

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL BACKGROUND

This chapter describes previous literature with the typical topic, research reviews, and comparison of those research with the current research. The theoretical background in this research explains about information systems, methods, and tools used in this research, as well as the basic theory of retail.

2.1. Literature Review

The information system can help a company to capture and store information in the whole business process. It provides the ability to monitor the company performance and support the decision making for further improvement to the company's business. Systems development life cycle (SDLC) method is the basic methodology that is commonly used to custom a development of information system. It is a traditional method that has been widely used for this kind of development (Rainer Jr. et al., 2015).

A literature review has been done by selecting an online database to find certain academic journals related to information system development using SDLC method. A keyword that is used in this process is "system development life cycle" and the type of reviewed document is an academic journal. The journals also filtered to the last six year of publications in order to avoid the outdated research. Then, the selected journals are the journals that have a clear explanation about the use of SDLC method or similar method to solve various problems.

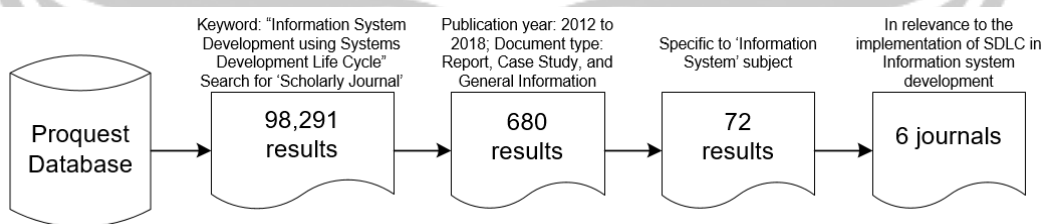


Figure 2.1. Steps of Searching Related Journals

As it is shown in the Figure 2.1., there are 6 journals that have relevancy with the current research in this final project. By reviewing those journals, this research is able to find the main idea of using SDLC method in developing an information system. It also helps the formulation of research background, strengthen the statement of research purpose, and support the basic theory of SDLC in information system development.

2.1.1. Previous Research

Lien et.al (2013) and Demir (2015) used SDLC method to develop an anesthesia information management system in Massachusetts General Hospital, USA, and large-scale defense system in Turkish Naval Research Center Command, Turkey. This research stated that SDLC is the most popular method used in designing information systems. The phases in SDLC method helps the implementation of the developed system better because the steps are really systematic. The development is based on the user's needs resulted from the analysis phase, so at the end of the result, the developed information system can meet the user requirement.

Singh & Kaur (2017) and Ali (2017) conducted a study to evaluate the use of SDLC models and both of the studies resulted in similar conclusion. They stated that the important phase in SDLC is between implementation and installation phase. Between these phases, the users are reviewed and gave feedback to the developed system and the researcher can easily adjust the system as the needs of the user. While Osman (2013) done a different way to gain user's feedback to the developed system. This research evaluates the developed system by gathering the responses from experts, then the evaluation phase is done along with a certain analysis of the given feedbacks.

Khan (2014) implemented the use of SDLC by highlighting the most important phase which is a testing phase (or usually included in installation phase). This phase provides a testing process that is done by the user and the user evaluated the whole system by giving a certain evaluation. In order to help the user in this phase, the developed system has to be verified in the previous phase. The verification is done by minimizing the complexity and anticipating change.

The conclusion of the review is that various information system can be developed using SDLC method. SDLC provides complete steps to develop an IS, which are initial research of the current information system, analysis the possibility of improvement, designing the new system, implementing the design of the system, installation of the system, collecting feedbacks, adjustment and system evaluation to meet the real objectives of the development.

The table on the next page shows the comparison between some research of developing an information system.

