the auto-calculated price by clicking Copy Suggested Prices button or Copy Previous Price button.

Figure 4.10 displayed the Customer Entry module of the developed system. It is used to input and store customer information such as full name, address, contact number, email, terms, and credit limit. It is best to fill all fields as possible for better reference.

Figure 4.10 Customer Entry

Figure 4.11 Sales Order / Quotation

Figure 4.11 showed the Sales Order / Quotation of the developed system. This module is used to create price quotations and sales order transactions. Price quotation is simply creating a listing of customer-requested items at the agreed price but the transaction is not stored in the database. Sales order is almost the same as price quotation; the only difference is the transaction is stored in the database.
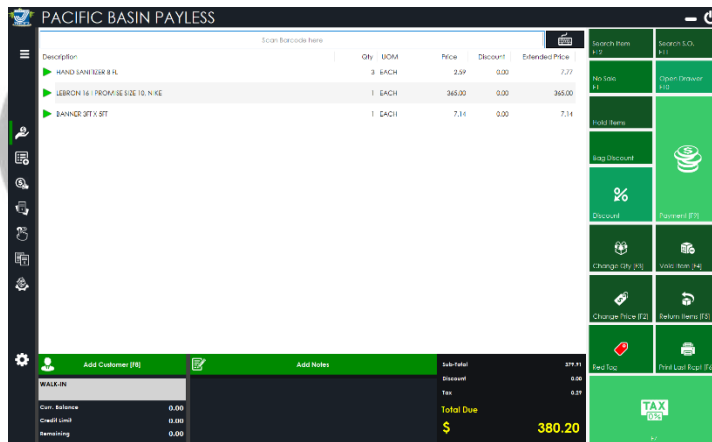

Figure 4.12 Point of Sale

Figure 4.12 displayed the Point of Sale module of the developed system. This is used to process customer purchases. The cashier will input the customer's order by searching for the product or by scanning the product's barcode. After inputting all purchased items, the cashier will accept the payment from the customers and print the receipt.
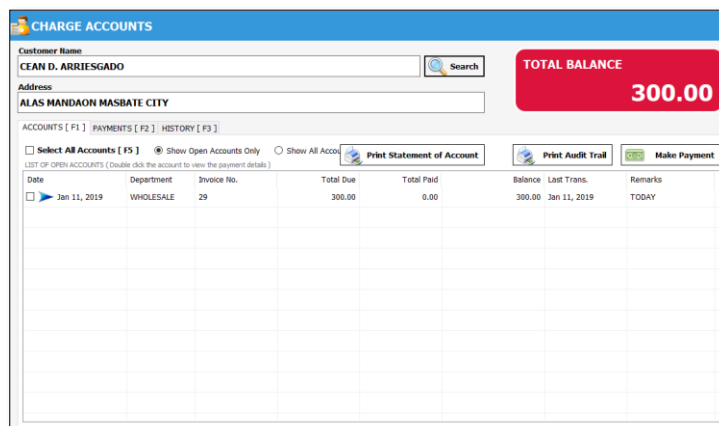
Figure 4.13 Charge Accounts

Figure 4.13 showed the Charge Accounts module of the developed system. This is used to track customer charge transactions and payment history. This module is also used for accepting charge payments and printing audit trails and statements of accounts.

Project Testing

In the fifth month of the development of the system, project testing was the next activity which was made by the researcher.

The researcher used statistical tools to get organized information and had a general view of the whole scenario of the study. This included: Frequency, used for the researcher easily determine the most dominant variable/s in the data, such as the current methods used, problems encountered, and possible solutions. Another statistical tool used is Ranking in order to determine the order of top priority of the variables, the scaling system, and weighted mean which was used by the proponent as a technique to monitor the respondent's interpretation of facts.

Table 3.1 Weighted Mean

Frequency	Description
F1	Total number of respondents who answered "Absence of the expectation"
F2	Total number of respondents who answered "Less than what is expected"
F3	Total number of respondents who answered "Presence of the expectation"
F4	Total number of respondents who answered "More than what is expected"
F5	Total number of respondents who answered "Far more than what is expected"

Table 3.1 depicted the Weighted Mean descriptions of the evaluation activity. The formula used to determine the weighted mean was:

$$\text{Weighted mean} = \frac{F_1(1) + F_2(2) + F_3(3) + F_4(4) + F5(5)}{F_1 + F_2 + F_3 + F_4 + F_5}$$

Where: F1 means the Total number of respondents who answered "Absence of the expectation"; F2 means the total number of respondents who answered "Less than what is expected"; F3 means the total number of respondents who answered "Presence of the expectation", F4 means the total number of respondents who answered "More than what is expected" and F5 means the total number of respondents who answered "Far more than what is expected".

