

## CHAPTER 2

### THEORETICAL FOUNDATION

#### 2.1 Background and situation of Pharmaceuticals Company in Indonesia

Pharmaceutical companies are one of the important elements that play role in increasing the national health. Pharmaceuticals companies have greatly increase in this past recent years in Indonesia. The national scale and multi-national scale of pharmaceutical companies competes each other to gain large market share that available in Indonesia. Although there are a lot of big pharmaceutical companies that enter the market in Indonesia, Linda Sitanggang, the Director of Indonesia BinaKefarmasiandanAlatkesehatan, stated that 96% of the raw material pharmaceuticals industries in Indonesia must be import from other countries. Linda also added that the government is committed to increase the availability of drug and pharmaceuticals in Indonesia, butthis effort can't fully rely on the government, the pharmaceutical company should also help in increase the availability [4].

Regarding to the availability of drug and pharmaceuticals issues in Indonesia, there is a great chance to develop a new pharmaceutical company in Indonesia. The government Indonesia regulation that is implemented in Indonesia also helps the growth of pharmacy business faster as they needed their help to distribute more drugs and raw material. The purpose of these company open a new business in Indonesia was not only looking for a profit and gain market share, but also the company helps the government in Indonesia to improve the public health standard. In brief, the rapidly increasing Pharmaceutical Company in Indonesia not only because of the great market share in Indonesia but also influence of the government that set some regulation that helps the company growth.

The competition of the pharmaceutical company has come to more competitive environment, as there are always new born pharmaceutical companies that enter the Indonesian businesses. Maintaining customer and quality of the services is one of the core parts to gain more reputations for the company. As the author mention about the complex archipelago of Indonesia, technologies have giving the impact of the business pharmaceutical in Indonesia. The technologies give numerous advantages in winning the competition in business such as speed up the work, managing the company inventory, the reliable of data; reduce the cost overtime, etc.

## **2.2 Inventory management**

Companies that are developed normally have the system and knowledge in managing the inventory for their product so that the company can meet the standard quality of services in their business. On other hand, some of the company that can't manage their inventory well enough either it is their own product, semi-finished goods and raw materials can hamper the business process which leads dissatisfaction of the client they sell the goods to. This is why inventory management playing an important part in the business.

### **2.2.1 Inventory theories on business**

A product or services which owned and stored by business which has the purpose to sell to the end customers or distributors is called inventory. According to investopedia.com one of the most important assets which most businesses own is inventory, because the turnover of inventory represents one of the primary sources of revenue generation and earnings for the company's stakeholder or

owner[5]. Nowadays, most of the business uses inventory in every part of their business process for example, the raw materials and semi-furnished products are being stored in inventory before it is being used, while after the product is complete, the product is being stored in the inventory before distributed or marketed.

Basically, inventory is divided into two types which is:

1. Merchandises inventories: is an inventory where the company has business is not manufacturing a product. The company takes product from other source or manufacturing company, which later the product is stored and distributed.
2. Manufacturing inventories: manufacturing inventory is more complex which usually is own by a manufacturing company. Manufacturing company consist of raw material, work in process, and finished goods which each of them are stored differently so that it is easier to manage using three different inventory.

Most of the trading companies have at least one of the inventories that are mention above. The presence much kind of inventories involves human power in operating the inventories and need different kind of action that needed towards each stock. Not only the human quality issues, has this also led other issues that strongly connected with other problem such as the problem in predicting demand and predicting sales of the merchandise that is store in inventory. The wrong prediction of demand and sales, the amount of unsold products will also increase which causing the companies have a great loss as the spending is inefficient. On other hand, if the stock doesn't meet the demand of the market will result in trouble in the business. Thus, the prediction and the stability of supply and demand are very important in inventory so that it will decrease the cost and help the business run smoothly.

In short, inventory in a business is essential as the main function of inventory is to store products which will be distributed in advanced. Not only storing, inventory helps the company to manage and as a tool to identify the fluency of the business itself. Although inventory is very important, by having inventory in enormous size and disorder will be harder to manage which will causing a lot of problem to the company in the future.

### **2.2.2 Factor affecting the inventory**

Regarding to several issues that exist in inventory, it is very important to keep the inventory in good hand. When it comes to effective business and reducing cost, inventory is always become a main focus. Inventory function is dependent upon physical operation involving multiple processes and location which inters dependence upon the process renders inventory vulnerable to inefficient inventory[6]. On the product side, these are several factors that company should concern towards their inventory:

1. The amount of stock that is requires running a business. If the greater amount demand of a product, the greater amount of stock is require in the inventory.
2. The characteristic of the product, determine whether the product is durable or not. If the product is easily broken or defected, the amount of stock in inventory should be minimized.