Table 2.1. Literature Review

AUTHOR	TITLE	METHOD					
		PRELIMINARY	ANALYSIS	DESIGN	IMPLEMENTATION	INSTALLATION	EVALUATION
(Lien et. al., 2013)	Methodologies of anesthesia information management system development	Estimating the project objectives.	Prioritizing user requirements.	Designing the data-flow diagrams and security needs.	Finalizing the technical design and construction and verifying the system specifications.	Implementing the training program and monitoring system.	Providing ongoing maintenance and user review.
(Demir, 2015)	Requirements for Systems Development Life Cycle Models for Large-Scale Defense Systems	Identification of requirements for LSDS development model.	Categorization of current LSDS characteristic.	Identification of processes consisting of best practices that can effectively address.	Development of LSDS development model capable of addressing today's and near future's needs.	Conducting industrial experiments.	Pilot studies and notes determinations.
(Singh & Kaur, 2017)	A Simulation Model for Incremental Software Development Life Cycle Model	Requirement analysis.	Specification.	Designing software architecture.	Implementation of software planning.	Testing, training and support, and documentation.	Maintenance.
(Ali, 2017)	A Study of Software Development Life Cycle Process Models	Plan the most vital and basic phase of every life cycle process.	Defining requirement for the customer and customer's verification.	Designing software architecture and reviewed by important stakeholders.	Building and developing the program using tools (programming tools).	Testing the program.	Evaluate whether the program meets user's requirement or not.
(Osman, 2013)	Integrated Framework of Software Engineering and Common Criteria Practices	Gathering information using Systematic Literature Review	Consolidation to map the diagram using Cognitive Mapping Technique.	Development of the integrated framework.		Comments gathering from experts, evaluation, and analysis of the comments.	
(Khan & Khan, 2014)	Importance of Software Testing in Software Development Life Cycle	Requirement analysis and problem definition.	Describing the requested behavior of the required system.	Defining the set of structures needed to understand the system elements.	Software construction, verification, minimizing complexity and anticipating change	Software testing and evaluation.	Deployment and maintenance
Current Research	Information System Development Using System Development Life-Cycle in TB. Panji Jaya	Observation in the company.	Business process identification and evaluation using SWOT Analysis	Information system model planning and documentation (DFD & ERD)	Information system modeling using Excel VBA and system trial	System training and user trial	Company's feedback

2.1.2. Current Research

The aim of this research is to develop an information system in Toko Besi Panji Jaya. This company runs a retail business of building materials. Following the SDLC method, this research developed the information system based on the business requirements. The business requirements will be identified in the analysis phase of this research. Business process mapping will be done to evaluate the current business and then propose a new business process with the use of IS in the business process. Then, the IS will be developed in MIS level, so that the developed IS can be used to support any decision-making process in the company. The goal of this development is to have the ability to record and monitor the flow of money in the company.

In this company, customers who come and order products are the top priority. Customers who come to the store can be given the account receivable without any proper calculation of how many accounts receivable has been given to other customers. This problem then affects the supply process. When a company needs to purchase products for supply, the company should pay for the purchased products, but sometimes because there is some unfinished payment of account receivables given to customers, the store does not have the cash to purchase the products, so the store must make account payable. The existence of these accounts receivables and account payables makes the financial condition of the company's owner become poor. Owner's personal savings that should not be used for company operations should be allocated to cover the needs of money in the company.

By having an information system, the owner can monitor how many accounts receivable and account payable have been made during a certain period of time. The value of money for each account can be recorded properly, so when it comes to making a decision in giving account receivable or making account payable, the owner can see the record and consider the decision carefully. The due date for each payment also can be the consideration for the decision-making process.

The information system resulted in the sales and purchases record made in a certain period of time. Those records used as the input of making sales and purchases report. The owner uses the reports as the business evaluation. The main goal of a business is to gain profit.

2.2. Theoretical Background

2.2.1. Information System

An information system is a system that has several processes and activities including managing information that consists of capturing information, transmitting, storing, retrieving, manipulating, and displaying (Alter, 2008). The information system can be implemented using a set of tools that is used to support the needs of information processing in an organization which is called information technology (IT) (Haag, et. al., 2006). IT consists of several functions such as collecting, processing, keeping, retrieving, showing, and communicating any information (Bourlakis & Bourlakis, 2006). Implementation of IT in a business can result in the competitive advantage which helps the business owner to find out the opportunity to support its utilization (Aali et. al., 2014).

