Information Engineering

DESIGNING WAREHOUSE MANAGEMENT SYSTEM IN PATRA VARIASI YOGYAKARTA

A THESIS

Submitted in Partial Fulfillment of the Requirement for the Degree of Bachelor of Engineering in Industrial Engineering

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IDENTIFICATION PAGE

A THESIS ON

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DECLARATION OF ORIGINALITY OF RESEARCH

I certify that the research entitled "Designing Warehouse Management System in Patra Variasi Yogyakarta" in this thesis has not already been submitted for any other degree.

I certify that to the best of my knowledge and belief, this thesis which I wrote does not contain the works of parts of the works of other people, except those cited in the quotations and bibliography, as a scientific paper should.

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ABSTRACT

Item management in warehouse is very important. If the goods in a warehouse are not managed properly, a company may suffer losses because the company does not have accurate data about the goods in the warehouse. This research was conducted to assess and improve the activity of managing the inventory in the warehouse of Patra Variasi Yogyakarta. Because of the absence of the inventory management system, Patra Variasi Yogyakarta had inaccurate data about the quantity of the items in the warehouse. The staff is usually having to search through the warehouse racks in order to confirm to a customer that the item is available in the warehouse. Sometimes the customer is waiting too long because the staff is searching the items and cannot find the items. Another possibility is the item is sold out, but the staff is still searching for the item for a long time. This problem creates a lost opportunity for Patra Variasi Yogyakarta to gain profit and decreasing customer satisfaction as well.

In this research, information system intends to manage the items inside the warehouse is developed. The information system can present the information of the items inside the warehouse, record the users, suppliers, items, and transaction of goods that enter and exit the warehouse. The user can also see the history of past transactions. This information system is developed using Microsoft Access Database, Visual Basic language, and SQL programming. The testing and implementation phase is also conducted by inputting the items and both exit and enter transaction data.

In conclusion, the information system has no errors when it is implemented in Patra Variasi Yogyakarta. It can store and present the information of the items, supplier, enter a transaction, exit transaction, and the user data.

Keywords: Warehouse, Information system, Items, Transaction, Database, Microsoft Access Database, Visual Basic, SQL.

CHAPTER 1
INTRODUCTION

1.1. Background

Inventory of sold items in a warehouse is a critical part of a business. Inventory is defined as a list of information about the number of goods that are owned by a business, most of the time the goods are to be sold to their customers. If a business keeps inaccurate list of the goods that that will be sold to their customers, many things would happen such as not finding the goods, the customer waits for too long, and the workers can be confused. These things, if happens, will create a loss for the business, therefore decreasing the profit that will be gained by the business.

Patra Variasi Yogyakarta is a car accessories retailer that was founded in 1992 by Mr. Leo Patra. The products it sells are car alarms, head units, window films, speakers, spoilers, lamps, and many more. Patra Variasi Yogyakarta also offer services to install the goods to the customer's car. Patra Variasi is located in Magelang street, Km. 7.9, no. 12, Sendangadi, Mlati, Sleman.

Since Patra Variasi was founded, the company has no well-managed warehouse management system yet. The owner of the company also only reorders the goods from the supplier based on intuition. In the warehouse, their records on stored inventories are unorganized, so frequently an order picking requires a long time and the customer will leave because they are waiting for too long. In another case, there are also goods that are actually still in stock and available to sell. However, because the worker is confused and cannot find the desired item in the warehouse, then the worker said she did not find it and the customer leaves the shop.

In a long term, the situation can create dead stocks that will pile up in the warehouse and because the dead stock will also depreciate as time goes on, it will generate loss to the company. The situation can also create trust issues for the customers for a long waiting time.

Based on the dialogue with the owner of the company, it is very important to create a new system that is listing the available inventory so the case mentioned above can be prevented, so that the company will be able to minimize the loss caused by the inventory problems.

1.2. Problem Formulation

Based on the background, the problems that can be formulated in this research are:

a. How to make a warehouse management system that can record and list the quantity of the items in the inventory?
b. How to make a system that presents the data of the items in real-time?
c. How to implement the system to the existing business process?

1.3. Objective

The objective of the research is to:

a. Evaluate the current business process and develop an information system conformed to the evaluation in the form of a database that can store the information about the items in the inventory.
b. Develop the information system to record the transaction of the items.
c. Do the testing and evaluation of the information system to record the items and the transactions of the items in the warehouse.

