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ANALYSIS OF BARRIER REVERSE LOGISTICS PRACTICES COURIER COMPANIES IN INDONESIA

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Abstract: The number of returned goods in the supply chain process increases significantly when companies do not have an effective system to manage them. The lack of special attention to the Reverse Logistics (RL) process cause companies to under estimate this process. This study focuses on analyzing the implementation of RL practices by courier companies in Indonesia. This research utilizes the SLR and Fuzzy AHP methods. By using keywords related to RL implementation, a thorough search was conducted in Q1 and Q2 Scopus rankings in order to determine the problems in reverse logistics. With this we can see in terms of other countries that have the same problems. Then, with Fuzzy AHP we found that external barrier has the manage highest rank to manage.
Keywords: *Reverse Logistics (RL), barriers in RL, Fuzzy AHP, Systematic literature review, Courier companies*

1. Introduction

With the growth of online sales at this time, the development of logistics has also grown significantly. According to the Badan Pusat Statistik or BPS, the transportation, the warehousing and logistics sector in 2022 had the highest growth, reaching 19.87%. Logistics in one of the businesses that has experienced high growth in recent years even as the covid-19 pandemic outbreak has increased. Thinking about logistics, there is a very important process, namely the process of delivery. This process of delivers involves a business entity, namely a courier company that acts as the logistics intermediary to ensure that the items reach their destination on time and in good condition. But the process of shipping does not always go well, sometimes there are several mistakes in the first mile to last mile process. As a result of these problems, based on various policies that have been established, goods that have been reversed by customers must be returned to the supplier in order to meet the desired customer satisfaction standards. This return procedure is called Reverse Logistics.

Reverse logistics is the opposite of the logistics flow, where the product will be sent from the recipient instead of the sender. This is done for several reasons such as damaged products, inappropriate quantities, wrong addresses, and others. If the focus of logistics is that the goods are sent from the seller to the buyer, then the focus of reverse logistics is that the product are sent from the buyer to the seller. The definition of reverse logistics is “the movement of product from users to sellers in a distribution flow.” (Rogers & Tibben-Lembke, 2001). This reverse logistics process includes properly managing the return of products and goods in the supply chain. Due to the fact, it is difficult for businesses because they pay more attention to forward logistics activities than reverse logistics due to several considerations (Naseem et al., 2023a).

The reverse logistics process does not always does not always go well, there will be some miss handling is caused by various factors both internal and external. When the mishandling occurs and the goods have reached the recipient’s hands, a reverse logistics process will be carried out to handle the return of the goods. The reverse logistics process is generally carried out by almost all business entities, in order to provide satisfaction to customer. But with reverse

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logistics, several barriers will arise to carry out the reverse logistics process. The barriers and challenges in each business entity will be different according to what is being researched.
This research is to explore and identify the practice of reverse logistics which includes the barriers, it will be seen what alternatives will be done to solve some of these problems. a literature review of various journals,
To find the concept of reverse logistics in this study using *Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)*. The use of PRISMA is done to review a strict system, the system used to review this library is Watase Uake by following several structured processes.
The utilization of the Fuzzy Analytic Hierarchy Process (AHP) approach is a suitable research method for this problem, as this approach qualitative methods. The Fuzzy AHP method is used to prioritize all the problems that arise in this research, as well as to support the decision-making process that involves linguistic and subjective judgments. By using Fuzzy AHP, each problem can be given a weight that reflects its level of importance, making it easier to prioritize problems that occur more frequently and require immediate attention.

2. Literature review

2.1 Reverse logistic

Reverse logistics is defined as the process of moving goods from their final destination back to the manufacturer or specific location to add value or ensure proper disposal. The importance of reverse logistics is emphasized in various industries, especially in promoting sustainability though recycling, repair, and safe disposal. Reverse logistics is a process of planning, implementing and controlling the flow of raw materials from the point of consumption to the point of origin with the aim of recovering or creating appropriate value (Agrawal et al., 2016; Maheswari et al., 2020).