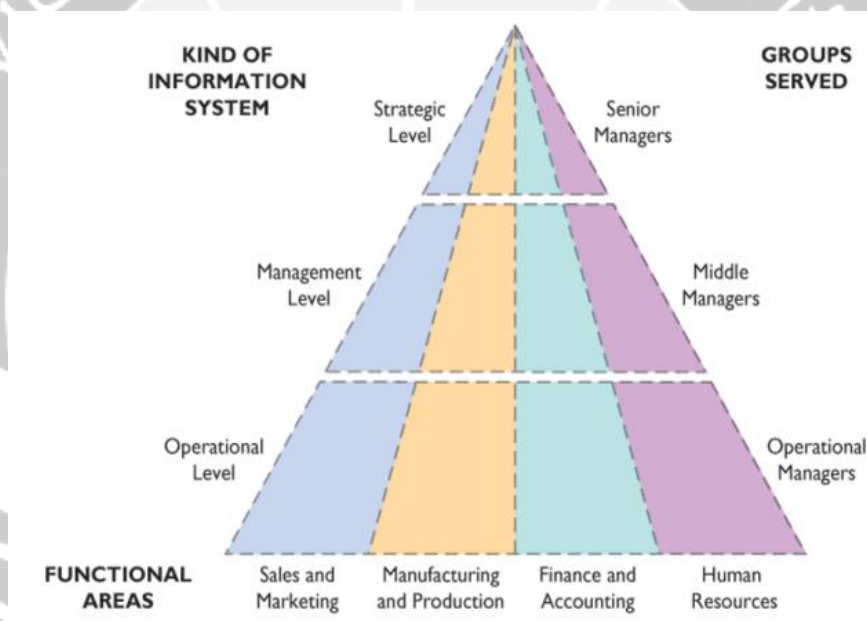


Figure 2.2. Types of Information System

(Source: Alter, 2008)

Referring to the Figure 2.2., there are three types of an information system that can be explained in the form hierarchy. From the top is Strategic Information System (IS). It is IS that support long-range planning. It usually used by senior managers. The second is Management IS. It is IS that supports certain activity such as monitoring, controlling, decision-making, and administration. It usually used by middle managers. The last is Operation IS. It is IS that provides information for routine activity in operational level. It usually used by operational managers.

2.2.2. Systems Development Life Cycle

The systems development life cycle (SDLC) is the traditional systems development method that organizations use for large-scale IT projects. The SDLC is a structured framework that consists of sequential processes by which information systems are developed (Cegielski, 2011).

Systems Development Life-Cycle is a term of a method that is used as a guideline for developing a system. By following this method, development of a system will be done in detail by considering many aspects that possibly affected in the development process. It also guides the project with an ordered step that helps the project to meet the objectives of the development. The phases include in SDLC method shown in Figure 2.3. below.

