

A Study on the Operation and Function Improvement for apparel warehouse Using Fuzzy-AHP

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Fuzzy-AHP를 활용한 의류 물류창고 운영개선에 관한 연구

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Abstract Given the expansion of globalization and international trade, the number of apparel consumers is growing every year, making it difficult to estimate the amount of handling needed from the logistics industry. To determine which management factors are important and which ones require improvement, fuzzy AHP was used. Using this method, the factors were ranked in the final analysis as follows: The first and most important factor was training employees (0.17), while the second was fire hazard management (0.169); the third-highest factor was inbound and outbound goods (0.142), and the fourth was the warehouse management system. Barcode management was ranked fifth. By these results, we were able to analyze the processes of clothing warehouses, noting that although the factors appear independent, they are actually connected while proceeding with full management control. Moreover, because of the special characteristics of garments, employee management is crucial. Due to the vulnerability of these goods to fire hazards, this factor must be well managed.

Key Words : Fuzzy-AHP, Apparel Industry, Warehouse Operation, Operation Factor, Warehouse System(IT), Improvement Plan

요 약 국가 간 다양한 상품 무역에서 과생되는 물류업무를 처리하기 위해 세계 물류시장은 성장하고 있는 추세이다. 특히 의류물류는 매년 처리량이 증가하고 있으며, 세계 산업 중 손꼽히는 매출 기록을 나타내고 있다. 현재 의류품목은 고가의 제품으로 성장하였으며, 정교하고 알맞은 물류서비스가 요청되고 있다. 본 논문은 3PL 서비스를 제공하는 회사들이 앞으로 성장하고 있는 의류시장에 대한 서비스 및 오퍼레이션에 대응할 수 있도록 효과적인 운영방안을 제시하는 것에 연구목적이 있다. Fuzzy AHP방법을 사용하여 의류창고 운영에 대한 중요요인의 가중치를 산출하였다. 분석결과, 1위로는 인력교육(0.17) 2위로는 화재관리(0.169), 3위로 입출고 관리(0.142)로 나타났으며, 4위와 5위는 각각 Warehouse management system 및 바코드 시스템으로 확인되었다. 즉 '의류' 특성을 정확히 이해하고 이를 바탕으로 인력교육, 화재관리 그리고 입출고관리를 수행해야하며, 이를 통하여 의류물류 서비스의 질을 제고할 수 있다.

주제어 : Fuzzy-AHP, 의류산업, 창고운영, 운영요인, 창고시스템(IT), 개선방안

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1. Introduction

With the recent development of globalization, a great variety of brands and items are being traded at all levels of society. Many of these brands, including global and luxury ones, are quite well known and are traded in worldwide markets within each nation.

Even though the demand for items from particular companies is not very high, these companies still enter the specific market of a given country, building a third-party logistics(3PL) workforce for manufacturing, or sometimes just using 3PL methods. There are many reasons for companies to use this strategy, but the most common is to reduce the cost of manufacturing and logistics by creating a home base for their workforce, thereby saving the labor and cost of transporting workers and exporting goods to third-party nations.

Nowadays, manufacturing companies are aware that logistics represent a large part of their total sales costs, and they are very eager to reduce this particular cost. Most companies choose to put their base 3PL in Asia. Along with many other Asian countries, South Korea is suitable, mainly for two reasons. First, according to 2016 IMF data, the Republic of Korea ranked 11th for worldwide GDPs, at \$14,044 USD. The Republic of Korea's economy has grown tremendously since its beginnings. Therefore, companies perceive South Korea as a place with high demand and potential for profit. Second, South Korea is an international trade-based nation, so the logistics for air and sea ports, as well as trucking, are held to a strict standard. The country's economy also has a high potential for growth, so for nearby companies, putting a manufacturing and 3PL base here and then exporting the goods to the third-party countries can be an ideal arrangement.