The flow of forward logistics is where the flow of materials from raw materials to final products and from suppliers to end consumers, while reverse logistics concerns the flow of materials and product from end consumers to manufacturers and suppliers (Dickie, C., & Dwyer, 2011). For example, the adoption of reverse logistics in the e-waste sector in Indonesia highlights the needs for effective strategies to engage customers and intermediaries (Maheswari et al., 2020). In addition, the integration of advanced technologies such as blockchain can increase transparency and efficiency in reverse logistics operations, there by mitigating common challenges (Naseem et al., 2023b). The involvement of the informal sector, especially in developing countries, further complicates the reverse logistics process, requiring customized approaches and robust frameworks to monitor sustainability (Maheswari et al., 2020; Nardi et al., 2017). the concept of circular economy also plays an important role in reverse logistics, where industry 4.0 technologies are used to achieve operational excellence (Dev et al., 2020). Historically, Reverse logistics have played a key in the industry in recent times there has been a sharp rise in the number of returns in many other industries, largely and the ease of availability of this option among consumers (Lamba et al., 2020a).

2.2 Implementation of Reverse logistics

The implementation of reverse logistics involves strategies and practices that aim to manage product returns and recycling processes. (Kumar & Putnam, 2008) said that his research found that the implementation of reverse logistics provides a benefit of 74% for energy shaving, 90% for natural resource benefits, 97% reduction in mining waste, 88% reduction in water emissions and 76% for water reduction. It can be seen that the implementation of reverse logistics will have a significant impact on a company. There are 4 key success factors for

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reverse logistics implementation, namely: Company background (number of staff, business field, roles in the SC), degree of recognition and perception (recognition of RL, perception of RL) dan internal and external factors. Internal factor consisting of company finances and resources support dan company human resources support. Factor external consisting of business partners in SC and government support (Ho et al., 2012).

There are several important aspects of reverse logistics implementation, namely product returns, returns processing, repair and rejuvenation, recycling and disposal, and inventory management. The returns process will include managing product returns from customers including those returned for other reasons and handling returns from various distribution channels. Returned products in RL can be collected from various points of consumption in various states of repair. Products may be returned due to the consumer's willingness to repair the product or damage, non-conforming goods, errors in delivery, or conformity to the consumer's needs (Panjehfouladgaran & Lim, 2020).

2.3 Barrier of logistics

The reverse logistics process is an activity that will be carried out by companies or producers, especially in companies engaged in freight forwarding services. Barriers in logistics, especially reverse logistics, are multifaceted, involving operational, regulatory, technological, and financial challenge (Waqas et al., 2018; Wardani et al., 2022). Courrier companies must learn how to properly conceptualize and implement reverse logistics. Analyzing the barriers to reverse logistics implementation is the first step to studying reverse logistics performance in any company/industry (Wardani et al., 2022).

Factors that negatively affect the reverse logistics process are referred to as reverse logistics barriers (Prajapati et al., 2019). Regulatory barriers are significant in developing countries, where the lack of supportive legislation hinders the adoption of reverse logistics (Maheswari et al., 2020). Technological barriers are often related to inadequate IT infra-technological barriers structure to track and manage reverse logistics activities, which is critical for sectors such as e-waste management (Naseem et al., 2023b). Financial barriers, including high implementation costs, are also major issue, especially in industries that are transitioning toward more sustainable practices (Younis et al., 2016). Overcoming there barriers requires a holistic approach involving government, industry and consumer engagement (Maheswari et al., 2020; Richnák & Gubová, 2021).

2.4 Fuzzy Analytical Hierarchy Process (FAHP)

Multiple-criteria decision making (MCDM) is one of the techniques used to handle unstructured problems that contain several objectives that may conflict (Lee & Eom, 1990). Some of the approaches that have been developed to solve MCDM problems are analytical hierarchy process (AHP), data envelopment analysis (DEA), and TOPSIS. These traditional MCDM approaches measure the ranking of alternatives and the weight on each criterion in the form of clear or precise numbers that depend on the preferences of the decision maker (Wang & Lee, 2009). Analytical hierarchy process (AHP) is a popular multi-criteria decision tool that allows decision makers to prioritize a set of alternatives based on a set of criteria (Naseem et al., 2023a). Traditional AHP assumes that uncertainty however, there is a Fuzzy lever analysis proposed by (Chang, 1996) as an extension of the traditional AHP method. Fuzzy AHP is an analysis method developed from traditional AHP.