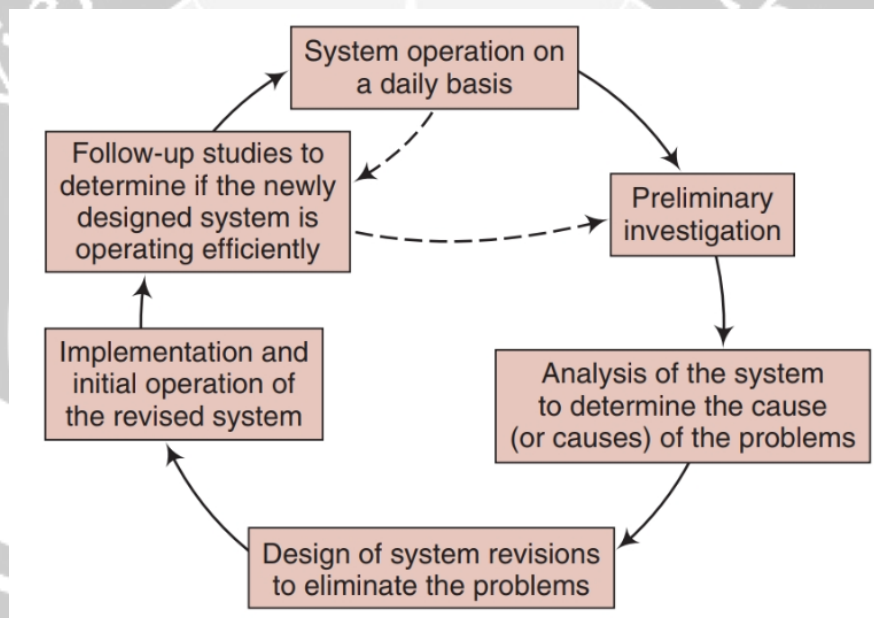


Figure 2.3. SDLC Phases
(Source: Simkin et. al., 2015)

a. Preliminary Investigation Phase

It consists of activities related to developing the project plan such as selecting the object of development, feasibility study, and project plan development. This phase evaluates whether the proposed development can be done or not considering certain factors.

b. Analysis Phase

The data from the object of research is being gathered, such as the requirement of development success, process diagram, determine the business opportunity and analyze the tools that possible to be used.

c. System Design Phase

This is the phase where the information technologies structure being designed because IT is one of the core aspects of a system. This phase also results in system modeling. There are several tools for system development documentation that usually used in this phase which are Data Flow Diagram (DFD) and Entity Relationship Diagram (ERD). DFD indicates the sources of data stored in a database and the destinations of the data flow, while ERD describes the resources, entity, and the relationship between entities that involved in the information system.

d. Implementation and Installation Phase

IT structure is being developed along with the program and its database. System testing is done to make sure that the program meets the business requirement. The graphic user interface (GUI) of the program is designed in this phase along with the program coding. Determine the method of implementation of the developed system, provide user training, and do the user trial. In order to make an appropriate program for the user, in this phase user can give any feedback that can be used to revise the developed system.

2.2.3. Data Flow Diagram

The key person in the IS development that follows SDLC method analyzes the business process and find the feasible improvements in the design phase of the IS. One of the graphical technique that commonly used to illustrate the proposed system model in SDLC method is data flow diagram (Yakubu et. al., 2011)

DFD is one of system documentation method. It consists of several elements which are an external entity, process, database, and flow of information. Each element represented by a symbol shown in Figure 2.4. on the next page. This diagram will show the sources of data that is going to be stored in the database and the destinations of each data flow. It also shows the relations between entities involve in the system.

The entity is external people, systems, and data stores. They stand outside the system but interact with the system by passively contributing information and/or receiving information. Entities have a role as origin or destination of external data flows. In the diagram, entities should be labeled as a noun.

Processes in DFD receive information or data flows as inputs, transform the inputs into outputs. So, the only way to move the data is by passing it through a process. The process that only has an input called as a black hole, while the process that only has output called as a miracle. The output of a process should be different from its input. In DFD, the process has a verb phrase label.

Data flow shows the movement of information or data in the system. It connects two elements in the system and the arrow direction shows the origin and destination of a data transfer, but the arrow can only have one direction. External entity can be both origin and destination of a data flow. External entity as data origin called source, and external entity as data destination call sink. The data flow can connect two processes. Data flow from a process to database means to update, whereas data flow from the database to a process means to use. Data flow from data store can only move to a process. In DFD, data flow has noun phrase label.

Data store is a passive element in DFD. It only can receive and/or give data to a process. Data store cannot change the status of the stored data. The process that related to data store i.e. store, add, delete, and update. In DFD, data store labeled as a noun.