Many kinds of items are in demand among customers, but apparel is in very high demand not only among South Koreans, but also among consumers all

over the world. Apparel companies commonly place their work base in Asian nations, particularly in South Korea. Therefore, South Korea's 3PL apparel service is growing and meets high standards.

Compared to the past, the value of and demand for apparel has grown greatly. Luxury apparel has an especially high value, costing from thousands to millions, and it is in high demand in the market. Given the high value involved in the development of such apparel, 3PL is needed. It must be managed very precisely and with high regard to safety to satisfy the needs of the customers. More development is needed to fulfill the requirements specific to apparel services and to know what these are. This study takes a close look at apparel warehouse management in today's fashion industry. In the following research, drawing out the operation factors of the apparel warehouse. Reflecting the data from the on-sight Apparel warehouse operation managers and resulting the priority of the operation importance using the Fuzzy-AHP method. By the final result we are suggesting the most optimum and the realistic Apparel warehouse operation.

2. Theory of Background and Literature Review

2.1 Industry of Fashion & Clothing industry

The origin history of clothing and somewhat close to the clothing has started since the approximate thousands of years before. As the century of the human time has changed and the development of the technology gradually increased and advancement of clothing have led as a popular culture of expressing our minds of creativity. By the factors that the rising of the economic growth comparing to the past, clothing was just a necessary need for the cover of our body to the well known public. But as somewhat the clothing has shown the rank and the status of the person. Still in the origin past luxury of clothing had existed. Comparing

to the current status of today the industry of fashion was not a big role in the normal society but the industry did exist. In Korea as the approximately in the 1900's the fabric business was starting to grow and by the time of today the business of clothing became a big central industry in our days today. And by the development of these factors of the industry and based on the instinct of human being of seeking to be more somewhat creative and beautiful the industry of clothing is a big business in the 3PL logistics. Currently there are over approximately 100,000 brands around the world and more that are not estimated. For the top companies of the brand cost value is approximately ten billion dollars and the world wide trade cannot be estimated by the numbers because of the fast estimated growing of the industry.

Due to the factors of the clothing manufactures, now the companies are putting their work bases all over the world and are unable to proceed the logistics of own power. And regarding 3PL companies are operating the handle for these clothing industry the service is very much being upgraded for the high value and needs for these items. And for the value of the luxury brands cost approximately between thousands of dollars to hundred millions of dollars and due to the status 3PL when giving the service it handles with strong care a specific quality of the clothing when handling the 3PL of these clothing. And it is very important to look into the advancing development of the 3PL when giving the service to the clothing industry for the right procedures.

2.2 Literature Review

Of the following chapter regarding the clothing warehouse efficiency of operation we will look into the advanced literature studies and will closely consider the study and will draw the informations and limit the study of differentiation to the current research.

Kim study focuses on the importance of procedures in warehouse operations, using European companies

with 3PL services in Asia as a case in point.

In the study the author is giving the main definition and the appropriate function when proceeding the warehouse services. It points out that the 3PL warehouse service is changing the function to a more responsible manner of service due to the adding services of the 3PL companies that are requested by the manufacture customers. And points out the conclusion that the services of the added service and the change of the responsibility of an warehouse regarding the functioning process is very much needed to cope the demands of the customers[1].

Kim et al. examine the efficiency of warehouse operations when loading goods using a stock plan. The authors found that many manufacturing companies were increasing the amount of goods entering the warehouse, which required more space. Their only option was then to construct additional space, which prompted them to spend a great deal of money. And in the study it show that the domestic warehouse of Korea when planning the warehouse they tend not to be well detailed planned and is spending the additional cost of construction after the business and the warehouse owner trying to reduce the cost when the first constructing the warehouse is occurred it results to weak construction and after time accidents can occur. So by these points the study focuses on a company that have proceeded the storage to the passage and resulted that it gives efficiency of reducing the cost and the additional amount of space that can be stored[2].

