INVESTIGATION OF CLIENT COLLABORATION IN DEVELOPING A SALES AND INVENTORY SYSTEM THROUGH AGILE METHODOLOGY

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ABSTRACT

The researchers discovered that one of the problems that Company XYZ experiences is having no security and accuracy in their data such that their records including transactions and product status are only manually stored in an Excel sheet. With this, the researchers implemented Agile framework. The Agile Framework is intended to promote Client Collaboration to enhance the quality and adaptability of the system to the company's daily routine. The researchers developed a system that keeps track of the sales, transactions, and inventory records of Company XYZ. At the end of every sprint, the researchers visited the company to show the prototype of their system. This was to enable the company to give their insights and suggestions to make the system better. The goal of this system is to reduce the difficulty in analyzing the company's sales and inventory status. This system will allow Company XYZ to maximize efficiency such that the employees will be more productive in their work. Each privilege has its own functionality. These are to add, delete, and update information including the inventory status, sales records, transactions, customer records, and new user accounts, granting privileges, and generating sales reports.

KEYWORDS

Sales, Inventory, Transactions, Agile, Customer Collaboration

INTRODUCTION

Company XYZ is engaged in the marketing, sales, and distribution of critical care products and medical devices. It is currently a small company with a huge potential of becoming a bigger company in the next 5 to 10 years. The company delivers medical products to various channels such as hospitals, drugstores, doctors and patients alike. Moreover, its mission is to provide the best healthcare solutions to varying needs of patients in a timely manner. Thus, its people are committed to ensure accurate, efficient and on-time delivery of products and services that help save lives.

However, the company is currently experiencing a problem in managing their data. There is no security and accuracy in their data such that their records including transactions and product status are only manually stored in an Excel sheet. Therefore, Software Engineering is essential to develop a system that can solve the problems faced by the company.

According to Sommerville [1], Software Engineering is an engineering discipline which that is concerned with all the aspects of software production from the start of the software specification up until the software evolution. Moreover, Software Engineering has two different types of approaches which are called the Plan-driven Process and Agile Process. Both aim to solve the problems with regard to the business process of the company. However, the difference is that Plan-driven process is an approach when all the process activities are planned and the progress is measured based on it, while the Agile process has incremental and continual planning as the system is being developed.

In terms of the software attributes specifically its usability, the software product is easy to learn and use and its appearance is pleasant. Moreover, it is also dependable and secure such that the software works reliably without major issues and has strong security. In this case, the system is doing what it's supposed to do. The software is also efficient in such a way that the software product performs its functions swiftly and efficiently. It processes a minimum amount of time and does not waste any resources [1]. However, there is still room for improvements with regard to its dependability, security and efficiency.

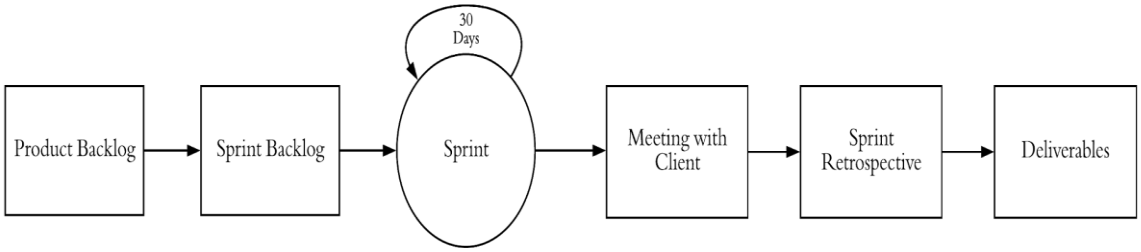

Figure 1. Agile Framework

The Agile Methodology with Scrum framework used in this study is shown in Figure 1. This will from then on be called as Agile Framework. This is to determine whether adopting an Agile Framework can deliver a system that solves their problems and increases client satisfaction. This method consists of 6 Phases: Product Backlog, Sprint Backlog, Sprint, Meeting with Client, Sprint Retrospective and Deliverables. One of the main advantages of using an Agile Framework as an approach in software development is that the outputs from the development process are decided through a process of negotiation during the software development process [1]. In this case, using an Agile Framework reduce overheads in software process and was able to respond quickly to the changes in customer requirements made by the company. As an Agile Framework promotes client collaboration in order to deliver working software that can adapt to changing requirements without excessive rework, a study was conducted to determine the client's response and involvement.