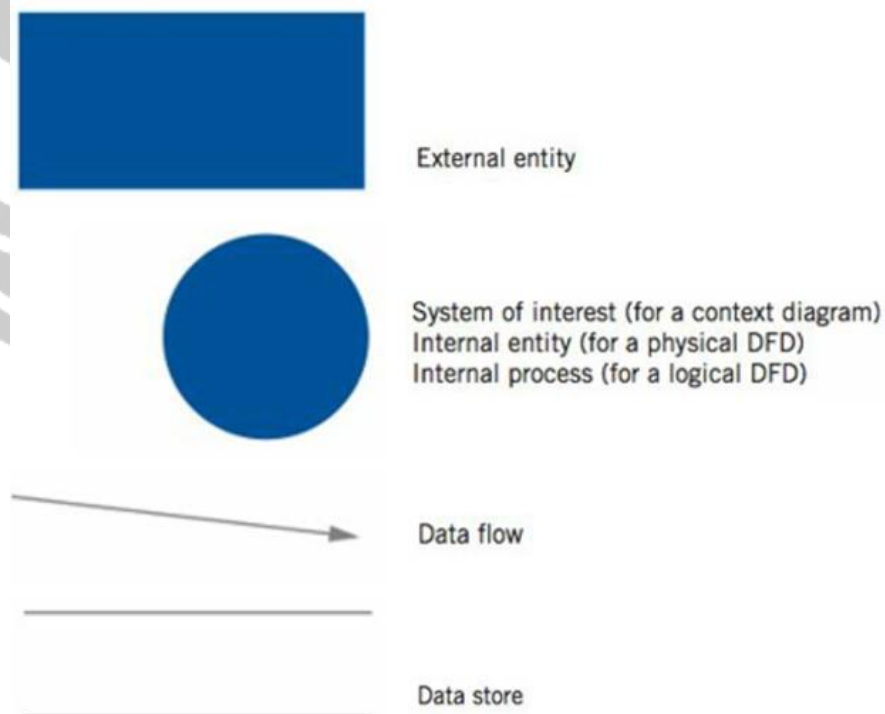


Figure 2.4. Data Flow Diagram DeMarco & Yourdon Symbols
(Source: Considine et. al., 2012)

DFD includes a context diagram, a level-0 diagram, and the next level diagram as the breakdown of a process in previous level as it is needed. Each level represents the detail of system. The more detailed data flows shown in the higher level of diagram (Vaassen et al., 2009). Context diagram shows the system of interest. System of interest is the main system shown as a process symbols (circle) and it connected will all entities involves in the systems. The context diagram provides a representation of the system of interest and the entities that provide inputs to, or receive outputs from, the system of interest.

2.2.8. Entity Relationship Diagram

Entity relationship diagram is one of system documentation method besides DFD. This diagram used to plan and create database by identifying the system's entities, the attribute for each entity, and the relationship between two entities. In ERD, entity can represent a person, place, or thing that can be identified in the users' work environment. Entities are pictured in boxes along with its attributes as its identifiers. Attributes describes an entity characteristic. Among the attribute, there is at least one primary key (PK). PK is a unique identifier or attribute among another attributes that never changed and it is differentiate an entity to the other. The relationship between two entities named by a verb. It showed by drawing certain line that indicated the relationship between two entities that is shown in the Figure 2.5.