Yi et al. look at the standard model of management for a logistics center. With the generation of new information technology (IT), many new products are being developed or manufactured, and brands are seeking a higher-quality 3PL services to meet the needs of the end consumers. So as to these factors the research is showing the standard current process of the warehouse that is being operated and the characteristic of the warehouse management. By these standard

operation of the various development, the research is seeking to find a standard way of warehouse management to fulfill the variety of characteristic handling situations of warehouse operation by the 3PL providers. The results show that setting up the standard process by the main checkpoints and giving the best solution by the particular logistics characteristic the warehouse operation can lead to a better future[3].

Kim and Kim seek the best storage policy for warehouse operation management to minimize the time it takes to pack and process goods, which are essential operations in a warehouse provided with 3PL added-value services. And to deeply seek the research they have compared the existing method which is called class-based storage policy with other matching methods. Comparing by the suggested storage which is the level by block based storage the efficiency of reducing the time of the process has deducted so giving the results of these data, it is able to be known that it gives the efficiency of the inbound and outbound[4].

Lee, focuses on the efficiency of the introduction of an automated warehouse management system (WMS) by adapting the existing bar code system within the warehouse during operations. Given of the 5 to 13 digits of bar-code by adapting the use of these functions inventory and inbound and outbound will be well planned and can be precisely followed of the correct information inventory as well as the operation inside the warehouse. The study was proceeded by the research of an automobile component manufacture and looking at the process of their management of the products. Comparing the use of the manual paper way check, when using the bar code it gave the precise amount of inventory data because by manually inserting the data there can be mistakes but by scanning the bar code and transmitting the data to the computer, the mistake can be very much be deducted. So by the research it was able to be known that the bar code system of the warehouse operation was very much strengthen the operation process[5].

Shin et al. investigate the effectiveness of warehouse operations according to the type of warehouse. Manufacturing companies that handle different products end up using strategies that vary greatly in terms of operation. In light of these differences, this study aims to discover what factors influence the efficiency of warehouse operation. Researching the experts on the field, the importance of the cause can be divided to facilities, automatic, standard procedure, human resource and operation and seeing the result facility and equipment was given as the most important factor. So by the study it cannot define all of the existing situations but as the result of the research can be know that the by the facility it gives the influence to the operation of a warehouse[6].

Kwon et al. explore the possible consequences of a fire inside a clothing warehouse. To this end, they created an experiment with a real fire trial on a model warehouse that was constructed. They used equipment to perform the room corner test and based the characteristics of the fire on the DB file, which represents a clothing warehouse. This experiment was to give the knowledge of the danger inside the warehouse when the fire has occur. And putting the model of the warehouse constructed of two different which is styrofoam and glass wool covered by panel gave a twice the more heat outcome as well as inside has been burnt very highly. By the research the construction of the warehouse and the product inside can give a high fire risk as well mass destruction[7].

Kim et al., the study focus on achieving the data of a fire under the bridge by giving the experiment to the fire result of inside the clothing warehouse. To proceed the experiment 10 MW of large scale calorimeter was used and using the glass wool and the styrofoam of the panel able to research the happenings. By the actual proceeding the experiment it was able to see that under the 5 minutes the fire has enormously been proceeded and by the result toxic gas has outcome and gave the result of able to finding the high danger of the

situation[8].

Yoon and Chun examine the quality of domestic logistics of outsourcing of the apparel industry in Korea. This research shows what kinds of services apparel companies score the highest. These results may predict whether the manufacturer will renew its contract with the logistics supplier. The research method was proceed by giving the survey to 65 companies that has the yearly sales cost of over a 10 billion and out of these companies 35 are apparel manufacture companies. 68.6% gave the logistics supplier the job to service and 88.6% gave the logistics suppliers part of the job. Given the survey the result was sorted by high, middle, low variables and given the factors of service ability and possessing the service. The result showed that the companies were giving the positive thoughts of the network that the logistics companies and that the service and the operations are very well positive and that by the quality of the service recontract can be proceeded[9].