1.4. Scope and Limitations

The scope and limitations of this research are described as follows:

a. The research is conducted at the warehouse of Patra Variasi Yogyakarta, which is located in Jl. Magelang, Km. 7.9, no. 12, Sendangadi, Mlati, Sleman.
b. The research is conducted from March until June 2020.
c. The research only focuses on the recording of transaction data and how to display the data to the users.
d. The location of items is unknown, because the company did not yet establish the name for each locations of the items.

CHAPTER2
LITERATURE REVIEW AND THEORETICAL BACKGROUND

2.1. Literature Review

This subchapter contains a review of the research that occurs in the past and present.

2.1.1. Previous Research

Some researchers have already researched the information system and inventory. Hermawan et al. (2016) conducted research and development about the information system of the inventory system at the Cahaya Baru Semarang shop. The problem that was faced by the shop is that the shop has not yet implemented the inventory system. The owner only checks if the bought spare parts from the distributors are matched the desired quantities or not manually. To check the real data of the inventory the shop has to be closed so there will be a loss of opportunity to the shop. Consequently, there are frequently failed transactions due to the item is unavailable. The purpose of this research is to develop an information system for the inventory so the real-time data can be maintained. The method that was used in the research is the waterfall method, and the programming language is Microsoft Visual Studio .NET 2005.

Saputra et al. (2012) conducted research and development of inventory system applications in the Maman Jaya car repair shop. The problem that was faced by the shop is that the shop is still using the manual method when checking their inventory. This manual activity has low efficiency if compared to checking the inventory using the application, furthermore, the list of the inventory is still in the form of a physical file that can easily get damaged and no backup. The effect of this problem is that the worker lacks efficiency when checking the inventory. The purpose of this research is to develop the application for the inventory so that the efficiency of the worker can increase, and the file is safe because there can be always backup for the file. The method that is used in this research is the Waterfall method, While the app design is using the SDLC method with PHP, MySQL, and also Javascript.

Utami (2018) researched the web-based inventory information system in PT. Tissan Nugraha which is a company that is in the cosmetic industry sector. The problem that is occurred inside the company is that the company still uses the manual recording of the inventory using an inventory report book. The processing

of the inventory data is also done by manually typing the data from the book into Microsoft Excel, which in turn makes the company slow to access the inventory data and also affects the production time because of the high demand and high variety of the product. The research aims to develop the information system of the inventory so the company can access the inventory data quickly and the transfer speed of the data between divisions can also be increased as well. The method of the research that is conducted is the Waterfall method, use case diagram, ER-Diagram, sequence diagram, and activity diagram. The programming language used is HTML, PHP, JavaScript, and MySQL database.

Another research and development are also conducted by Iryaning (2008) in PT. Duta Mas Satu Pasuruan, in which the company is still using the manual method to record the inventory data. The effect of this activity is that access to the inventory data becomes limited to time and space, so the sales division can't access the inventory data because there is no connection whatsoever. Furthermore, the product inventory data is not real-time and needs a lot of time to one time check the amount of inventory of one product. The purpose of this research is to develop a system that connects the inventory data so the access can become easier and more efficient. The methods used by the researcher are interview, object verification, and simulation. The programming languages used are Apache, PHP, and MySQL.

Kurniawanto (2015) also researched PT. Graha Surapati Core about the inventory information system. In PT. Graha Surapati Core, the recording, and the processing of the item inventory data are still done manually. This affects the workers that found difficulties in making the notes and reports of the permission for the purchase of goods. The time usage to send reports to the secretary, director of finance, and accounting also inefficient. This research aims to make the information system so that the user can input, edit, delete, and search for data. The user will also be able to send the data as the report for permission of item purchasing, and also the ability to send directly to the printer. The output of the research is the report of item inventory data and sales data. The method that is used in the research is the Waterfall method, an object-oriented analysis that is visualized by the unified modeling language.

Kurniawan et al. (2015) researched inventory management in Industrial Engineering Department in Universitas Brawijaya. The problem is that in the Industrial Engineering Department of Universitas Brawijaya there is high data

complexity caused by the high number of information on inventory such as amount, condition, score, the person in control, etc. The department is also currently using Microsoft excel and paper document that is less efficient to store the data. The purpose of the research is to develop the inventory management information system for Industrial Engineering Department on Universitas Brawijaya. The method that is used in the research is PIECES analysis, software prototyping, data modeling, process modeling, and software modeling.