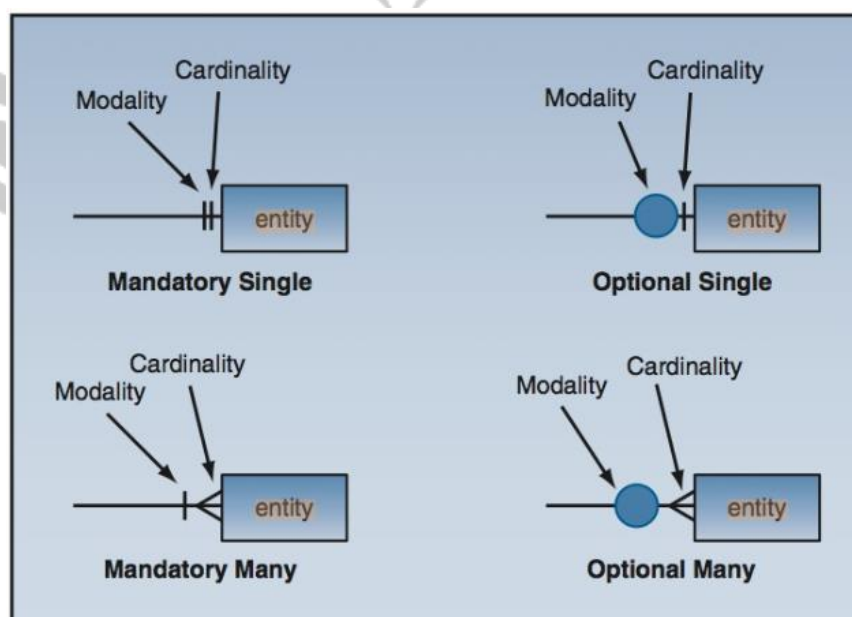


Figure 2.5. Cardinality and Modality Symbol
(Source: Cegielski, 2011)

As it is shown in the previous figure, there are 4 types of entity relationships. Each type of relationship has two indicators, which are cardinality and modality. Cardinality refers to the maximum number of times an instance of one entity can be associated with an instance in the related entity. Modality refers to the minimum number of times an instance of one entity can be associated with an instances in the related entity. Cardinality can be 1 or many, and its symbol is placed on the outside of the relationship line, closest to the entity. Modality can be 1 or 0, and its symbol is placed on the inside of the relationship line, next to the cardinality symbol (Cegielski, 2011).

2.2.3. Business Process

A business process is a natural group of activities that create value for an organization. It consists of some activities done by certain entities that involve in the whole business. Business process in a company are usually the sales or order fulfillment process. In the business process, all entity that involves in the process is drawn in the form of flowchart (Simkin et al., 2015).

The goal of company's business process is to create product or service for its partners, or customers. A business process can be considered as a success business process if the business partner or the customer can be satisfied as it receive the product or service (Rainer et al., 2015). To reach this goal, basically there three fundamental elements, which are:

- a. Inputs, includes materials and or information that flow through certain process and transformed as the result of the process.
- b. Resources, includes people, tools, or equipment to execute certain process or activities.
- c. Outputs, includes product, service, or any kind of decision as the result of certain process.

Company's business process can be identified using business process modeling scheme that will review the process in detail. It is done by discussing the process with the owner and employee of the company, so it can figure out the real condition of the business process that has been implemented in the company. It resulted in a business process documentation that can be used in evaluation and optimization process. The business process can be made for the whole process of partial process. This helps the company to improve the certain process in the business and perform the business better (Cezar & Beatrice, 2014).

2.2.4. System Flowchart

There are some tools that can be used to explain and visualize a business process modeling. One of those tools is system flowchart. A system flowchart represents the company's system, involving the system's inputs, manual and computerized processes, and outputs. This flowchart uses certain symbols to show certain elements that is included in the business process as shown in the Figure 2.6. below (Turner et al., 2017).