Yoo investigates the most important factors when apparel manufacturing companies select 3PL companies for apparel logistics service. The study shows the basic concept of the 3PL service for the logistics and arising development of the services that are being proceeded in the warehouse. Giving the precise and matching the needs that the apparel companies are requiring to suggest 3PL are adding and developing the service that the companies need. By using the AHP method and the survey of employees that have been working in the field of logistics of the apparel companies which is inside the work force of department stores and road shop from over 5 years and putting the status to 15 peoples. The result has shown that service of the handling in the warehouse for the apparel is important and the network of the 3PL companies that reaches is important and lastly the variety of the different service require is important. As a result the study shows when the apparel companies are seeking for the 3PL supplier, they give the most positive factors on the service of

handling the goods as well as the network with the high tech information technology set up. It also gives another result of the high skilled staff member as a positive factor[10].

Lee looks at improvements in logistics operations for the apparel industry. The study attempts both to reduce costs and to improve operation efficiency by seeking the factors of successful apparel warehouse operation. The method of the research was by the survey and referring the advanced literature studies. The particular company was given in the research to see the negative factors and a way to improve the situations[11].

Son and Rhee outline the increasing demand for apparel brands as the textile industry becomes more globalized. Textiles and apparel brands are growing in the Korean market, and this study shows that the rise of exports will make the demand for this industry increase still further. The method was proceed by seeking the data's of the export status by regions in the world and researching the companies of apparel on the investment that have been carried out. As a result the rise of the OEM is giving the data that the needs of demand is rising and that the Korea manufacture of the fabric and apparel is not yet strong from the outside of Asia[12].

2.3 Differentiation of the Research

In the literature review, many studies were found that focus on warehouse operations, particularly for apparel warehouses. The efficiency of warehouse center operations, storage, apparel handling, and many more related subtopics have been actively studied. However, the current study aims to discover which factors are absolutely necessary for apparel warehouse management. Although there are many studies that explore the operation of warehouses in general, there are relatively few studies on the apparel industry, despite its recent growth. Therefore, more studies are needed to investigate the best possible operation for apparel warehouses.

<Table 1> Condition of the Worldwide Purchase of Clothing

Country Market Potential Rate		
1	China	0.50
2	USA	0.33
3	Bangladesh	0.19
4	Tanzania	0.18
5	South Korea	0.17
6	Cambodia	0.14
7	Ethiopia	0.13
8	Yemen	0.13
9	Panama	0.13
10	Bolivia	0.12
11	Japan	0.12
12	Ecuador	0.12
13	Italy	0.11
14	Brazil	0.09
15	Kyrgyzstan	0.09
16	Malaysia	0.08
17	UK	0.08
18	Israel	0.07
19	Jordan	0.07
20	Germany	0.06

In this the study, a review of the literature was conducted, and surveys were distributed to experts in the warehouse operation field with approximately 3~20 years of experience. In the following research to analyze the success of the Apparel warehouse operation, Fuzzy-AHP has been used and applying the experts of the field to the method is a very advantage fact. Using the survey results, the fuzzy AHP method was adopted to point out which factors are important. By ranking the factors based on their priority, the most important factors and those that require further improvement have been identified for apparel warehouse operations.

3. Analysis of Clothing Industry

3.1 The Condition of the Clothing Industry

In 2015, the data standard of the clothing industry, which includes all types of apparel, was estimated to be \$1.2 trillion (USD) worldwide, and in 2017, it was estimated to be \$42.9 billion (USD) in South Korea. By 2018, the world clothing market is estimated to become

3.6% larger than it was in 2014. Now, Bangladesh, China, Korea, Tanzania, and USA seem to be potential areas of growth for this market. 'Global Research & Data Services', a research company, recently published a report, which stated that from 2007 to 2013, there was an average 5.1% yearly increase in the clothing market. In the table below, the purchase rate of each clothing category is indicated by an individual percentage.