There are several other factors that need to be concern in implementing inventory to the company. As the inventories need a lot of human resource in operating it, this may lead to miss communication in making decision in purchasing stocks which is causing the inefficient waste of cost in the company. On other hand, technology can

influences process improvements speeding up the sales and delivery processes and to a certain extent reduces manpower resources and associated costs too[6].

In brief, the factor that affecting the inventory of a company such as the product and human resource, is an obligation for a company to concern about. The benefits that are offered by having an inventory will be no effect to the company if they didn't manage the inventory well. The availability of technologies nowadays may be one of the solutions to reduce the risk in inventory.

### **2.2.3 Purpose of inventory management system**

Due to the importance of the inventory in business now a day, the inventory needs a management system which would help the company to keep the level of inventory at optimum level. The information should be delivering in an effective way so that there is no data inconsistency which may lead to miscommunication. The optimal inventory is very important to the business as it helps the company to maintain the continuity of the business and use the expenses of the company efficiently. With such knowledge and understanding of the inventory, there are purposes of inventory management system which is [7]:

1. Meet customer demand: The inventory management system ensures the company has the materials available to build product to meet customer demand. Accurate quantities in the system allow the company to build the product within the time frame the customer demands as well[7].
2. Business planning: the business planning relies on accurate inventory quantities to schedule builds and production run. An inaccurate inventory can cause delays in the material necessary to maintain the continuity of the business[7].

3. Reduce cost: An accurate inventory management system prevents delays in purchases or over ordering materials for production. Excessive amounts of inventory tie up company funds and can result in waste[7].
4. Purchasing: inventory management system provides trigger points of material purchases[7].

### **2.3 Information Systems**

Information system is a set of connected component which involved information technologies and human activities that support, operate, manage and also as a decision making. It is clear that information system nowadays, have make a lot of impact in the real world especially business world. By the help of information system, business can speed up the work and overcome some technological problem.

#### **2.3.1 System**

According to Alexander Backlund, a system *“is a set of interacting or interdependent components forming integrated whole or set of elements and relationship which are different from relationships of the set of its elements to other elements or sets.[8]”*

#### **2.3.2 Information**

Information is a collection of data that is combined and process in a design which have meaning for the users so that the data become useful. These are several factor that determining the level of usefulness of information:

1. Fast response, meaning that information is available when needed.
2. Accurate, meaning that the information is free from error.

3. Relevant means that the information should give benefits to the researcher.

#### **2.4 Web -based database**

The growth of World Wide Web (WWW) and the internet, has influences many business to implement these technologies in their business environment. These technologies help business to reduce time in the work, manage the business, communicate with other business colleague, and can also advertise their business. Due to the wide differences of resources, frequent maintenances, the changing of content (update), and unlimited content, the business is facing a new challenge. Therefore, the web-based database application (WBDB) was introduce. By implementing the WBDB the company might overcome the challenge in using the internet or intranet for their business. The benefits and implication of WBDB has proven to several companies especially in Indonesia where the geographical is consisting of a lot of Small Island. WBDB help the company to increase the performance of work process through extensive database system that is implemented in form of internet based application. According to Alexandru and Prof. Vasile web-based database is a database that resides entirely on an internet server. Access to the database is through a web browser and usually utilizes a password system that allows for restricted access to users depending on the privileges they have been given [9].

Based on article on dbnet solution, these are several advantages by implementing WBDB in the company [10]:

1. Cross platform compatibility –The compatibility of web-based application can be implemented in most of the software that exist now a day. As the web-based

application minimum requirement is web browsers which there are many, (Internet Explorer, Firefox, Google Chrome, and many others.).Moreover the web browser is available in most of the technologies from pc to cellphones and web browsers also available in most of the OS such as Windows, Linux or Mac OS can still run the web application [10].

2. More manageable –As the minimum requirement of web-based database is web browser, web based system will be only implemented and install on the end user computer. All the maintaining and updating can be done on the server which can make reduce the time in updating. Any client updates can be deployed via the web server with relative ease [10].
3. Highly deployable -. The end user is far easier to deploy the web applications because web application support cross platform support. Web based application are also ideal where the bandwidth is limited and the data is deliver to the end user. These give a lot of advantages which allows the company to extend the access towards the system, and also can improve relationship with the customers as we give limited access to the system [10].
4. Secure live data - Typically in larger more complex systems data is stored and moved around separate systems and data sources. In web based systems these systems and processes can often be consolidated reducing the need to move data around.