Fiqran et al. (2015) researched the information system of item records in PT. Masterweb Network. The problem that is faced by the company is the processing of the item records data is still not optimal and only using Microsoft Excel, so the worker finds difficulties in making the report for the records. This research aimsto develop a computerized system and to control and maintain the server. The method that is used is Unified Modeling Language, Entity Relationship Diagram, and SDLC Model Waterfall.

Neeraja and Tejesh(2017) researchedthe warehouse inventory management system using IoT and open-source frameworks. The problem that is faced is because of the need to store different types of products or goods to maintain seasonal production, price stabilization. There are also urges to automate the warehouse because a manual handling system may lead to human errors. The purpose of this research is to develop the warehouse information system that is based on IoT and open-source frameworks. The methods used in this research are technology roadmap, block diagram, and RFID system.

Wibisono and Nainggolan (2010) researched the information system planning in the Industrial Engineering Department in Universitas Parahyangan. The problem that exists in the university is that the activity is still not integrated between another. Every staff has their version of data so there are redundancy and inconsistency are unavoidable. The purpose of the research is to identify the function that is needed by the Industrial Engineering in Universitas Parahyangan, and also developing the information system for the activities existed in the Industrial Engineering Department in Universitas Parahyangan. The method used in the research is the organization mapping, function, and information mapping.

Rahmayanti and Afrinando (2013) researched the information system in PTPN VI Unit Usaha Ophir. The problem that is faced is that the information flow in the company is still manually processed (hand to hand). This makes the worker encounter difficulties in accessing the administration information, there could also

be missing data, error in inputting the data, therefore hampering the production process. The purpose of the research is to develop the information system that helps the worker to access the administration data. The method that is used in the research is the Usecase Diagram, Class Diagram, and Entity Relationship Diagram. The programming language used is MySQL.

2.1.2. Recent Research

The recent research is focused on assessing and developing a computerized system of inventory system in the warehouse of Patra Variasi Yogyakarta. The problem that is faced by the company is that the owner does not have real-time information about the inventory data, so most of the time the data is not accurate and can make the customer's transaction fail due to the unavailability of the item. Another problem is that the customer is told that the item is unavailable but after an intensive search the item is found available in the warehouse. This makes Patra Variasi miss an opportunity to make a profit. The purpose of this research is also to develop the real-time inventory data by creating an information system so the shop can access the data anytime and anywhere.

Table 2.1. Previous and Recent Research

No	Research	Name (Year)	Object/Location	Method	Purposes
Previous Research					
1	Previous	Hermawan et al. (2016)	Cahaya Baru Semarang Shop	Waterfall method	To develop the information system of the inventory so the real-time data can be maintained.
2		Saputra et al. (2012)	Maman Jaya Car Repair Shop	Waterfall method, SDLC	To develop the application for the inventory so that the efficiency of the worker can increase, and the file is safe because there can be always backup for the file.
3		Utami (2018)	PT. Tissan Nugraha	Waterfall Method, use case diagram, ER-Diagram	To develop the information system of the inventory so the company can access the inventory data quickly and the transfer speed of the data between divisions can also be increased as well.
4		Iryaning (2008)	PT. Duta Mas Satu Pasuruan	Interview, Object verification, and Simulation	To develop a system that connects the inventory data so the access can become easier and more efficient.
5		Kurniawanto (2015)	PT. Graha Surapati Core	Waterfall method, Object-oriented analysis, universal modeling language	To make the information system so that the user can input, edit, delete, and search for data.
6		Kurniawan et al. (2015)	Industrial Engineering Department in Universitas Brawijaya	The method that is used in the research is PIECES analysis, software prototyping, data modeling, process modeling, and software modeling.	To develop the inventory management information system for Industrial Engineering Department on Universitas Brawijaya.