Similarly, USA , China, Japan, and Italy experienced a high degree of expected growth in this market. Cambodia, Ethiopia, Bangladesh, Yemen, and Tanzania have also experienced high growth, indicating the rapid spread of the clothing market worldwide due to globalization. By examining the data of particular companies, we are able to see 20 countries with the greatest potential for growth in the clothing market.

3.2 The Fashion and the Clothing Industry

In Korea, the fabric industry began to develop in the early 1900s. Today, the clothing industry has become central to the nation. With the development of this industry, which was based on the human instincts of ingenuity and creativity in the manufacture of beautiful things, the clothing business soon adopted 3PL. Currently, there are over 100,000 brands of clothing around the world, and many other brands are not included in this estimate. For the top brands, the cost value is approximately ten billion dollars, and the worldwide trade within this quickly growing industry cannot be estimated accurately.

<Table 2> Condition of the Worldwide purchase of Clothing

Purchase of the Clothing Industry	
Women's Clothing	50%
Men's Clothing	34.5%
Clothing Accessories	3.9%
Baby Clothing	2.8%
Sportswear & Gloves	2.3%
Towels	2.0%
Other Kind of Gloves etc	4.1%

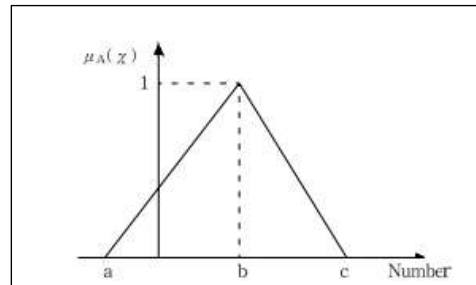
Because of the many factors involved in clothing manufacturing, companies are now putting their work bases all over the world, and they are unable to proceed with the logistics using their own power. Since 3PL companies take care of the handling for these clothing companies, the service is constantly being upgraded to achieve higher value and to accommodate the demand for these items. As a consequence of their 3PL status, the value of luxury brands ranges from thousands of dollars to millions of dollars. When the 3PL handles the clothing, care is taken to ensure that a specific quality standard is met. Hence, identifying the best procedures for advancing the development of 3PL services can benefit the clothing industry.

4. Empirical Analysis

4.1 Fuzzy-AHP Method

Fuzzy-AHP (Fuzzy-AHP) is an analytic methodology that combines AHP and Fuzzy theory. AHP is a method of layering multi-criteria decision problems and determining the importance of each property through pair comparison. However, Oh et al. pointed out that the scale used in the analysis of AHP analysis is composed of specific figures and is not suitable for actual decision making. Fuzzy-AHP is the analysis method that can overcome these drawbacks[13]. The fuzzy hierarchical analysis can solve the problem that the AHP method does not apply the human ambiguous factors by using the triangular fuzzy number to determine the response area. it is able to digitize the uncertain of the human expression and give the difference of the analyze Above [Fig. 1], the triangular fuzzy number is composed of (a, b, c), and a, b, and c can be expressed as a range of lower limit, middle, and upper limit when analyzing the questionnaire response. Since these mathematical operations can not be converted to linguistic values, the range of direct linguistic values must be converted to fuzzy

numbers[14]. Therefore, in this study, <Table 3> is used.



[Fig. 1] Triangle fuzzy number

<Table 3> Scales of triangular fuzzy numbers

Importance	Triangular Fuzzy Numbers	Reverse Swap Triangular Fuzzy Numbers
Equal	(1, 1, 1)	(1, 1, 1)
Very Low	(1/2, 1, 3/2)	(2/3, 1, 2)
Low	(1, 3/2, 2)	(1/2, 2/3, 1)
Medium	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
High	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Very High	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

In this study, we used the weight analysis method proposed by Chang [15]. If $M_2 = (a_2, b_2, c_2) \geq M_1 = (a_1, b_1, c_1)$, the probability of the triangular fuzzy number is given by the following equation (1).