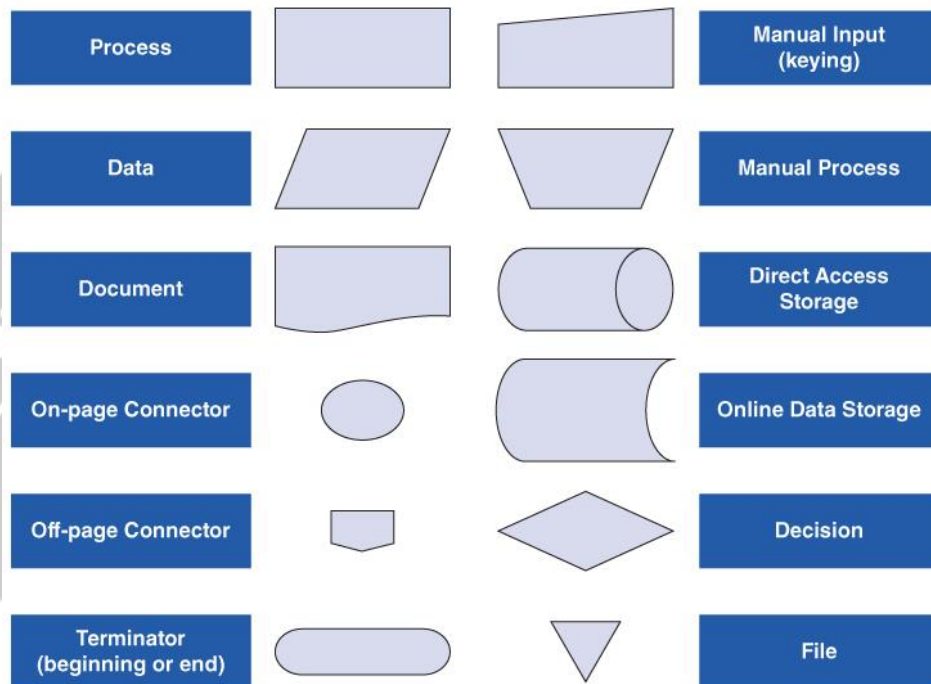


Figure 2.6. System Flowchart Symbols

(Source: Turner et. al., 2017)

This flowchart shows the general sequence of the business process in the company using those symbols. Inputs can include any kind of information in the form of data, document, electronic information, or processes that feed data to other processes. Process can be manual or computerized process. While output can be document, statement, decision, reports, stored data or data fed into other process. The flow of information in the business process then be shown using the line and each line connected at least 2 symbols that represents the relations between those elements.

System flowchart can be used to complement data flow diagrams. It combines the business, information, and the information technology that can describe the business process in the company (Vaassen et al., 2009).

2.2.5. SWOT Analysis

The origin of the term “SWOT” is unknown. It has been used by individuals or organizations to identify complex strategic situations to support decision making by reducing the quantity of information. (Chiritescu, Andrei, & Gogonea, 2013)

SWOT Analysis focuses on how the researcher analyze recommended strategic actions for a company or organization. This method is done by listing the favorable and unfavorable internal and external factors in the form of 4-quadrants SWOT Analysis Grid. The quadrant shown in Figure 2.3. (Helms & Nixon, 2010)

STRENGTH INTERNAL	WEAKNESS INTERNAL
OPPORTUNITIES EXTERNAL	THREAT EXTERNAL

Figure 2.7. 4-quadrant SWOT Analysis Grid

Strength and weakness include the internal factors from the company and those factors can be determined according to company's resources, access to the resource, company's structure, the uniqueness, the location of the company and company's business process. Factors considered as company's strength usually give competitive advantage and attractiveness to the company, while factors considered as company's weakness usually create obstacles and tendencies to the company.

The opportunities and threats can be found by analyzing company's external environment which can include the customers, competitors, market trends, company's business partners (suppliers, distributors, agents, etc.), social and economic condition, the development of technologies, and government regulations. Opportunities are factors that possibly support the development of the company in many ways, while threats are factors that able to decrease the company's competitive advantage and a attractiveness.

2.2.6. SWOT Strategies

SWOT Strategies can be determined by maximizing company's strength and opportunities analyzed in SWOT Analysis. It also can be determined by minimizing company's weakness and threat. These strategies formulations can be done in four different types of strategy. The first is SO-strategies, which formulated by considering both strengths and opportunities and combine those factors to propose strategies that can be used to support the external opportunities using company's current strengths. The second is WO-strategies, which formulated by considering the way to reduce company's weakness so the opportunities can be developed well. Then, the third is ST-strategies, which formulated by optimizing the company's strengths to minimize any possible problems caused by company's threats. Lastly, WT-strategies, which consider the way to reduce the company's weakness in order to avoid any external threats, or can be determined as a defensive strategy. (Rauch, 2007)

2.2.9. Microsoft Excel and Excel VBA (Visual Basic Application)

Microsoft Office Excel is one of Microsoft Office Packages that is essential for collecting, managing, and analyzing data in a tabular form or usually known as a spreadsheet. The spreadsheet can help the user to do the arithmetic calculation using some mathematic functions that provided in the program (Kadry, 2011). Microsoft Office Excel spreadsheet also can do non-numerical functions such as date and time, logic, text, etc.