The researchers chose to implement the Agile framework since it is not necessary for them to specify all the requirements all at once. Based on the definition of Somerville [1], in Agile development, program specification, design and implementation are interleaved. It is also essential that the client is involved in version specification and evaluation throughout the software development. Hence, in order to build a strong relationship with the client, the researchers had regular client meetings. Through this, they were able to adapt or negotiate in terms of customer specifications. Moreover, in this kind of approach, frequent delivery of new versions is needed for evaluation and thus, focusing on the actual code is much more essential than having written documentations.

RESEARCH OBJECTIVES

The researchers used collaborative sessions to get a better understanding of their client and develop a system that caters their needs in terms of managing the company's records. To begin with, the main objectives of the researchers were the following:

- To identify the client process issues;
- To discover the effects of Agile Framework on client's motivation of being involved in the development; and
- To propose a system that is customized based on clients' demands.

METHODOLOGY

The researchers used the qualitative approach in gathering information for the problem. According to Statistics Solutions [2], a qualitative research approach seeks to tell the story of the scope's comments and experiences in their own words. Hence, it focuses on narratives rather than numbers. The researchers visited the company several times in order to immerse themselves in their environment to better understand the business process and the causes of the problem. Moreover, interviews were conducted to of all the employees to enhance the understanding of the root cause of the problem. The researchers used their gadgets and journals to take note all of the narratives and comments from the company. On top of that, voice recording was also used to ensure that all of the information will be taken into account.

The researchers made a system for the company implementing the Agile Framework. Their intention for using the Agile Framework was to better manage the progress of the system and also ensure customer collaboration. The developers had 20 working days and 10 days of weekends of Sprint taking approximately 4 weeks to complete a Sprint. The developers held a weekly stand up meeting with the adviser to report on what user stories the developers had done in the past 7 days. After the Sprint, a meeting with the client was held to update the progress of the system. It is during this phase that the developers received feedback and comments on the presented prototype. After this stage, a Sprint retrospective was done to demonstrate with their adviser the current status of the system and to also discuss the challenges and solutions of the researchers.

The benchmark for the researchers to measure their client's interest and involvement in the progress of the system was based on the interviews, evaluation and the client's feedback that are based on the metrics of the university's internship evaluation form. The client evaluated the researchers' progress on the system after each Sprint. The evaluation was based on the Likert Rating Scale with 1 as the lowest and 5 as the highest. The client rated the system based on the system's usability, dependability and security, efficiency, and acceptability. The evaluation also included the general evaluation of the researchers; this was based on the researcher's professionalism, receptive of constructive criticism, competency, resourcefulness, adaptability, responsiveness and ability to communicate with clarity during the Sprint meetings. The evaluation form also had a portion where the client could comment or give feedback to the researchers based on the system. The form was enclosed in a sealed envelope and only the mean scores from the three Sprints were shared with the researchers.

RESULTS AND DISCUSSION

The researchers gathered all of the comments during the interview and analyzed them. These comments help determine the problem of the company. Moreover, the comments and suggestions of the company helped the researchers determine what system the company needs. Listed in the table below are some of the issues and comments that the client mentioned during the interview:

Table 1. Content Analysis

INVENTORY MANAGEMENT ISSUES	
There were inconsistencies found in the inventory records.	● The company has a difficult time tracking the stocks of the products in the inventory as they did not use product codes. ● The company has to update the inventory records from time to time.
The product status was not up to date.	● The client had to manually recount the stocks to check if there are still enough stocks.
SALES MANAGEMENT ISSUES	
The sales records were not accurate.	● Since the company is manually encoding the data, there were data redundancies. ● There were two copies that they have to update. One copy is for the General Manager, and the other one is for the Sales and Operations Director. If one copy is not updated, there will be confusions between the two records.
Sales and Inventory Records are not affected once a transaction is done.	● The client has to manually update the sales and inventory record if there is a transaction. ● Some information are not consistent such as the prices.
SECURITY ISSUES	
The records of the company were not secured.	● There was no proper security with regard to accessing the confidential data in the company as they did not have a system that would be accessed by the authorized users.