This approach is suitable for use in this study, where the sample used is an assumption pot forward by people who are experts in their fields. This person is one of the stakeholders who has an important role in the goods delivery service company. From the assumptions given,

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calculations will be make using the fuzzy AHP method. The following are the stages or workings of the Fuzzy Analytic Hierarchy Process (AHP) method to determine alternatives to reverse logistics obstacles as follows.

3. Research method

This study consisted of two components or mix method which is use a comprehensive literature view followed by additional data analysis and quantitatively used Fuzzy Analytic Hierarchy Process. The explanation of each method as follows :

3.1. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)

The use preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines was proposed by (Moher et al., 2009). The use of PRISMA in this study is generally accepted as a strict systematic review procedure (Panic et al., 2013). This literature review utilized the Watase Uake System, following a structured process: 1) Identification of keywords, criteria, and limitations; 2) Screening for relevant articles.; 3) Search for articles from selected sources and potential exclusions; 4) Reviewing the titles, abstracts, and keywords of the selected articles. 5) Compile relevant information and items from each selected article during the extraction process; and 6) Classification analysis, network patterns, network hypotheses, and visualization.

The data for this study was collected from June 2024, using specific search keywords such as “reverse logistics implementation in the world”, “reverse logistics in Indonesian”, and “reverse logistics barrier and challenging”. These keywords were searched carefully to include articles related to reverse logistics implementation. And there are inclusion criteria that must be applied, namely: 1) Publication in a scientific journal.; 2) Publication between 2019 to 2024; and 3) Scopus journal quartile, Q1 to Q2. After applying the article, a total of 84 articles were obtained from keywords in accordance with this research. Of these 84 articles there are 2 articles that are very suitable for this research.

3.2. Fuzzy Analytic Hierarchy Process (AHP)

This method is used to determine the weight of criteria and alternative priorities in a structured manner based on pairwise comparisons (Liu et al., 2020). in order for the matrix analysis results to be consistent or acceptable, the Fuzzy AHP method is appropriate for analyzing this decisions problem. To overcome the imprecision of AHP, the method has been extended, where the relative importance is described as a triangular Fuzzy number. by describing the uncertainty experienced by decision-makers when applying interval values when conducting pairwise comparisons.

Consider that Fuzzy numbers can be used to indicate expert preference and discuss the consistency of existing data. It is obvious that when expert judgments are expressed as Fuzzy numbers, it is more difficult to select the best alternative and investigate the consistency and acceptable consistency of the comparison matrix with fuzzy number entries.

as indicated in the chart. 1. At each stage or level, the barriers of reverse logistics will be seen, such as the first level of hierarchy that shows the purpose of the research, the second level showing the main part of the barriers that affect the effectiveness of RL practices, and the third level of sub-criteria that show the main barriers. In addition, there are two phases to this investigation, and figure 1 shows the two-phase process followed by this investigation.