Web based applications also provide an added layer of security by removing the need for the user to have access to the data and back end servers [10].



5. Reduced costs –a low requirement, change from paper based to web based application, will dramatically reduce a lot of cost for the company [10].

## **2.5 Technology in web-based database**

According to Alireza(2009), there are several methods in developing and maintaining a WBDB. To summarize these are several methods [11]:

1. Underlying all WBDBs is a relational database-management system (RDBMS), together with one or more relational databases (RDBs) that actually contain the data or information of interest[11]. Example of RDBMS: MySQL.
2. A web page defined in HTML or Dynamic HTML (DHTML) controls the visual display that the user of the WBDB sees[11].
3. An interface receives information from the user and passes it to the RDBMS, extracts information from the RDB (with the assistance of the RDBMS), and provides the information to the web page, whose HTML or DHTML structure makes the information visible[11].
4. A script that is usually uses in WBDB is the PHP[11].

### **2.5.1 PHP**

In 1994, RasmusLerdorf a programmer firstly created a script which is called “Personal Home Page tools” which is now known as PHP. In the early years, when PHP firstly introduce is only use for displaying the programmer resume and documenting his web-page traffic[12]. As the technologies and requirement surge

toward a higher level, ZeevSuraski and AndiGutmans rewrote and develop a new kind of PHP which is named PHP: hypertext preprocessor[12]. Regarding the issues of demand in business that uses PHP in their development, PHP is now safer and provide a better tool to develop a website database.

PHP is server side programming languages which have the ability to process dynamic data which usually operates on a web server. PHP usually known to be a server-side embedded programming language which all the syntax and commands that we write will be fully executed by the server, but produce the output result in a web browser. As the PHP became popular with the advantages that PHP offer such as, improve the presentation of data and information from other source and other individual to access file, easy to develop and PHP compatibility towards most of the operating system, According the research data, over 20 million domains had web services hosted on servers with PHP installed which is around 78.1% of the web sites that exist nowadays[13] and around 62% companies in the world use PHP to develop their applications[12]. Moreover, PHP syntax is similar to other programming language, such as C, C++, Java and Perl. Without wasting time in learning new programming language it is easier for the programmer to develop using PHP.

## **2.5.2 HTML**

Hypertext Markup Language which is known now as HTML, firstly develop by Tim-Berners Lee who proposing internet-based hypertext system for CERN company [14]. According to Peter Flynn, he stated in his journal Hypertext Markup

Language (HTML) as a language of identifying information text for the World Wide Web, it is provided a way of marking structure, content, and appearance which is editable by hand with any plain-text editor [15]. The usage of website in these past recent years has become popular because it is easy to read and understand the information that is provided in the website. Furthermore, the basis of all webpages in the website is the language of HTML itself. HTML is use to design a web pages, as combining words, sentences and phrases is one of the capabilities that HTML have. Rather in reading hard coding language in HTML format, with the help web browser which has function is to interpret the language in HTML which then produce an output that is readable and visualize to the individual who using the browser.

### **2.5.3 MySQL**

MySQL *“is one of the most popular and most used open source relational database management systems (RDBMS) based on structured query language (SQL)[16]”*. MySQL usually implemented on web based application which has the capability of handling a large number of database connection [17]. Basically, MySQL store the data in the databases objects which is called tables, inside the tables consist of several related data and also consist of columns and rows as their separator. MySQL has given a lot of contribution towards the business environment which help them to speed up the searching and also manage a lot of information and data in the company. According to Marten Mickos, MySQL CEO, his product now is more reliable as MYSQL sustenance with high level of concurrency and low cost of ownership which make more attractive for business uses. Furthermore, MySQL can

be implemented in most of the system platform such as Microsoft Windows, Linux, Mac OS X, Symbian, Novell Netware, UnixWare, SunOS and many other more. In developing MySQL, the developer uses C and C++ programming language as its basis.