Based on Table 1, the major concern of the company was managing their sales and inventory. One of the problems that Company XYZ experienced was having inconsistencies and outdated information in their inventory records. Having inaccurate sales and transactions records are also a problem. With this being said, the root cause of these issues is the fact that all their data is manually encoded in different locations. Hence, the employees always have to communicate in order for them to align the data they have. Aside from this, there is no security and accuracy in their data such that their records including transactions and sales can be accessible through Microsoft Excel. In this case, the goal of the system is to record the information of the company accurately in such a way that all the data stored is updated and consistent.

In each sprint, the developers showed prototypes of their system to the company to receive feedback and suggestions to improve the system and fit the business process of the company. The tables below are the rephrased requests and comments of the company for better understanding:

In Sprint 1, the company was pleased to see the progress of their system. There were only few comments with regard to its functionalities. Most of them were the feedback in the User Interface. They also wanted the developers to use their actual data for them to better appreciate the system. Lastly, they gave comments about the sales and transactions of the system because it is the most crucial part of the business process.

Table 2. Client Requests: Sprint 1

Client Response and Comments for Sprint 1
Comments about User Interface
1. The company was pleased with the color of the User Interface. However, they wish to change the pictures of medical tablets to vials. 2. The company wanted to include actual data of the company in the database in order to simulate real business processes
Comments about the Sales and Transaction portion
1. The company changed the mode of payments into Cash on Delivery and Credit Card Payment. 2. The company specified two types of processes which are delivery processed transactions and pickup processed transaction
Comments about User Access
1. The company wanted salesperson to only view sales records

Table 3. Client Requests: Sprint 2

Client Response and Comments for Sprint 2
Comments about User Interface
1. The company changed some of terminologies of the system. 2. The company added more data in the different pages of the system. 3. The company removed the TIN Number in the principals table and profile picture in user profile.
Comments about User Access
1. The company changed to permissions of every employee. They specified 5 types of Privileges.

Table 3 shows the comments and requests of the company during the second Sprint: The company requested to have different privileges that fit for each employee in the company. This is to make sure that the integrity and security of data of the company will not be compromised. The company showed more interest and collaboration since the system is almost close to completion, giving them more possible ways to make the software better.

The table 4 shows the comments and requests of the company during the third Sprint. The developers were able to finish and show all of the functionalities of the system for the company. The client was pleased that the system only needed polishing and refactoring. Their main concern for the system during the third Sprint was the permissions of all the users. It was still unclear and would need more improvement

Table 4. Client Requests: Sprint 3

Client Response and Comments for Sprint 3
Comments about User Interface
1. The company wanted CSS for the whole system to be fixed
Comments about User Access
1. The company said that the employees cannot edit their profile except their password. 2. The company was confused with the permissions of every employee and wanted to fix permission for all.

Based on the analysis above, the client was concerned more about the accessibility of the users of the system. They specified what functionalities each user can access so the security and integrity of the data are not affected. Another concern they had is the design of the system itself. The wanted to incorporate the terminologies they use so that it wouldn't be hard for them to adjust. Lastly, the company gave possible functionalities that the system may have. According to Somerville [1], customer feedback and collaboration better suits the outcome of the system for the use of the client. Moreover, it shows that the company is very interested in using the system.

