A PROBLEM ORIENTED APPROACH TO IMPLEMENTING AN INVENTORY AND POINT-OF-SALE SYSTEM FOR COMPANY KCP

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ABSTRACT

In an observation concerning a school cafeteria operation, we discovered that the cafeteria was prone to human errors due to the inefficient Point-of-Sale system, lack of a refund feature in the system, lack of proper and informative inventory system, and the unfriendly main user interface for transactions. These main problems led to the occurrence of more problems like slow transaction time, product shortage, product overstocking leading to product spoilage, the loss of data integrity, data redundancy, and the occurrence of inaccurate information due to manual transactions to record the refunded items, and an overall inefficient and ineffective system. This paper proposes a software design for an automated point-of-sale and inventory management system that aims to reduce the amount of data redundancy and the loss of data integrity within the system in order to attain a better business process. The development of a prototype that encompasses solutions to solve the aforementioned problems was used to validate the design and initial results showed that the client supports the relevance of the design.

KEYWORDS - Point-of-Sale, Inventory Management, Inbound Logistics, Outbound Logistics, Stock Keeping Unit (S.K.U), Agile, Transactions

INTRODUCTION

Company KCP runs a school cafeteria that experiences problems in their day-to-day business operations. The inefficient Point-of-Sale system that lacks of a refund feature in the system and a proper and informative inventory system, and the tedious main user interface of the system for transactions. These problems led to the occurrence of more problems like slow transaction time, product shortage, product overstocking leading to product spoilage, and the loss of data integrity due to manual transactions to record the refunded items. After several investigations and interviews, a point-of-sale and inventory management system prototype was proposed and developed in order to validate the design and solve the problems that occurred within the cafeteria. The prototype aimed to address the aforementioned problems encountered by the client with their current system inside the cafeteria. The new automated system will enable the client to manage new and existing users as well as record, monitor, and track inbound and outbound transactions happening in the cafeteria. Additionally, the system will show a list of products below its threshold every login so as to prevent product shortage and product overstock. Through the improved reports generator, the company will be able to maintain integrity in their data and efficiently reduce the time spent in double checking the inventory records per day. After several meetings with the client, the prototype was presented and

evaluated. The client was pleased with the current stand of the system and is able to see the purpose of the system. Further, the needs of the client are met and the problems previously encountered are addressed.

LITERATURE REVIEW

Inventory System

An inventory is a stock of items kept by an organization to meet internal or external customer demand and is considered to be the final product holding up to be sold to a client [2]. According to [3], an inventory system is a software-based business solution used to simultaneously track activity and inventory. Manufacturers and trade resellers can both benefit from a thorough solution, where single transaction entry records necessary details on the customer, products purchased, price and date while also updating the inventory. Using a computerized inventory system enables the user to have an accurate product management and encourages the ease of interaction between employees and shoppers as transactions are processed and items move from the business to the consumer. Lastly, inventory systems save time for businesses by speeding up transactions while raising accurate data which allows for confidence in accountability among employees as it is easy to verify how much money was earned and what time did the transaction took place.

Point-of-Sale System

According to [1], a point-of-sale system conducts payment transactions which include a card reader, for payment cards and a cash drawer. It has two payment methods: Credit and Cash. If the customer pays by credit, the personnel enters the amount and the customer will swipe the credit card in the reader. However, if the customer pays by cash, the cashier will receive and deposit the cash into the cash drawer and prints a receipt with a detailed transaction.

Agile Methodology

The agile methods are iterative development methods in which are done in increments and involve the client during the development to receive instant feedback. The method includes a Scrum approach which focuses on managing iterative development. The Scrum approach has a fundamental feature called the sprint cycles which is a planning system where the tasks and the features are evaluated and selected for development. Then, the completed feature is presented to the client at the end of the sprint [5].

Good Software Attributes

The essential attributes of good software are **(1)** ***maintainability***: software must evolve to meet changing needs, **(2)** ***dependability & security***: software must be trustworthy, **(3)** ***efficiency***: software should not make wasteful use of system resources, and **(4)** ***acceptability***: software must be understood and accepted by the users. These attributes should deliver the required functionality and performance to the user and should be *maintainable*, *dependable* and *acceptable* [5].

METHODOLOGY

The paper adopts a problem-oriented research method wherein, according to [4], the objective is to define the problem and formulate a solution that would solve the client's predicaments. The methods used in the process of solving the problem is a combination of research and qualitative approach. The research portion allowed us to view other existing systems with similar difficulties to allow us to formulate an idea on how to tackle the problems.