Table 4. 2. The Scaling Systems

Interval Scale	Description	Interpretation
4.1 - 5.0	Highly Applicable	The system efficiently and effectively satisfied all quality model characteristics in terms of functionality, reliability, usability, speed, and maintainability
3.1 - 4.0	Very Applicable	The system efficiently and effectively satisfied some of the quality model characteristics in terms of functionality, reliability, usability, speed, and maintainability.
2.1 - 3.0	Applicable	The system minimally satisfied all quality model characteristics in terms of functionality, reliability, usability, speed, and maintainability.
1.1 - 2.0	Slightly Applicable	The system hardly satisfied the quality model characteristics in terms of functionality, reliability, usability, speed, and maintainability.
1.0 or less	Not Applicable	The system did not meet the quality model characteristics in terms of functionality, reliability, usability, speed, and maintainability.

Table 4.2 showed the numerical rate: (1) not applicable, (2) slightly applicable, (3) applicable, (4) very applicable, (5) highly applicable equals Overall Satisfaction. An interval using a scale was used to show the description and interpretation of the average response in the system. The scale was utilized in order to describe the user satisfaction level of the system.

During the testing, evaluations were done also. The system evaluation was anchored on the ISO 9126. The areas that were evaluated in the developed system were the functionality, reliability, usability, efficiency, maintainability, and portability. Thus, the results were presented in series of tables below.

The sets nine (9) sets of respondents gave insights on the overall quality of the developed system. These respondents were three (3) IT Experts, and two (2) General Managers, four (4) Retail Managers, two Warehouse Managers, two Purchasing Managers, two (2) Inventory Controller, five (5) Stockers and ten (10) Cashiers. The respondents evaluated the system using the five-point scale system reflecting One (1) as the lowest and Five (5) as the highest.

Table 4. 3. Table of Verbal Interpretation

Mean	Verbal Interpretation
0 – 1.0	Absence of the expectation
1.1 - 2.0	Less than what is expected
2.1 – 3.0	Presence of the expectation
3.1 – 4.0	More than what is expected
4.1 – 5.0	Far more than what is expected

Table 4.3 showed the Table of Verbal Interpretations: 0 – 1.0 means the "Absence of the expectation", 1.1 – 2.0 means "Less than what is expected", 2.1 – 3.0 means "Presence of the expectation" 3.1 – 4.0 means "More than what is expected", and 4.1 – 5.0 means "Far more than what is expected".

Table 4. 10. - Overall Evaluation of the Point of Sale and Inventory Management System

Quality Characteristics	Section Mean
Functionality	**4.3824**
Reliability	**4.3211**

Usability	**4.395**
Efficiency	**4.356**
Maintainability	**4.330**
Portability	**4.208**
Overall Mean	4.332

Table 4.10 provides an overall evaluation of the system as reflected by the different respondents consulted by the researcher. The system from the perspective of the respondents turned to be "Far more than what is expected" with an overall mean of 4.5253. The system is considered to be "Highly Applicable" as perceived by the different respondents.

Project Deployment
This phase is the implementation of the project. The objective of this stage is to deliver a completely functioning and well-documented system. The developed system was installed and deployed to the company's server, manager's workstation, and cashier's cash register terminal. Initial training was conducted after installation thus each module will still be subject to reevaluation and testing. The researcher will revise and send patches to the installed system if bugs occurred upon training.

Findings
Based on the analysis of the data presented, the following findings were stated:

1. Triple J Enterprises still uses DOS-based applications in their day-to-day business operation. The current system cannot manage and hold a large number of records which causes the system to freeze and worse crushed. This kind of scenario frustrates the management because it hampers normal business operations. The current system is no longer compatible with the most recent versions of the Windows operating system thus the management decided to upgrade to a more robust and reliable application.
2. Jones Point of Sale and Inventory Management System is designed to provide a more efficient way of storing records. The researcher designed the user graphical interface of it to a more user-friendly as possible so that even a non-technical person can easily understand its flow of it. The developed system provides accurate and reliable

reports that help Triple J Management in their decision making which will result in better sales marketing strategy, better inventory management, and better customer service.

3. The developed system was evaluated in terms of its reliability, functionality, usability, maintainability, efficiency, and portability. It was evaluated by ten 9 respondents namely three (3) IT Experts, two (2) General Managers, three (3) Accountants, four (4) Retail Managers, two (2) Warehouse Managers, two (2) Purchasing Managers, two (2) inventory Controller, (5) Stockers and ten (10) Cashiers.

4. All respondents are satisfied with how the developed system works. This proves that the system is effective and efficient for their everyday task. One notable respondent says that the developed system will be her new "best friend" as it helps her work more easily and it delivers real-time inventory management information.

Conclusions

The conclusions drawn from the findings were the following:

1. The Jones Point of Sales and Inventory Management System is more efficient and reliable compared to the old system that they used.
2. The monitoring of sales and inventory records was way easier.
3. The graphic interface of the system is user-friendly and its flow is easy to learn.
4. The developed system eliminates most of the manual processes.
5. The system has no compatibility issue with most versions of the Windows operating system.

Recommendation

Based on the conclusions, the proponent recommended the following:

1. Triple J Management may utilize the developed system to improve and enhance the method of keeping the inventory records.
2. This study is recommended for implementation since the developed system proves that it will be beneficial to all Triple J employees.
3. Triple J Enterprises should acquire all recommended hardware specifications to get the full capability of the system.