## **2.6 Systems Development Life Cycle**

In these recent years, system analysis and design has been known to give some benefits. The benefits is identified in different words, the most important mission is to analysis what is the current problem and designing a system that can fulfilled the client requirement. To accomplish the mission, the system life cycle must be well defined and the methodologies must be carefully towards the systems that will be implemented[18].Systems development life cycle which is now known as SDLC is defined as a methodology that is used mostly for system analyst to elaborate the process in constructing information system. Below are the most essential steps in systems development life cycle:

1. **Planning:** In the first step of SDLC, which is planning, is how we plan for the future development, defining the scope, and identify the problem that may occur during the project.
2. **Analysis:** On the second stages, is to identify what are the problems that exist in the old system and seek for solution. Make decision towards the finding of the problem.
3. **Design:** On the design stages, elaborate the new system in several diagrams such as ERD (entity Relationship Diagram), Use case diagram, DFD (Data

Flow Diagram), Context Diagram, and many other more. And also defining what the new system can do to overcome the existing problem.

4. **Testing:** Before implementing the new system, testing is the most essential stages. The testing is tested in various way depending on which testing is the most crucial to the system. Testing is very important because in this stage, the developer of the new system will find defect and swiftly correct the error before the defect getting worse.
5. **Implementing:** In this stages of SDLC, how to implement the new system. The purpose is implementing the system with lower level of disturbance towards the older systems and also how to implement efficiently
6. **Maintain:** The last stages of SDLC is maintaining, the objective of this stage of SDLC is to maintain the new system in the client environment. The changes of structure, the technologies, the requirement of the business make the maintain stages become the last and important aspect of SDLC.

## **2.7 UML Diagram**

UML is an abbreviation of Unified Modeling language. In software engineering, one of the important and serious issues is the design and analysis the specification phase. Because in this phase a complex real world problem will be transform into a computer software systems. According FahadAlhumaidan journal, the Unified Modeling Language (UML) *“is a standard set of notations and diagrams for specifying, visualizing and constructing artifacts of software systems as well as for business modeling and other non-software systems”*[19]. UML diagram consist a lot diagram. In the system development life cycle (SDLC), UML diagram can be used

in most of the process. The diagrams which are going to be used are different regarding to the implementation of the technologies. These are several UML diagrams that will also be included in this thesis.

### **2.7.1 Entity Relationship Diagram**

Based on Ronald Gege Allan journal, entity relationship diagram which is usually called ERD is a diagram that has its functions to designing and analyzing database, and for applying the ERD diagram is using a technique called entity relationship(ER) modeling in the design phase [20]. The ERD diagram has been declared to be successful at rendering the connection/relationship between tables that consist inside a database. In the entity relationship diagram there are three components which are:

1. Entity: entity refers to a table in the database which consists of a lot of data. For example: in the student table there is name, email, addresses, MidName, etc.
2. Attributes: is the data inside the table in the database such as: sex, name, etc.
3. Relationship: represent the connection between two entities. In relationship component of ERD, there is cardinality of a relationship which use to classify the relation such as : 1:1, 1:M, M:N

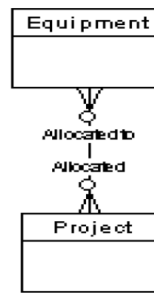


Figure 2.1 M: M relationship [33]

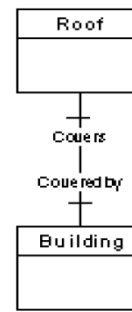


Figure 2.2 1:1 relationships [33]

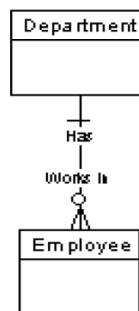


Figure 2.3 1: M relationship [33]

## 2.7.2 Use case diagram

In Unified Modeling Language (UML), the different type of diagram that uses to describe a system is used for different view or perspective level of a system. One of them is use case diagram. Based on Andrew Gemino journal, Use case diagram is “a diagram that shows the interaction between use cases and actors in the system as well as any interactions among usecases in the system[21]”. Basically, use case diagram consist of the actor and the activities inside the system. The actor is usually shown in a stick figure, while the activities are in a circle. Furthermore, use case diagram must also describe about the detail by writing every single activity between the actors and the system. The description usually documented it in a table call use case

description. Because of the simplicity of the diagram, users found that use case diagram is easier to understand and readable.