Table 2.1. Continued

No	Research	Name (Year)	Object/Location	Method	Purposes
7	Previous	Fiqran et al. (2015)	PT. Masterweb Network	The method that is used is Unified Modeling Language, Entity Relationship Diagram, and SDLC Model Waterfall.	To develop a computerized system and to control and maintain the server.
8		Neerajaand Tejesh (2017)	Warehouse	The methods used in this research is technology roadmap, block diagram, and RFID system.	To develop the warehouse information system that is based on IoT and open-source framework.
9		Wibisonoand Nainggolan(2010)	Industrial Engineering Department in Universitas Parahyangan	The method used in the research is the organization mapping, function, and information mapping.	To identify the function that is needed by the Industrial Engineering in Universitas Parahyangan and developing the information system for the activities existed in the Industrial Engineering Department in Universitas Parahyangan.
10		Rahmayantiand Afrinando(2013)	PTPN VI Unit Usaha Ophir	The method that is used in the research is the Usecase Diagram, Class Diagram, and Entity Relationship Diagram.	To develop the information system that helps the worker to access the administration data.
Recent Research					
1	Recent	Austine (2019)	Patra Variasi Yogyakarta		Designing real-time inventory data by creating an information system so the shop can access the data anytime and anywhere.

2.2. Theoretical Background

This subchapter contains the basic theory and definitions of terms that are used in this research.

2.2.1. Definition of Inventory

Sunarto (2007) formulates inventory formulated as assets to be traded and sold to meet the desired rate of return. Supply in the sense of the company depends on the type of company. According to Munawaroh (2006), in manufacturing companies, inventory is more towards the supply of raw materials needed in the production process, whereas in trading companies, inventory is more towards the inventory of goods to be sold.

According to Vinci (2009), an important aspect of inventory is inventory planning. Inventory planning consists of four basic decisions: Quality of goods, how many goods are stocked when to carry out stock of goods, and where to store stock of goods.

a. Quality of goods.
   Retailers must determine the quality of goods purchased, according to the target market targeted by the retailer. Top-quality for upper-class consumers, middle quality for middle-class consumers, or lower quality for lower-class consumers.
b. The number of items stocked.
   After setting a target market, retailers must determine how much inventory to buy.
c. When to stock goods.
   To order goods appropriately, retailers must predict sales levels for a year and calculate other factors such as peak times, order and delivery times, routine and special orders, inventory turnover, discounts, and efficiency of inventory procedures.
d. Where items will be stored.
   Will stock items be placed in warehouses before being circulated to branch stores or placed directly in branch stores.

According to Sujanaand Asep (2005), based on the Concept of Inventory Balance, the input component must be the same as the output component. The input component is every item that enters the store inventory. While the output component is each expenditure item from store inventory.

Wibowo (2009) states the inventory system of goods inbound and outbound is an activity consisting of data entry of goods, return data, and inventory data which reports all transactions in and out of goods from day to month.

2.2.2. Definition of Information

According to Jogiyanto (2003), information is data that is processed into a form that is useful for the wearer. To be useful, information must be supported by three pillars as follows: The right to the person or relevance, timely, and accurate. Outputs that are not supported by these three pillars cannot be said to be useful information but are garbage. According to Amsyah (2001), information is material that is a result of data processing.

2.2.3. Definition of System

According to Jogiyanto (2003), the system can be defined with a procedural approach and with a component approach). Systems with a procedure approach can be defined as a collection of procedures that have specific objectives. Systems with a component approach can be defined as a collection of components that are interconnected with one another to form a unity to achieve certain goals. Examples of systems that are defined by the component approach for example are computer systems that are defined as a collection of hardware and software. Both of these approaches are correct. There is no wrong approach. Some authors choose one of these approaches to make it easy to describe a system. For systems that emphasize more on the process, the procedure approach will be more appropriate to describe the system.

According to Amsyah (2001), there are systems called open systems and closed systems. An open system is a system whose work can be influenced by external factors. A closed system is a system that works not influenced by external factors. Examples of open systems are the weather system, nervous system, circulatory system. An example of a closed system is a laboratory work system for chemical tube processes.

The system module consists of four elements namely input, processing, output, and feedback. The information system module consists of data, processing, information, and feedback subsystems.

2.2.4. Definition of Information System

According to O'Brien and Marakas (2010), information systems are any regular combination of people, hardware, software, communication networks, and data resources that collect, change and disseminate information within an organization. In the book, Sutabri (2012) explained that an information system is a system within an organization that meets the needs of daily transaction processing that supports the organization's operational functions that are managerial with the strategic activities of an organization to be able to provide reports needed by certain outside parties.