We used the qualitative approach in collecting data for the client's predicaments. Hence, the methods to gather the data will further focus on the client's anecdotes rather than their numerical data. The initial data gathering phase entails Interviews and Observations. Interviews with stakeholders were done to enhance our knowledge of the root cause of the problem. Observations require onsite visitations to fully understand the business process and the effect of the problem to their business process. Comments and anecdotes were transcribed by journals and analyzed to identify the focus of the proposed system.

After identifying the data, we then created a prototype system for the company by utilizing the Agile Methodology with Scrum. This methodology was a necessary and logical approach for solving the client's problems because it permitted the involvement of the client in the development of the system. Thus, the development of a prototype of the system is essential and required to prove that the design works for the client given the necessary software requirements specifications. After every sprint, a meeting with the client was held to present the updates and changes to the system. We then receive feedback and comments from the client on the presented prototype. The client evaluated our progress on the system after every sprint. The evaluation was done using a survey to evaluate the system based on the good software attributes namely usability, dependability & security, efficiency, and acceptability. Each of the criteria was rated using the Likert Rating Scale, with 1 being the lowest score and 5 being the highest score and then using the mean score to determine the overall score. If the score is 3 and above, then the proposed prototype is acceptable for the client's needs.

RESULTS

Table 1.0 presents the observations that were made during the company visit and the problems that were discovered and how we decided to solve them.

Table 1.0 Business Environment Observations, Problems and Resolutions

Business Environment and Processes	Observations	Problems	Resolutions
1. Unknowing Staff	Slow with fulfilling customer orders	1. Manual Sales and Refund Transaction Recording	Automated transaction recording
2. Manual Sale Transaction Recording	Took a long time to calculate and tally their weekly sales	1. Unreliable Inventory Control	Batch processing
3. Manual Inventory Listing	Time consuming tallying the inventory	Long hours of calculating the business sales	Newly functional reports

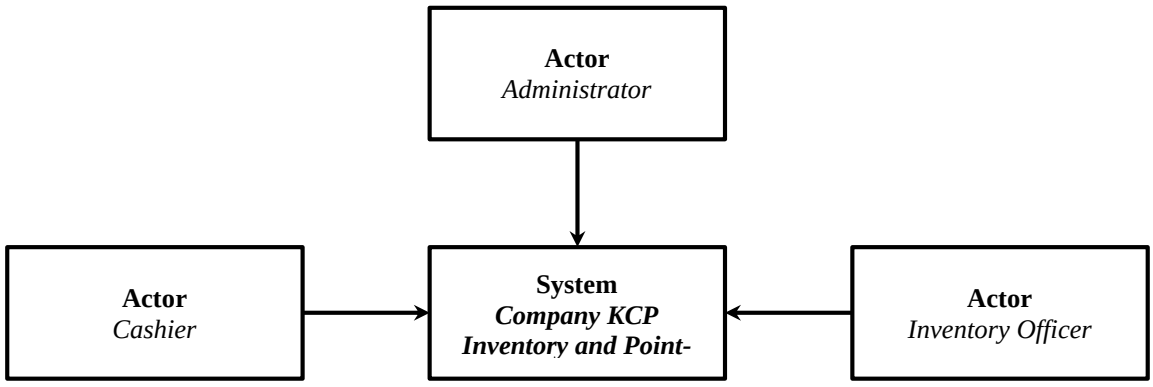

Figure 1. Software Context of Company KCP

Figure 1 shows the primary actors that are able to interact with the system in the client's company. Included are the Inventory Officer, Cashier, and Administrator and each has different restrictions respective to their roles. In this way, we would be able to develop a better functionality for each user of the designed prototype.