The Figure 2 shows the software context diagram which shows who are the actors that have the privilege to access the system:

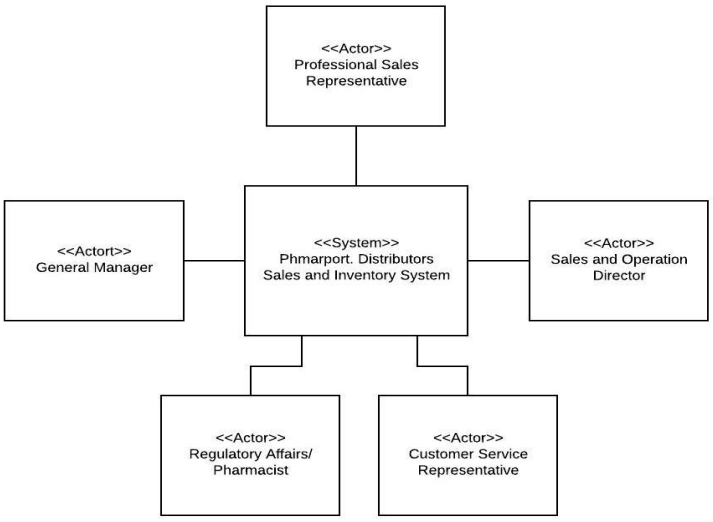

Figure 2. Software Context Diagram

The class diagram below is the structure of the system that the developers built for Company XYZ:

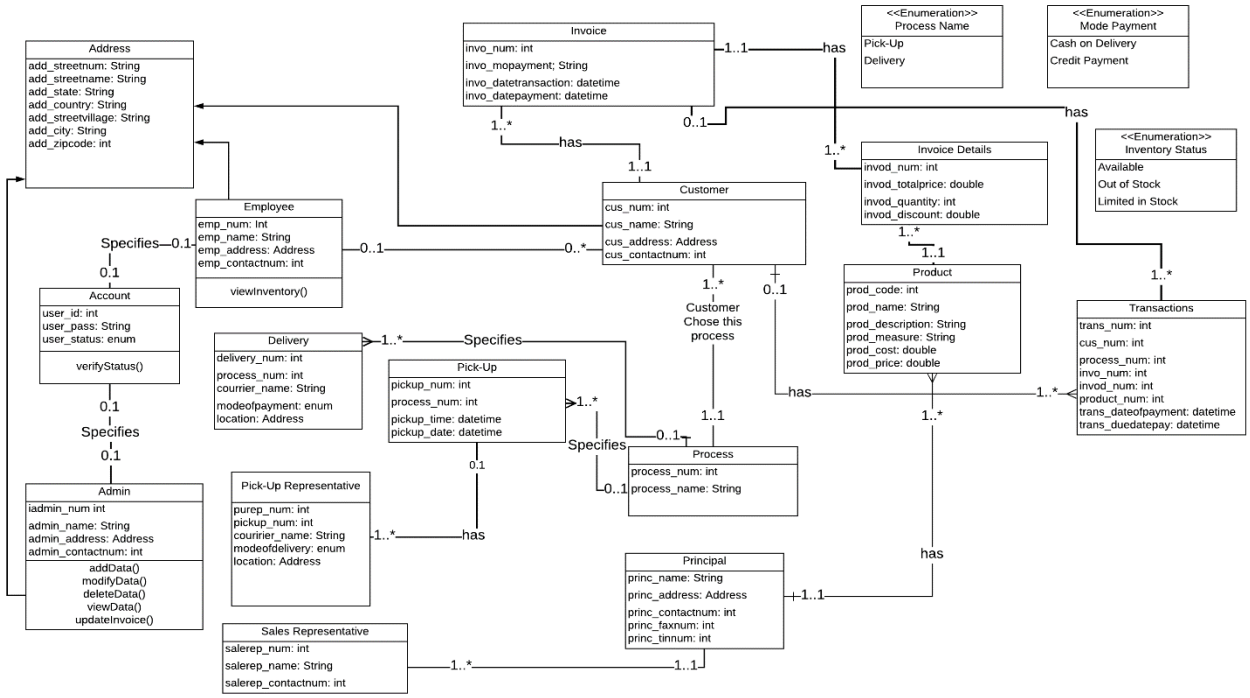

Figure 3. Class Diagram

The sequence diagrams below show the sequence of use when a user wants to generate a sales report.

