CHAPTER 2

LITERATURE REVIEW AND THEORETICAL BASIS

2.1 Literature Review

A literature review is a process of finding information from other research. A literature review helps the researcher to find or arrange a method/way to solve the problem encountered.

2.1.1 Previous Research

Previous research helps the researcher to solve the problem encountered by understanding the process of problem solving in previous research. Previous research is searched based on research, books, or journals that have been published. The summary of previous research can be seen in table 2.1.

Based on the research findings of Reis et al. (2017) main aspects of the research are related to warehouse design. The framework for solving problems regarding warehouse is divided into inputs, design, implementation and outputs. Input is divided into three aspects, namely supply chain design, financial factors, and operation factors. Design and implementation are divided into five parts, namely layout, operation strategy, resource dimensioning, information and control technology, and measuring and monitoring performance. While the output is divided into two namely service level and cost. The research of Dukic and Opetuk (2012) showed the purpose of this literature is to discuss how to arrange the traditional layout of the warehouse optimally, that this literature also discussed how to prepare the modern warehouse layout optimally. To minimize the cost of the warehouse, the layout design needs to be designed well, after designing the warehouse layout, the next step is to think about the layout. So that the process of taking goods can take place more effectively and efficiently. The literature by Martínez et al. (2012) showed a guide about how to create a fishbone layout. Fishbone's literature layout is based on an international journal of logistics. The advantage of using a fishbone warehouse layout is that it can determine the layout better so that the process of taking goods can be done 20% faster than traditional square warehouses. The literature of Baker and Canessa (2009) discussed how to create a general framework for the steps in making a warehouse design. Several aspects can be considered to arrange warehouse design. Because these aspects can help in forming a better warehouse layout. The literature also used several

methods and tools so that the warehouse design process can become more mature, an example of a tool used in computer-aided design or commonly referred to as CAD. Martínez et al. (2016) showed about minimizing the distance to the warehouse so that the process of moving goods can be done more effectively and efficiently. In this literature, the author studied the impact of class-based storage policy based on the optimal configuration of U-flow single command warehouses using an ABC product classification. The method used is ABC product classification. Gu et al. (2010) discussed the overall warehouse design, performance evaluations, practical case studies, and computational support tools. But not all of the knowledge contained in the literature is used. There are several methods used to design warehouses such as simple analytical equations and multi-stage hierarchical approaches. Wibowo et al. (2016) discussed the arrangement of materials on the shelf so that the process of structuring goods can be neater and does not take up much space. The method used in this literature is the shared storage method. Placement of goods also can be arranged by using a rack, so that the remaining space can be used to store other goods. This system is more suitable to be used in outbound activities. Outbound activities are activities that move material from the warehouse out of the warehouse. Bentz (2017) discussed Fiskars's Garden Tools Distribution Center (D.C.) located in Billnäs, Finland. By using the ABC Analysis method or Pareto's 80/20 rule researchers can determined goods with the highest sales and picking frequency. By knowing goods with the highest sales and picking frequency the author can determine the location of the shelves by looking at the highest picking frequency. The author can also determine the place according to the intensity of taking goods. Tinelli et al. (2012) discussed product positioning based on the ABC method. By using this method the researcher can observe the highest logistic costs in the company. Besides that, the researcher can also find out the most important part of optimization. The result of this method is to fix the conditions in the company and storage in the company. Geuken and Jäger (2015) discussed developing a Warehouse Layout Design Framework for Fast-Growing Companies. By evaluate and searching data through developing companies, researchers can design the layout of the warehouse. Data that can be obtained using the warehouse layout design framework method are growth expectations, the current layout, and flexibility for volatile future demand. Ekoanindiyo and Wedana (2012) contained a method to calculate the area needed to accommodate raw material and finished product. This literature also has a

purpose to make a better warehouse layout because poor layout conditions can lead to inefficient delivery of goods. A warehouse that has poor structuring procedures will cause the room less organized.