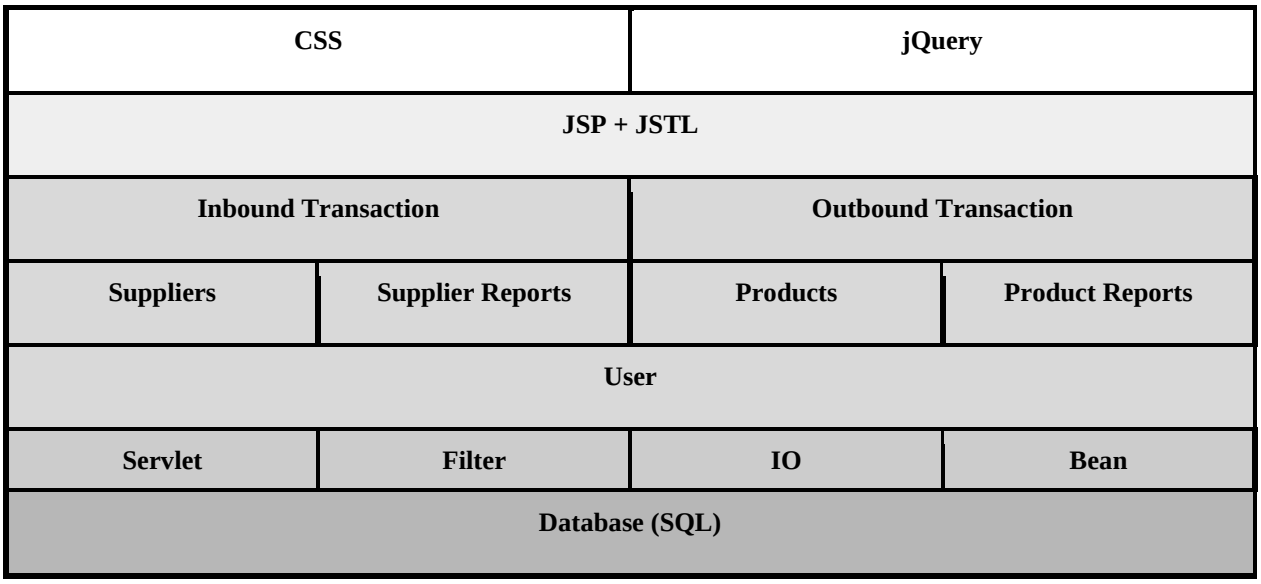

Figure 2. Layered Architecture Diagram for the prototype

Figure 2 displays the layered architecture diagram for Company KCP that served as a basis for the design of the prototype. While on the Table 2.0 shows the client's requested modifications and additional functions on the system every after sprint evaluation.

Table 2.0 Client Requests

Sprint #	Additions and Modifications	
1	Redirect Button	
2	Change Status Type	Add Date Range
	Add User Type	Expense and Income Report
	Add Email Address	Visible CSS
	Generate Grocery List	
3	Add Month and Year filter	Free Meals Expense Report

Table 3.0 presents the client's overall evaluation of the system.

Table 3.0 Customer Evaluation of the System

USABILITY		**EFFICIENCY**	
Easy to learn and use	**5**	The system performs its functions swiftly and efficiently	**4.33**
Appearance is pleasant	**4.33**		
DEPENDABILITY & SECURITY		**ACCEPTABILITY**	
The system works reliably without major issues	**4**	Presented functionality is complete and according to the client's request	**5**
The client is confident that the system is secure	**4**	The system has all the features that the client needs	**5**
		The client is convinced that the system can be deployed in the company	**4.33**

DISCUSSION

We gathered all of the client's comments and suggestions during the evaluation and created solutions that would cater the problems such as the manual sales and refund transaction recording, an unreliable inventory control, and long hours of calculating the business sales. The interviews and meetings helped us and the client identify the root cause of the issues occurring in the cafeteria. In addition to that, this allowed us to create and design a suitable prototype for the problems that were addressed in table 1.0. In Figure 2, we designed an architectural diagram where each of the layers in the architectural diagram has a specific role and responsibility for the P.O.S. and Inventory functionality that is needed to satisfy the client's requests.

In each sprint, we had to demonstrate to the client company the work that we have done so far in the form of prototypes. Table 2 presents the feedback that the client provided. Based on the feedback there were changes on the usability of the prototype in terms of accessibility, features added such as new user data fields to fix the unreliable inventory management, and a functional reports generator to solve the long hours of calculating business sales.
Upon evaluation of the client, we scored 5 and 4.33 on the usability of our system for its interface and its appearance, respectively, which reflects that our system is easy to learn and easy to navigate. Dependability and security scored 4 which signifies that the client is confident in the security of the system. The client gave the system's efficiency a score of 4.33 to say that system performs its functions swiftly and efficiently. Finally, acceptability score is 5 to prove that the client sees the purpose of the system and the needs of the client are met.

CONCLUSION AND RECOMMENDATIONS

We were able to identify several issues of the company by conducting interviews with the head director and cafeteria manager of the company and by firsthand observation in their business environment. These problems arose due to the company's old POS system which caused multiple functionality errors. The company often experienced mismatched data in their inventory which led to slow updates of inventory records. By using the Agile Methodology, we were able to adjust to the client's demands. Hence, the client evaluation showed the effectiveness of the prototype on their process.

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