Information systems are defined by Buckingham et al. (1987) as follows: Information systems are systems that compile, store, process, and deliver information relevant to an organization, in a way that information can be accessed and useful for those who want to use it, including managers, staff, clients, and citizens. An information system is a system of human activity that may or may not involve the use of a computer system.

2.2.5. Picture of Information System

According to Laudon and Laudon (1988), information systems are mostly depicted in the form of a pyramid. The pyramid form is chosen because it represents the hierarchy of the organization. Most of the time on the base of the pyramid is the activity of the transaction processing system, followed by a management information system, decision support systems, and at the top of the pyramid is the executive information systems.

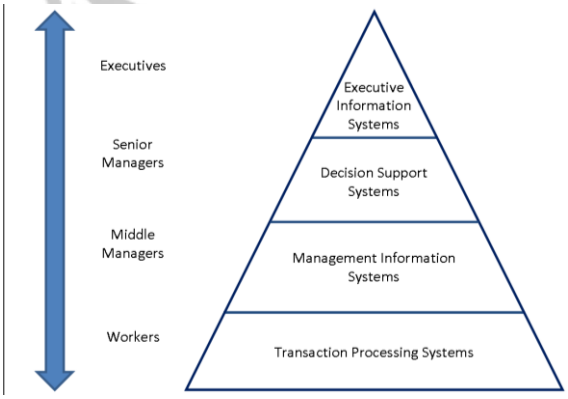


Figure 2.1. The Picture of Information System in Pyramid Form (Laudon and Laudon, 1988)

2.2.6. Definition of Data-Flow Diagram

According to Bruza and van der Weide (1990),a data-flow diagram is a tool and visualization which has the purpose of representing a flow of data or a system (generally information system). The DFD contains information about the outputs and inputs of each entity and of the process itself. There is no control flow, decision rules, and loops on the data-flow diagram. A flowchart can be used to represent specific operations based on data. The use of DFD was popularized by DeMarco-Jordan and Gane-Sarson using the Structured Systems Analysis Method (SSADM).

Figure 2.2. The Example of Data-Flow Diagram of DeMarco – Yordan Symbols (DeMarco, 1979)

Four basic symbols represent the data-flow diagram that is:

a. External Entity

   It is an entity that is positioned outside of the modeled system. The external entity can give input or receive output from or to the system. The external entity can be a person, organization, another source of information, or the final recipient of a report. The external entity should not have the same name, except when the object is the same, it should be drawn two times. The symbol that can represent an external entity can be seen in Table 2.1.

b. Process

   It is a work or activity carried out by a person or computer, where the data flow enters, is transformed into the data flow out. This symbol is represented by the shape of a circle which can be seen in Table 2.1.

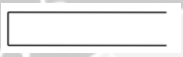
c. Data flow

   It depicts the flow or movement of the data from one process to another process. It is represented by the arrow symbol which can be seen in Table 2.1.

d. Data Store

   It depicts the storing activity of the data into the database. It can be a file or a database system from a computer, an archive or document, an agenda, or a book. The process can give data to the data store or receive data from the data store. The symbol that can represent the data store can be seen in Table 2.1.

Table 2.2. Four Basic Symbols of Data Flow Diagram in DeMarco - Yordan, and Gane - Sarson

Name of the Symbol	DeMarco – Yordan Symbols	Gane – Sarson Symbols
External Entity		
Process		
Data Flow		
Data Store		

2.2.7. Definition of Entity Relationship Diagram

According to Chen (1976),an entity-relationship diagram is a tool to describe the interrelation of things in a certain domain of knowledge. An entity-relationship diagram is also can be used specially to define the data or information structure that can be implemented in a database, more specifically in a relational database.There are several kinds of aspects in the entity-relationship diagram, such as entity, attributes relationships, and cardinality:

a. Entity

An entity is divided into a normal entity,weak entity, and associative entity.

Table 2.3. Entities Symbols in Entity Relationship Diagram

Entities		
Symbol	Name	Symbol Description
	Entity	Entity is a rectangle symbol that has the entity's name inside of it.
	Weak Entity	Its existence is dependent on the owner entity. It cannot be uniquely identified by its attributes alone.