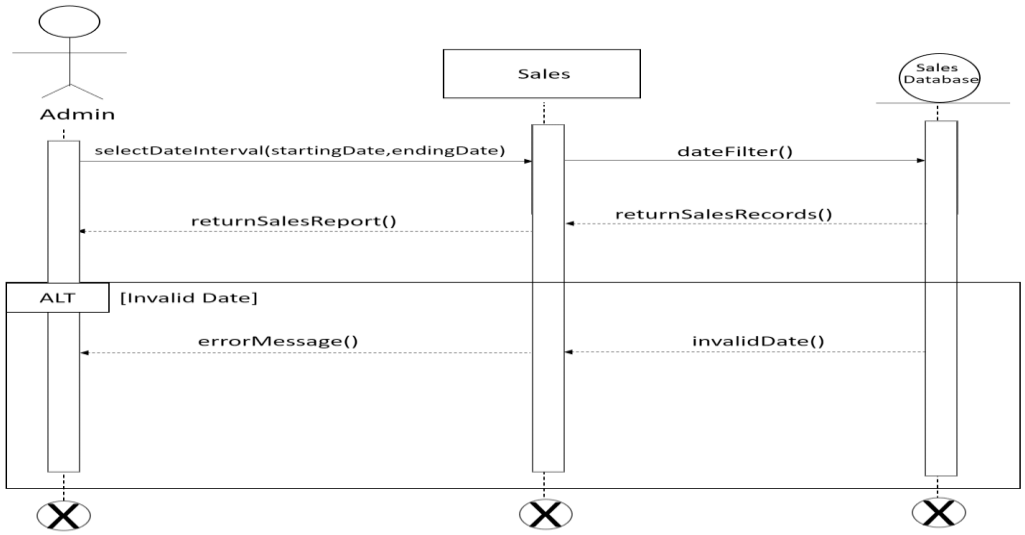

Figure 4. Generate a Sales Report

The user inputs the date intervals, meaning the starting and ending date of what they desire. The system processes the given information to be able to retrieve the data in the database. The system then processes the information into something the user will be able to read. When the user enters invalid dates, the system will notify that the selected dates are wrong and will return an error statement.

The sequence diagrams below show the sequence of use when a user wants to generate an inventory status:

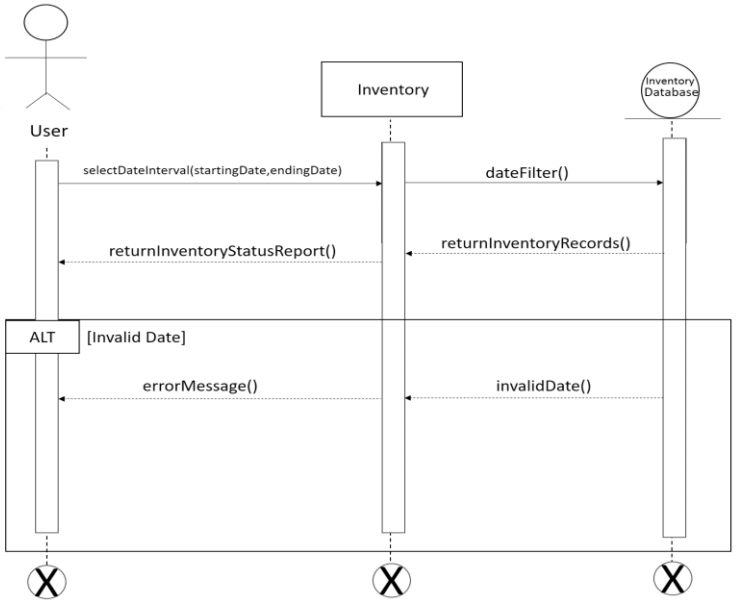

Figure 5. Generate an Inventory status

The user inputs the date intervals meaning the starting and ending date of what they desire. The system processes the given information to be able to retrieve the data in the database. The system will then process the information into something the user will be able to read. Moreover, the system will be summing up all the products that the

company has in stock and will be highlighting products that are low in inventory. When the user enters invalid dates, the system will notify that the selected dates are wrong and will return an error statement.

Table 5 shows the evaluation of the client towards the system. This is to show how effective the system is for the use of the company.