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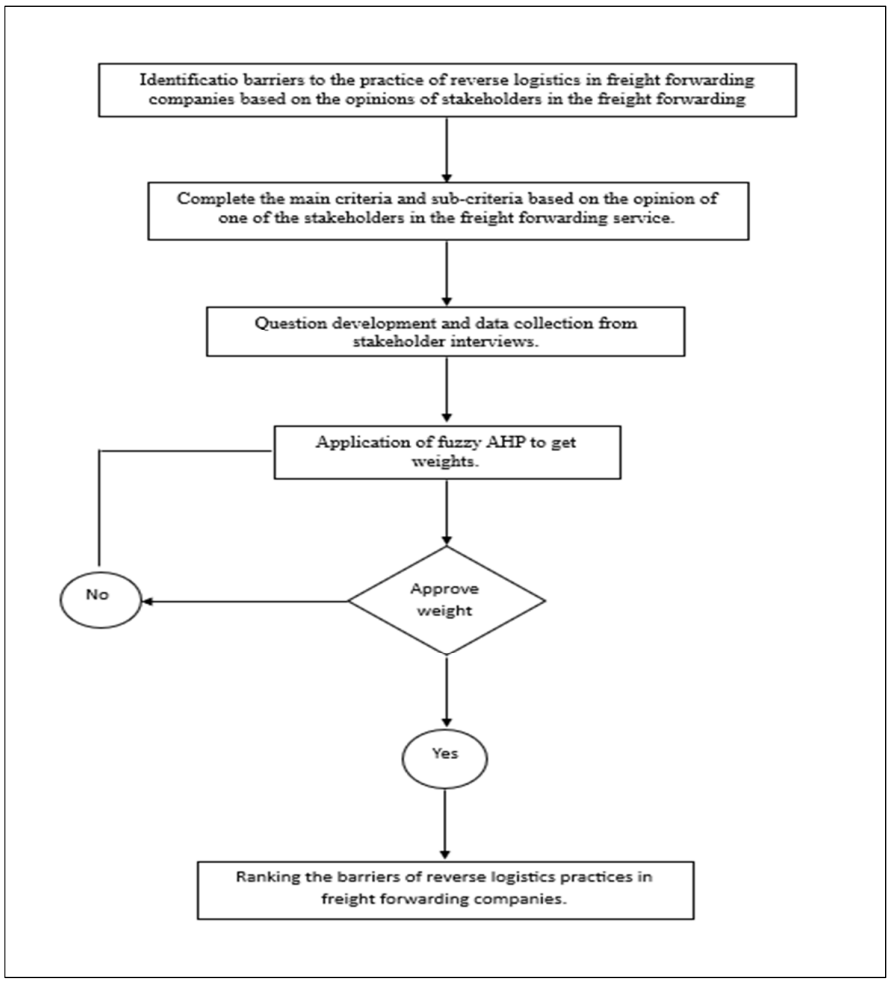

Fig 1. Research method

Steps if the Fuzzy AHP method

The following are the stages of how the Fuzzy Analytical Hierarchy Process (FAHP) method works to determine alternatives to reverse logistics barriers:

Step 1, describe the problem by creating a level or hierarchical structure.

Step 2, create a pairwise comparison matrix between criteria using the AHP scale, which will then be converted into a Triangular Fuzzy Number (TFN) scale.

Step 3, calculate the weight of each criterion and alternative using the Fuzzy synthetic extent method. The procedure for calculate Fuzzy synthetic extent involves several important steps.

4. Results and discussion

Application of the proposed method for reverse logistics barrier ranking

In this section, clear findings are discussed regarding the research objectives. The purpose of this research is to prioritize the barriers of reverse logistics in one of the courier express parcel companies in Indonesia using the Fuzzy Analytical Hierarchy Process (FAHP). The following are the results of the finding obtained at one of the courier express parcel companies in Indonesia in June which was carried out by

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interviewing and filling out a questionnaire by the stakeholders of the place. The result of which are explained in the following table:

Table 1.
Results of Identifying Barriers to the Reverse Logistic Process

Criteria	Sub-Criteria
External Barrier (EB)	- Large number of items - Requires more time
Organization Barriers (OB)	- Physical with different documents - Incomplete data provided
Social barrier (SB)	- Investigation process - Non-compliance with complaint time standards

Ranking the barriers to reverse logistics implementation, requires the application of the AHP technique. Table 1-4 shows the values of the criteria and sub-criteria of reverse logistics barriers with a pairwise comparison matrix. The values taken from the comparison of these barriers will be compared and paired to determine their weight and ranking.

Table 2.
The Main Criteria Will be Calculating with Fuzzy Evaluation and Decision Matrix.

	EB	OB	SB	Weight	Rank
EB	(1,1,1)	(0.22, 0.22, 4.5)	(3, 3.5, 4)	0,39	2
OB	(4, 4.5, 4.5)	(1,1,1)	(4, 4.5, 4.5)	0,70	1
SB	(0.25, 0.28, 0.33)	(0.22, 0.22, 4.5)	(1,1,1)	-0,09	3

Based on table 2, determining the barriers that are made the top priority, there are organization barriers (OB) to be ranked first for the most priority barriers because they have the highest weight value.
Furthermore, the weight is determined on the sub-criteria in each main criterion described in table 3-4

Table 3.
Calculating Pairwise Comparisons and Sub-criteria Decision Matrix (External Barriers).