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d) \tag{1}$$

$$= \begin{cases} 1, & \text{if } b_2 \geq b_1 \\ 0, & \text{if } a_1 \geq c_2 \\ \frac{a_1 - c_2}{(b_2 - c_2) - (b_1 - a_1)}, & \text{otherwise} \end{cases}$$

In the above equation (1), d is the y -coordinate value of the highest intersection D between μ_{M_1} and μ_{M_2} . Also, for comparison of M_1 and M_2 , $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$ values are required.

The equation for calculating the probability that the number of fuzzy numbers k is greater than M is given by the following equation (2).

$$V(M \geq M_1, M_2, M_3, \dots, M_k) \quad (2)$$

$$= V[(M \geq M_1) \text{and} (M \geq M_2) \text{and} (M \geq M_3) \text{and}$$

$$\dots \text{and} (M \geq M_k)] = \min V(M \geq M_i), i = 1, 2, 3, \dots, k$$

Assuming $d(A_i) = \min V(S_i \geq S_k) \quad k = 1, 2, 3, \dots, n; k \neq i$ where the weight vector is given by the following equation (3).

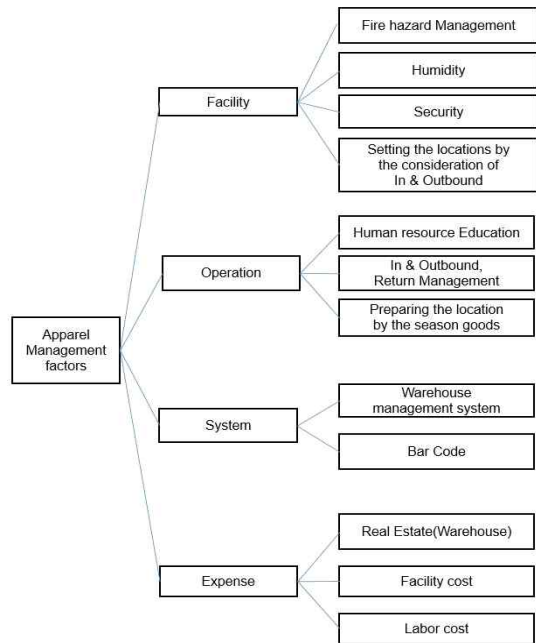
$$W' = (d(A_1), d(A_2), d(A_3), \dots, d(A_n))^T \quad (3)$$

4.2 Results of Fuzzy-AHP Method

[Fig. 2] is hierarchy for this research. For this research, a survey was given to determine the most important factors. As shown in the following <Table 4>, about 30 people were given the survey and replied to it. These individuals are all experts in the field of logistics and have experience with warehouse operation. The interviews shed light on the most important factors for operating apparel warehouses, and the contents of such warehouses were discussed based on normal operations.

<Table 4> Content of factors in survey

Gender	Male			
	30 People			
Age	21-30	31-40	41-50	51-60
	4	6	10	10
Academic	High School	College	University	Graduate School
	12	10	5	3
Position	Clerk Assistant Manger	Section Chief Deputy Head	Department Head	Executive
	7	6	7	10
Duty	Operation		Deputy Center Head	Center Head
Work Period	3-5years	5-10years	10-20years	20years or over
	4	8	8	12



[Fig. 2] Criteria Structure

As shown in the table below, the survey respondents ranged from 21 to 60 years old, and their work experience ranged from 3 to over 20 years. Most of them had internal warehouse operation skills, while others were also acquainted with the management of warehouse operations. Their positions ranged from clerk to executive.

The results of the analysis of important factors in the operation of apparel warehouses are as follows: training employees (0.173) was the most important factor, while the fire management (0.169) and in and outbound management were the next most important factors. This applies to all warehouses in the industry.