Table 2.1. Literature Review Summary

No	Researcher	Research Object	Research Purpose	Method	Result of Research
1	Reis et al. (2017)	-	improving and understanding warehouse design by the construction of framework	1. Layout 2. Operation Strategy 3. Resource Dimensioning 4. Information and Control Strategy 5. Measuring and Monitoring Performance	* Maximize the Service Level * Minimize the cost of implementation and Operation
2	Dukic and Opetuk. (2012)	-	overview of optimal traditional layouts, overview of new innovative storage area layouts, results of the analysis of order-picking in these new innovative layouts and relevant conclusions	1. Optimal layouts of storage area 2. Optimal layouts of order-picking area 3. Non-traditional warehouse layouts 4. Order-picking in non-traditional layouts	reduction in average order-picking travel
3	Martínez et al. (2012)	-	study the Fishbone Warehouse Layout	Fishbone Design	Fishbone Design Layout
4	Baker and Canessa. (2009)	-	designing warehouse	1. Database and spreadsheet models for data analysis 2. Spreadsheet models for considering equipment types 3. Spreadsheet models for considering equipment types 4. Computer Aided Design (CAD) 5. simulation software and formal spreadsheet models for evaluation and assessment	The output is a general framework of steps, with specific tools and techniques that can be used for each step

Table 2.1. Continued

No	Researcher	Research Object	Research Purpose	Method	Result of Research
5	Martínez et al. (2016)	-	Study the impact of class-based storage policy based on the optimal configuration of U-flow single command warehouses using a on an ABC product classification	ABC product classification	Minimize the expected travel distance of the warehouse
6	Gu et al. (2010)	-	Mastering warehouse design, performance evaluation, practical case studies, and computational support tools	Multi-stage hierarchical approach	Effective and efficient warehouse
7	Wibowo et al. (2016)	-	Provide a storage rack layout of raw materials	Shared storage method	Effective space usage
8	Bentz. (2017)	Fiskars's Garden Tools Distribution Center (D.C.) located in Billnäs, Finland	optimize the layout	The ABC analysis is based on Pareto's 80/20 rule	a high sales revenue and have the highest picking frequency
9	Tinelli et al. (2012)	-	Observing high logistic costs in the company, highlighting the needs of the proposed optimization	ABC Curve, Pareto´s Principle	Improved conditions and storage methods
10	Geuken and Jäger. (2015)	-	Develop an aligned warehouse design solution for current and future operations considering a company´s growth expectation	warehouse layout design framework	growth expectations, the current layout and flexibility for a volatile future demand
11	Ekoanindiyo and Wedana. (2012)	Plastic Factory at Semarang	* Goods arrangement in warehouse and inventory * Calculating average monthly production * Calculating average monthly inventory	Shared Storage	* Storage Area Required * asile width

2.1.2 Current Research

The research was conducted at companies located in Kebumen Regency. Name of the company that used as the object of research is CV. Sang Timur or Toko Sumber Wangi Kebumen. The address of the company is Jl. Kolopaking No. 15 Kebumen.

The purpose of doing research in the CV. Sang Timur is giving recommendations regarding the layout arrangement in the warehouse.

Data obtained from the company were processed into output in the form of a warehouse layout proposal.

2.2 Theoritical Background

This sub chapter discusses theories related to the title, namely warehouse layout arrangement. After getting an understanding of the title used, the researcher also needs to determine the function, types, and how to organize the warehouse.

2.2.1 Problem analysis

Problem analysis is the process of understanding the problems that occur in the object of research. Problem analysis is carried out so that researchers can understand in detail the problems faced by the company and the effects that these problems can cause. By knowing the problems faced by the company, the researcher can make decisions in solving the problem, then the researcher can also find out the effects caused by these problems. The effects caused by the problems that occur help researchers making decisions in choosing methods to solve problems.

By conducting problem analysis and being able to understand the problems in the company, the actions taken by researchers can be more effective.

In conducting problem analysis, researchers need to really understand the problems that occur in the company and the effects of these problems. Data to make problem analysis can be obtained from the interview and observation process that has been carried out.