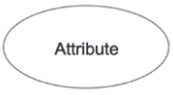
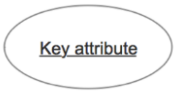
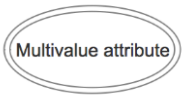
Table 2.3. Continued

Entities		
Symbol	Name	Symbol Description
	Associative Entity	It can represent extra table and be used in a many to many relationship. The relationship for this entity should be many.

b. Attributes

In entity-relationship diagram, the attribute is divided into four, which is an attribute, key attribute, multivalued attribute, and derived attribute.

Table 2.4. Attributes Symbols in Entity Relationship Diagram

Attributes		
Symbol	Name	Symbol Description
	Attribute	The attribute is represented by an oval shape containing the name of the attribute in Chen's notation
	Key attribute	This key attribute can identify uniquely of a particular entity. The name of this symbol is underscored.
	Multivalued attribute	It may contain many values, hence the name. It is represented by the double oval shape with the name inside.
	Derived attribute	This attribute value is obtained or derived from other attributes. This attribute can be stored inside the database or not stored in it. Depicted by a dashed oval with the name inside.

c. Relationships

An entity-relationship diagram, there are several relationship symbols that represent the relationship between entities. It is divided into a strong relationship and a weak relationship. With each having their own representation, it can be seen in Table 2.4.

Table 2.5. Relationships Symbols in Entity Relationship Diagram

Relationships		
Symbol	Name	Symbol Description
	Strong relationship	This relationship is that when entities is existence independent with other entities. This relationship is pictured by a single shape of rhombus.
	Weak Relationship	This relationship is that when child entity is existence independent with the parent of the child entity. This relationship is pictured by a shape of double rhombus.

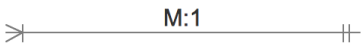
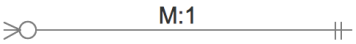
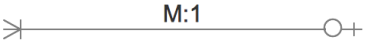
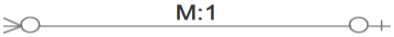
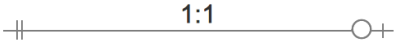
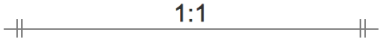
d. Cardinality

An entityrelationship diagram, cardinality's purpose is to represent the Describes the number of entities where other entities can be related to the set of relations. It is very useful in describing the binary relations between each entity. The types of cardinalities can be seen in table 2.5.

Table 2.5. Types of Cardinality in Entity Relationship Diagram

Symbol	Meaning
Relationships	
	Relationship that has symbol of zero or one on one side.
	Relationship that has symbol of one or more on one side.
	Relationship that has symbol of one and only one on one side.
	Relationship that has symbol of zero or more on one side.

Table 2.5. Continued

Symbol	Meaning
Manyto One Relationship	
	It has one through many symbol on the side, and also one and only one symbol on another side.
	It has zero through many symbol on the side, and also one and only one symbol on another side.
	It has one through many symbol on the side, and also zero or one symbol on another side.
	It has zero through many symbol on the side, and also zero or one symbol on another side.
Many to Many Relationship	
	This relationship has the zero through many symbol on both ends
	The relationship has zero through many symbol on the side, and one or many symbol on the another side.
	This relationship has one through many symbols on both ends.
	This relationship has one and only one symbols on the side and the other side is zero or one symbol
	This relationship has one and only one relationship on the both ends on the relationship.

CHAPTER 7
CONCLUSION

7.1. Conclusion

From the existing system in the warehouse of Patra Variasi Yogyakarta, the recording of items that is available in the warehouse is done manually only using paper and handwritten. The manual process has many drawbacks such as the paper that is used as the record can be damaged or lost. The calculation on the record is done manually as well, so it is prone to a calculation error.

The information system for item recording of Patra Variasi Yogyakarta can record the data digitally so it is less prone to the trouble caused by the data record or losing the data. Furthermore, the data can be backed up to prevent loss of data. To record the data of the items and the transactions the user simply clicks the software and the calculation of the stock is also done automatically, minimizing the chance of error. Furthermore, the information system also provides information for the user about the items that are low on quantity and needs to be restocked. The information system is also proved to be able to give information about the items in real-time, by updating it every time there are transactions of items or new items.

7.2. Suggestion

The information system can be improved more to the cashier system and the display stock inside the shop. The information on the exit transaction can also be analyzed in the form of a chart to understand the trends of items and to acquire business intelligence. Regarding the warehouse condition, the stocktake activity should be conducted every certain period to make sure that the quantity of the items in the warehouse is correct according to the information system.

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