The document made by this program can be designed in such a way that it has a certain layout, fonts, colors, to improve its visual presentation (Sung, 2011). Besides, it also can represent a collection of data and calculation result in the form of chart, table, diagram, that can improve the presentation of data (Doush & Pontelli, 2013).

Processing data in the spreadsheet is a common method, and it becomes an important tool for problem-solving (Pichitlamken et. al., 2011). Some data analyst has been using this program to manage various of data.

Besides the main functions that have built into the program, Excel also has additional feature for programming called Visual Basic Applications (VBA). It is a combination of Microsoft Office Excel and Microsoft Visual Basic. This feature develops the Excel functions into a graphic user interface (GUI) form that is built using VBA (Tambade, 2011).

2.2.10. Storytelling as Qualitative Research Method

Storytelling is one of qualitative research method type. This is a traditional method to gather some information about a certain process directly from the process performers or someone witnessing the process which can be called as the storyteller. This method let the storyteller to use natural language and contextual elements to express their experience in the working process. Without being confined by the limitations of a formal language, storyteller can express freely and the facilitator can use the reports to extend their knowledge about the processes (Santoro et. al., 2009).

2.2.11. Retailer

Retailing is buying certain product and reselling it by adjusting the price of the product in order to gain profit. A retailer is one of distribution channel that closest to the customer. Product produced by a producer or manufacturer distributed through wholesaler and retailer. A retailer directly interacts with the end customer. However, a retailer can also sell its product to another retailer.

In a book titled *Retailing in 21st Century* (Thomas & Segel, 2006), there eight points to indicates retail business' success factor called "The 8-Point Retail Filter", which are:

1. Product

This what the retailer sells. Considering what kind of product will be sell in the store is important especially to provide product availability in the store. But since the store has limited space, the retailer has to decide the right type product and amount of the product being supplied as the stocks in the store.

2. Presentation

Presentation of the product in the store is what the store will look like. Displaying the right product in a right place is necessary for the retailer itself and for the customer.

3. Procedures

There should be certain procedures in the retailer to organize the operational activity of the retailer. Procedures consists of how the retailer purchase product and sell the product. It can includes the regulation of delivery service and payment process. Even now, there are some innovative procedures implemented by the modern retailer like computer-based information system, e-commerce, etc.

4. Pricing

Pricing policies are depending on the customer and or the type of product that is going to be sold. The decision of giving discount for certain product is also one of pricing policies. Deciding the price also has to consider the price given by the other competitor.

5. Promotion

Promotion includes some activities to advertise and market the product to the targeted customer. The goal of a promotion is to be recognized by the public and gain attentions about the business in the retailer.

6. Profitability

Profitability is the retailer's ability to earn profit from the sales activity. A profit is the amount of money that left of the revenue the retailer generates after expenses.

7. People

People in the retailer includes the cashier, delivery staff, cleaning service, and so on. The retailer's success depends on how the retailer can organize and put them together to support the operational of the retailer.

8. Brand

A retailer can have an identifier that differentiate it with another typical retailers and it is called brand. Branding can be very important if the competitors are many and has a very typical business, for example a mini market, supermarket, etc. From many supermarkets, customer has to choose one whenever they want to buy daily needs, so branding plays important role in this case.

These points are used by retailer to analyze and evaluate its business process. Thomas & Segel stated that these points are basic elements of running a retail business. They are essential to the retailer as their success strategies. By identify those points, the retailer can focus on detail and set goals better in order to support its business improvement.