### Sociabubbles Use Case Diagram

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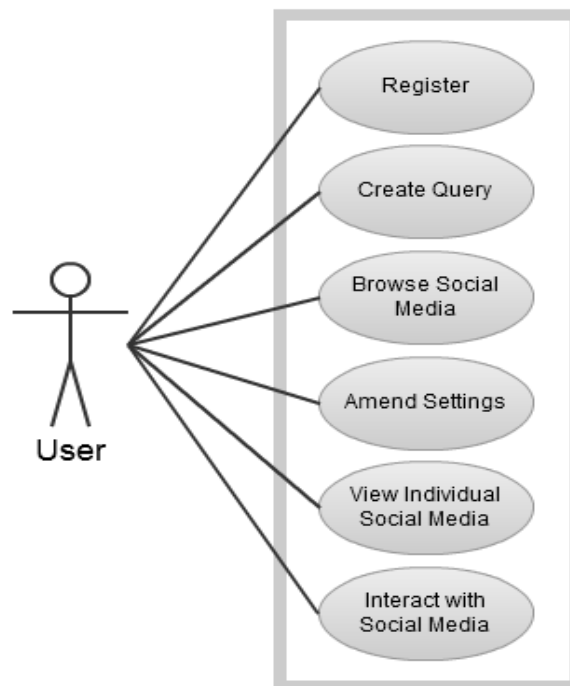


Figure 2.4 Use case diagrams[22]



<b>Usecase Description</b>	
System : ConveyorSystem      Name : Defects extration	
Scenario : Identifies defective products using 2 photo sensors. If defect product is identified, controller actuators extraction cylinder for the removal of product.	
Pre-condition : identification of defective products	
Post-condition : extraction of defective products	
Typical course or Events	
Actor	System
1. Product arrives 1.1 high level sensor is OFF and low level sensor is ON 1.2 high&low level sensors are all ON 1.3 high&low level sensor are all OFF 3. Extraction point sensor senses product  5. Extract defective product by forward stroke 6. Proximity switch senses good product	2. Identifies state of product 2.1 identifies good product 2.2/2.3 identifies defective product  4. Controller control cylinder according to the state of product 4.1 in case of defective products, sends forward stroke signal 4.2 initialize product status memory  7. Initialize product status memory

Figure 2.5 Use case descriptions [22]

### 2.7.3 Data Flow Diagram

Data Flow Diagram (DFD) is a graphical representation that has the objective to show the input, output, data storages, and most importantly is the process or flow inside a system. DFD will be shown in broad (DFD level 0) how does the system work which is later break down into several levels. The lower level (level 1) of DFD helps di explain more in depth the system. The importance of DFD is very essential in information system because with the help of DFD, the development of the system will be faster and accurate as the people that develop the system have a visualize version of the workflow of the system. Below are several symbols that help to construct a data flow diagram:





	<i>External entity</i>	Source or destination of data that is external to the system
	<i>Process</i>	Manual or computer process that changes data. In the following text a circle is used to indicate a process
	<i>Data flow</i>	Data transfer in the direction indicated by the arrow. Each arrow should be labeled to indicate what data is being transferred
	<i>Data store</i>	Manual or computer storage of data

Figure 2.6 data flow diagram attributes [22]

### 2.7.4 Context Diagram

In DFD, context diagram is one of the important parts as context diagram has a purpose to explain and visualize the processing activity inside the system or subsystem and all the external entities in a broad view. In the context diagram below, the circle shape represent a single process and the rectangular shape represent

external entities. It also describes what output can the system produce by receiving an input from the external entities. Moreover, context diagram usually does not include the data stores in it as the data store is used to be inside the system.

In brief, by the help of UML diagram, users can understand easier about the system; what the system consist of, what is the capabilities of the system, what is the impact from the users, etc. Although UML diagrams were actually consist other diagrams, the diagram explain above is considered to be the most popular used. Furthermore, the main objective of UML diagram is to design and sketch the system into a visualize view which help not only the business to understand but also help the system development team to work efficiently.

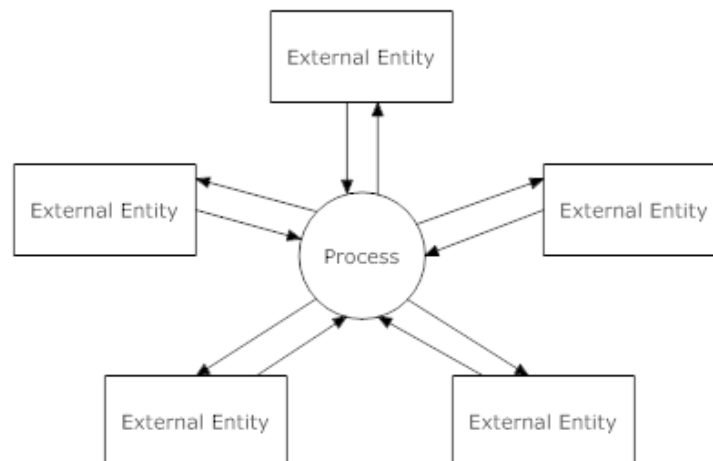


Figure 2.7 Context diagrams[22]