	EB1	EB2	Weight	Rank
EB1	(1,1,1)	(2,2.5,3)	7,525074	2
EB2	(0.33,0.4,0.5)	(1,1,1)	-6,525074	1

Table 3 shows the sub-criteria of external barriers (EB) which have two barriers, namely the large quantity of items (EB1) and wasting time (EB2) then after the calculation shows the highest weight result, namely wasting time (EB3)

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Table 4.
Calculating Pairwise Comparisons and Sub-criteria Decision Matrix (Organizational Barriers)

	OB1	OB2	Weight	Rank
OB1	(1,1,1)	(0.5, 1, 1.5)	0,50	0,000
OB2	(0.67, 1, 2)	(1,1,1)	0,50	0,000

Table 4 shows the sub-criteria of organizational barriers, namely physical differences in document (OB1) and the documents provided are incomplete (OB2), after calculation shows the resulting weight has the same value so that the priority value is equally important.

Table 5.
Calculating Pairwise Comparisons and Sub-criteria Decision Matrix (Social Barriers).

	SB1	SB2	Weight	Rank
SB1	(1,1,1)	(4, 4.5, 4.5)	-0,037207	2
SB2	(0.22, 0.22, 0.25)	(1,1,1)	1,037207	1

Finally, in table 5, there are sub-criteria of social barriers, namely the investigation process (SB1) and non-compliance of complain time (SB2) with the results of the calculation that the non-compliance of complain time (SB2) has the highest weight value.

Table 2 will be normalized, the value of each criterion can be multiplied by the number of criteria or each row can be multiplied by the number of columns. then the normalized weight value of the criteria matrix is obtained.

Table 6.
Synthetic Fuzzy Level Value of the Criteria

Criteria		Calculations			Results
EB	=	(4.22, 4.72, 9.5)	X	(1/25.33, 1/16.22, 1/14.69)	(0.167, 0.291, 0.647)
OB	=	(9, 10, 10)	X	(1/25.33, 1/16.22, 1/14.69)	(0.355, 0.617, 0.681)
SB	=	(1.47, 1.5, 5.83)	X	(1/25.33, 1/16.22, 1/14.69)	(0.058, 1, 1.724)

Table 7.
V-value for Main Criteria

	EB	OB	SB
EB	1	0,558	1
OB	1	1	1
SB	0,632	-0,125	1

Table 7 mentions that to calculate the probability level (V-value) using on the criteria,

$$m\,(EB) = min.V(S_1 = S_k) = \min(0.558)$$

So that the minimum values (V-values) are as follows,

$$m\,(OB) = -1, \qquad m(SB) = -0.125$$

Because the weight exceeds 1, it will be normalized vector value for each criterion presented below

$$W' = (0.558, 1, -0.125)^T$$

The final weights of the criteria are calculated through the normalization given below.

$$W = (0.389, 0.689, -0.087)$$

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The calculation technique for the reaming criterion is not explained here, as it is the same as the calculation process for the other criteria weights. the weights of the other criteria, as well as the final results of the pairwise comparison of criteria and sub-criteria, are shown in table 8.

Table 8.
The Final Ranking of Reverse Logistics Implementation Barriers.

Criteria	Weight	Sub-Criteria	Weight	Finalized Weight	Global Weight
External Barriers	0,389392882	EB1	7,525074	2,929513	1
		EB2	6,525074	2,540213	2
Organizational Barriers	0,697836706	OB1	0,5	0,348844	3
		OB2	0,5	0,348844	4
Social Barriers	-0,087229588	SB1	0,037207	-0,003237	5
		SB2	1,037207	-0,090226	6

The final results of the weight calculation by combing the main criteria and sub-criteria of reverse logistics barriers show that external barriers with the sub-criteria of the large quality of item (EB1) are the top priority in this study.