Table 5. Customer Evaluation of the System

EVALUATION OF THE SYSTEM	
Criteria	**Mean Score**
USABILITY	
The system is easy to learn and use	5
The system's appearance is pleasant	5
DEPENDABILITY AND SECURITY	
The system works reliably without major issues	4.33
The client is confident that the system is secure	4.33
EFFICIENCY	
The system performs its functions swiftly and efficiently	4.33
ACCEPTABILITY	
Presented functionality is complete and according to the clients request	4.33
The system has all the features that the client needs	4.33
The client is convinced that the system can be deployed in the company	5

Table 6 shows the evaluation of the client towards the researchers. This is to show the professionalism of the developers towards the company.

Table 6. Customer Evaluation of the Researchers

EVALUATION OF RESEARCHERS	
Criteria	**Mean Score**
Professionalism of the researchers	5
Receptiveness of constructive criticism and feedback	5
Competency	5
Resourcefulness	5
Adaptability	5
Clear communication	5

The developers were able to improve and create a better prototype throughout the Sprints. They were able to incorporate the feedback and changes received from the client during the following Sprints. At the end of the third Sprint, the client was convinced that the system can be deployed in the company and was pleased as the system's functionalities were complete according to her requests. According to the client, the system was easy to use and also appeared to be pleasant. The developers received positive feedback such as being open to suggestions and possibilities that inspires the client to work with the developers seriously on the system. In order to enhance the developers' progress on the development of the system, the client was asked to assess the workmanship and progress of the system by evaluating the developers after meetings

Through Agile, they were able to feel the pulse of their clients. By having regular meetings, the motivation of clients being involved in the development also increases. This can be measured through their positive verbal and written feedbacks and good scores at the end of every Sprint. Moreover, Agile process is the best approach to use in developing this kind of system. Based on the analysis above, it is evident that the client gives their requests during the evaluation. The researcher and client would often have negotiations in terms of user specifications. In this case, Agile framework is necessary for the researchers to have regular client collaboration in the system development.

The figures below show the User Interface of the system developed for company XYZ:

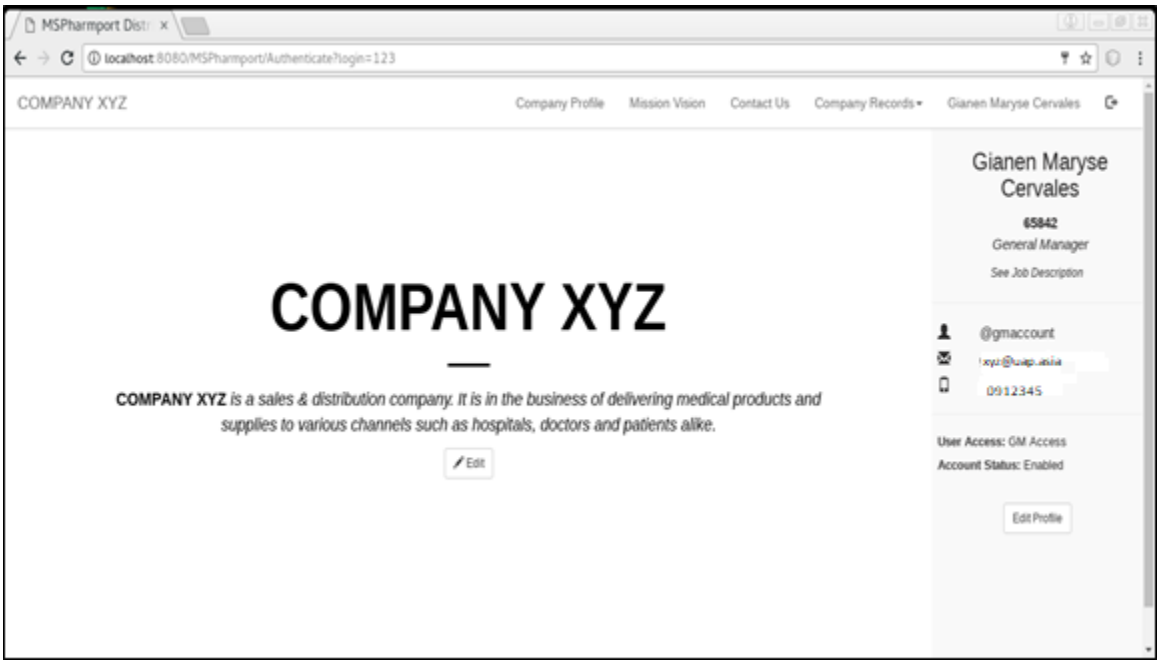

Figure 6. Home page for the system

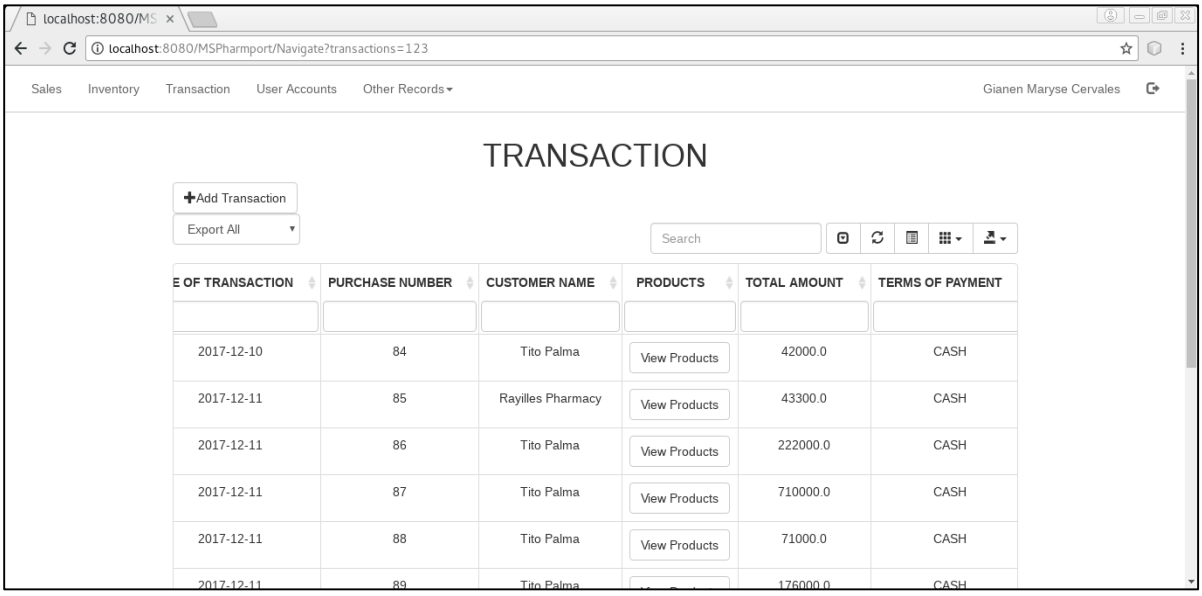

Figure 7. Transactions in the system

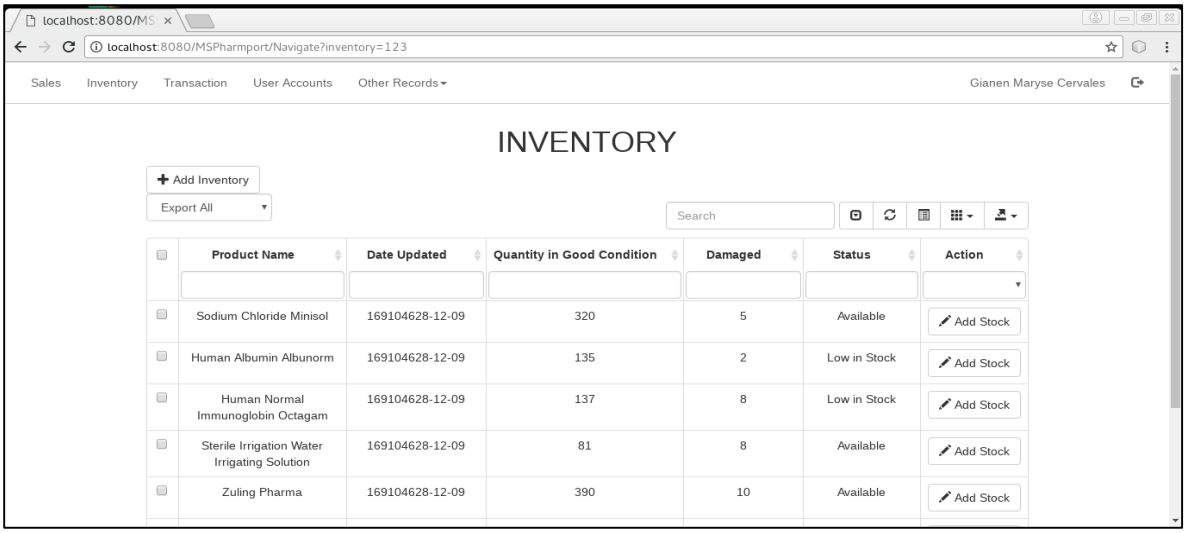

Figure 8. Inventory in the system

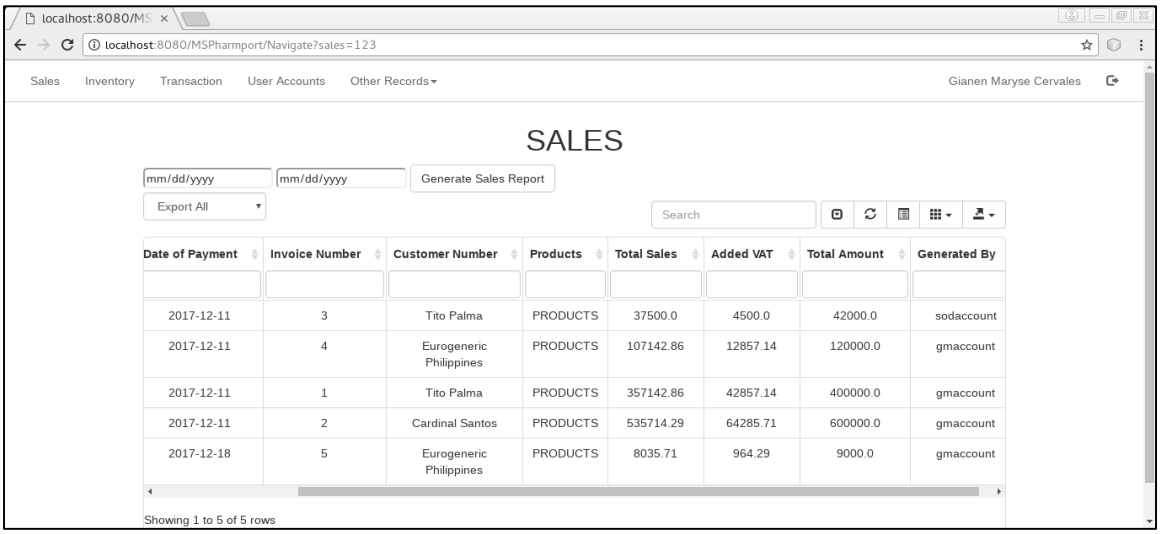

Figure 9. Sales in the system

CONCLUSION

In conclusion, Software Engineering method and techniques are necessary in software development. This engineering discipline enabled the developers to produce a working system efficiently and productively. Moreover, the researchers were able to identify the client process issues due to the mismanagement of the sales and inventory data of the company. This leads to inefficiency, inconsistency and inaccuracy. With this, the researchers were able to propose a sales and inventory system for Company XYZ. This idea was accepted by the client after discussing the proposal. In this case, the researchers decided to build a system for the company using the Agile Framework. This is to ensure that the client's specifications are met and that working software is able to respond to changing requirements without excessive rework.

Furthermore, throughout the development process, the researchers worked closely with their client. They were able to receive positive feedback from their client at the end of each Sprint. The mean scores of the three sprints serve as validation that their client was satisfied with the overall functionalities and appearance of the system. The researchers were able to improve and create a better prototype after discussing and receiving feedbacks from their client. Moreover, by involving their client throughout the system progress, and with the help of weekly scrum meetings, the researchers, through the Agile implementation, were able to deliver a Sales and Inventory System that solves client problems through the evaluation and collaboration, we conclude that the client was satisfied with the system deliverables.

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