2.2.2 Warehouse Function

Function of the warehouse are providing good for the shop. So the shop can provide goods for the customer. The main purpose of a company is to guarantee customer satisfaction. Aspect that can guarantee customer satisfaction is product

availability. By providing products according customer needs, the customer will be satisfied. Second aspect is on target. The meaning of on target is the customer are provided with goods and quantity they want. To guarantee these aspects a company needs to stock items that have possibilities needed by the customer. To guarantee these aspects the company must provide facilities to stock these items. So in conclusion the function of the warehouse is providing space to store goods that are needed by customer. Warehouse also have to be maintained and arrange in order to perform well. With the right method the activity conducted in warehouse can be improved. Resulting better business activities in the company.

2.2.3 Definition of Warehouse Layout Arrangement

"The design of warehouse's layout represents one of the priority tasks of successful manufactures. An optimal warehouse layout contributes to a decrease in the overall production costs and to reduce the overall time required for orders management and fulfillment. (Mirabelli et al., 2015).

With a warehouse, a company can accommodate goods according to customer needs. But the warehouse can also be one of the factors that hinder the sales process at retail, because with a messy warehouse the process of finding goods is harder to do.

Layout is a drawing that has been arrange based on method or proposal, in order to arrange goods or facility placement. With a good layout design, condition of the warehouse can be neater. So the process of finding goods can be faster and accurate.

Arrangement is an activity with purpose improving the quality of layout design. By arranging the layout properly the activity of searching goods can be conducted with more simple.

2.2.4 How to Arrange Warehouse

To manage warehouse layout, several method are used. Method used to improve the performance of the warehouse are: determining placement of goods, determining warehouse condition and shorting the level of goods importance.

Condition of the warehouse is comparison between warehouse capacity and goods owned by the company. Data of warehouse condition is used to help the researcher to determine the placement of goods. The idea of finding warehouse

condition are motivate based on research conducted by Ekoanindiyo & Wedana (2012).

The placement of goods is determined according to the placement of goods policies. To determine the type of good placement policy, first the researcher must collect information from the source. Researcher also have to understand the condition of the warehouse. Then the information is used match the placement of goods with the condition faced by the company.

Based on research conducted by Reis et al (2017). Layout is one of the methods used to improve warehouse design performance. Then the aim of the research is to maximize service levels in resource-limited situations and minimize operating costs. Researchers and Reis et al (2017) have the same goal, namely increasing service levels. To achieve this goal, the researchers decided to use the layout as a solution to solve the problems that occur in the company.

To get a good layout, the placement of the items is arranged. One of the methods used to organize the placement of goods is ABC analysis. From the research conducted by Martinez et al (2016) regarding the warehouse sizing problem under class based policy. ABC analysis using class based storage policy can be used to minimize warehouse travel distance. With the same objective, the researcher used ABC analysis with class based policy to minimize the time and distance for taking goods from warehouse stores. By using this method, the researcher increase the time efficiency due to the definite placement of goods. ABC analysis is a method used to sort things based on priority levels. The priority level is adjusted based on the needs of company. To get the best results, researchers determine the needs of the company. From the research conducted by Bentz, K.T (2017), ABC analysis is used to sort products based on revenue and the frequency of items that are most often taken. From the data obtained, it is then processed and then goods are located to strategic location that is easily accessible to workers. From the problems that occurred at CV. Sang Timur researcher moved goods based on the most frequently purchased items by buyers and then based on their priority level moved the goods to a place that is easily accessible to workers. So the researchers used the report that has been made by Bentz, K.T (2017) to guide the design of the ABC analysis that has been carried out.

The combined method of random storage and dedicated storage is also used in the research that has been conducted. In the research of Wibowo et al (2016)

shared storage is described as a mixed method between random storage and dedicated storage. The shared storage method is used in order for the warehouse to adapt to uncertain demands. Due to uncertain demand conditions at CV. Sang Timur, the researcher used a combination method of random storage and dedicated storage in order to suit the company's needs. Researchers do not use the same method to implement the share storage method because the conditions are different from the research conducted by Wibowo et al (2016). Researchers also do not use the name shared storage because researchers also use class based storage methods in the research that has been carried out, so the use of the name shared storage is not suitable for use.