5. Conclusion

The conclusion of this article is that delivery service companies in Indonesia have a priority ranking of barriers to solve first. Since human error is common in Indonesia, it is very difficult for delivery companies in Indonesia to deal with these barriers at the same time. After a thorough analysis of literature, expert comments, and conversations, this research identified six barriers to reverse logistics practice. As shown in table 8, there barriers are divided into main criteria and sub-criteria.

This research uses the calculation of the fuzzy AHP method to rank the identified obstacles. the results obtained are due to the less strict implementation of regulations, so that customers still underestimate the complaints that have been set, which causes reverse logistics problems. This study provides insights into the main barriers to reverse logistics Patrice and provides useful information for courier company in Indonesia. To overcome these barriers, stakeholders can see the potential of reverse logistics and realize progress in the supply chain to increase efficiency, cost savings, improved customer satisfaction, and greater competitiveness

This research identifies the provision of solutions for each criterion. External barriers in reverse logistics, the solution to this problem is to optimize the warehouse layout, separating return items in a dedicated area to avoid accumulation. In addition, companies can contact recipients after the failure of the first shipment to ensure that reshipments are only made when necessary, thus saving time and avoiding unnecessary trips.

Next, organizational barriers in reverse logistics is that companies can implement an integrated digital management system such as a Warehouse Management System (WMS) that synchronizes data on goods and documents automatically. In addition, performing double verification between physical goods and documents at each stage of recversing and issuing goods will ensure data conformity and prevent errors. Improved communication with suppliers and customers in also important to ensure that

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documents accompanying goods are complete and accurate before goods are received or shipped.

Finaly, the solution to this social barriers in reverse logistics is that in order to improve compliance with the standard time for complaint management system that can track and prioritize complaints in real time, while establishing regular monitoring and evaluation mechanisms to ensure that the time standards are adhered to; in addition, feedback from customers and staff needs to be regularly collected to identify areas of improvements, allowing for the implementation of the investigation process.

6. Implications

Table 8 the main barrier in the application of the fuzzy AHP calculation method arose due to the accumulation of goods resulting in a significant increase in the duration of the process, where couriers had to make delivery up to three times. This situation was exacerbated by a variety of factors, such as discrepancies in physical document and incomplete data, which ultimately required further investigative steps. The barrier was further compounded by the fact that consumer complaints often exceeded the standard time limit set by the company, disrupting the flow of what should have been a more efficient process.

The findings of this study can help companies in the practice of reverse logistics, where companies know the main barriers that must be resolved first. This is done so that these barriers do not cause problems in other processes. By knowing the main barriers, it is hoped that the company will be more assertive in existing regulations and help customers to know or remind the rules that have been made that there is a time limit that has been given for complaints. In addition, the findings of this study can be useful for new entrepreneurs who will open a courier company and entrepreneurs in other courier company to understand the impact of reverse logistics and to see more efficient supply chain changes as an opportunity so that the company that has been built does not experience large losses. the large number of goods piled up in the warehouse is the main barriers in the external category because customers are difficult to contact. Therefore, stakeholders must come forward and collaborate to improve the company's practices and processes.

This research provides knowledge on the extent to which reverse logistics has been adopted around the world and the pathways to overcome the obstacles faced in its implementation. In addition, this research identifies the stages for reverse logistics policies to be developed in order to increase healthy competition among other companies.

7. Research limitations

In this research, there are several limitations and even difficulties experienced. The low of literature review that discusses the problem of obstacles in reverse logistics is still very little. it is hoped that in the future there will be many who discuss obstacles in reverse logistics. Because, by knowing the barriers that occur, the company will know what steps to take so that these obstacles do not interfere with other reverse logistics activities. the use of the fuzzy AHP approach is still very rare; this is also the main reason this research is difficult to do because the explanation of this method is difficult to understand. This method is less attractive to researchers because the results are still very ambiguous or uncertain. However, this approach is suitable for knowing which priorities should get immediate treatment.

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The small number of criteria and sub-criteria in this study might attract experts to develop more or even find other criteria and sub-criteria courier express parcel. This research can also be further examined and used as a comparison in the same context in the future for the same company engaged in goods delivery services. As it is known, courier express parcel services are companies that have a large level of reverse logistics because the number of users in increasing every year due to the increase in online shopping at this time.

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