The training of workers in the warehouse is most important because of the volume of garments being handled. Such training allows the employees to be safe and to avoid losing items. If the necessary training is not provided, then the work cannot proceed, and loss of money will occur for both the client and the provider. When managing clothing warehouses, the important

factor is fire preparation. Apparel is especially vulnerable to fire, and if a warehouse fire were to occur, the danger and damages would be astronomical. In the processes for inbound and outbound goods, the management of returned items is a key factor. When the goods are outbound, many will be returned. Rather than destroying the returned items, the manufacturing company will decide what to do with them. So, if the inventory of returned garments is not well managed, the losses incurred can be quite substantial.

<Table 5> Total Analysis result of the factors in the Apparel Management factors

Main Factor	Detail Factor	Weight Value	Priority
Facility	Fire	0.169	2
	Humidity	0.011	11
	Security	0.078	7
	Setting the locations by the consideration of In&outbound	0.003	12
Operation	HR Education	0.173	1
	In&Outbound, Return	0.142	3
	Preparing the location by the season goods	0.033	10
System	WMS	0.090	4
	Bar code	0.087	5
Expense	Real Estate(Warehouse)	0.085	6
	Facility	0.073	8
	Labor cost	0.055	9

The WMS is also important because it controls both the inbound and outbound inventories, including the location of each individual garment. The WMS allows managers to plan the daily workload while managing the warehouse efficiently. There are many reasons for the importance of using bar codes. These include the ability to control the inventory and trace where a particular garment is located, as well as the ability to reduce the workers' operation time. Using IT is an effective way to manage apparel. Security came in at a low rate of importance while examining the importance of management factors. However, since inbound garments arrive at the warehouse in large quantities,

garments can be missed or out of stock if the inventory and other operations are not well managed. For this reason, security management is still important.

5. Conclusion

5.1 Conclusion and Implications

Worldwide globalization has allowed for an increase in the trade of goods between countries. With this increase, the 3PL service for manufacturing companies has become important in the industry to maintain our current lifestyle. The research in this paper focused on the apparel industry and the factors that affect the handling of apparel in the warehouse to determine which factors can be improved. Currently, the apparel business is very successful and the number of consumers are increasing, although the numbers are hard to estimate. Therefore, it is important to seek the services of a 3PL group as the needs of the customers and the money increase.

The method of analysis used in this research was fuzzy AHP. The results of the apparel management analysis showed that the operation (0.348) was the highest priority and that the facility (0.262) was second, with the expense (0.213) third and the system (0.177) fourth. However, when all the factors were put together, training employees (0.173) was first, fire management (0.169) was second, in and outbound management (0.142) was third, the WMS (0.090) was fourth, and the bar code system (0.087) was fifth. According to the results, the training of employees was the most important factor because large amounts of apparel, whether in bound or outbound, require handling by the employees. Following fire management, which was shown to be important because of the weak endurance of apparel to fire hazards. For the inbound and outbound operations, WMS, and bar code system were connected to each other. The WMS and barcode system can be used to manage the inventory and the

locations of particular garments.

The study showed that the operation of a normal management warehouse is very similar. However, the apparel logistics service is somewhat different when comparing the factors. This research indicated the most important factors needed to operate an apparel warehouse and the layout for an operating an apparel warehouse. Since the apparel industry is growing, the research suggested a future layout to develop the best way to handle the 3PL of apparel. and The following research not only focus on the Apparel operation of a warehouse but can give supplement data to the similar market which is the Apparel industry and is very much able to be useful as a meaningful data.

5.2 Limitations and future research

One of the limitations of this study was that the research into apparel warehouse improvement factors focused mainly on the operations. When an apparel warehouse is developed, all the factors should be researched, including the facility construction and operations. According to the apparel logistics service, each style of apparel can have a different operation, which should be considered when evaluating the impact that the factors have on an apparel warehouse. The most important factors were training employees and fire management. However, the WMS also has to be focused on the content to determine the positive effects. In a future study, the apparel logistics services should be researched according to each style of apparel. Specific factors should also be researched for each style, and the results should be compared to determine the total factors that affect the improvement of the apparel logistics warehouse service.

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