

ANALYSIS OF CONTAINER BRAND SELECTION AT BATU AMPAR PORT, BATAM CITY USING *ANALYTICAL HIERARCHY PROCESS AND EXPERT JUDGEMENT*

Vivian Anastasya, Mia Syafrina

Batam State Polytechnic
Department of Business and Management
Email: Viviiananatasya@gmail.com

Abstract

Containers have become a means of packaging goods used by all international logistics service providers in their operations so that they are an important factor in the efficiency of goods delivery. This study aims to determine the best containers in Batu Ampar based on measurements from the criteria of Price, Quality, Reliability, and Service Network as well as subcriteria compiled by the *Analytical Hierarchy Process method*. The research was conducted by obtaining a sample of 8 people who work as experts in the field of logistics in the city of Batam. From the results of the study using Expert Choice 11, it was found that Quality is the main factor as an important criterion in the selection of containers. While the best containers went to Maersk

Keywords: AHP, Container, Quality, Reliability, ExpertChoice

1. Introduction

International Trade is a significant thing for a country's economy to be able to meet the needs of each of its citizens. According to (Ibrahim & Halkam, 2021), international trade is a transaction of goods and services between a country and another country that aims to meet domestic needs or gain profits. This trade occurs because a country has excess resources needed by other countries.

Based on data from *the United Nation Trade and Development (2025)*, in 2024, global trade will reach 33 trillion US dollars, an increase of 3.7% from 2023. Most countries are experiencing positive developments, including Southeast Asia. However, in 2025 it is predicted that there will be a decline due to the direct impact of the trade war between the US and China. Indonesia can be directly affected by the increase in US import tariffs which can reduce Indonesian exports. However, this can open up opportunities for countries affected by the regulation to be able to access the Indonesian market, especially China, which has become Indonesia's trading partner and has free *trade zone regulations* through ASEAN.

Indonesia is a developing country that is a member of the G20, a country with a high-value economy based on gross domestic product. According to data from (The Observatory of Economic Complexity, 2025), Indonesia ranks 27th in the total value of world exports

and 28th in the total value of world imports. The countries that import the highest goods from Indonesia are China, the United States, India, Japan, and Singapore. Meanwhile, Indonesia imports the highest from China, Singapore, Japan, the United States, and Malaysia. This causes the trade process to have a very important economic impact on the local industry, and including its delivery services. Based on data from the Ministry of Trade in 2024, Batu Ampar Port is the number 4 busiest port in Indonesia with a non-oil and gas import value close to 10.48 billion US dollars.

With high import demand, a dexterous logistics process is also needed in handling the entry and exit of goods. Imported/exported goods are sent using containers or containers according to the needs of the goods to be shipped. Generally, the container used is a 40ft container, various types of container brands also have their own advantages and disadvantages so choosing a brand of equipment is important before determining the shipping process. Some of the leading brands with containers include; Maersk, Hapag-Lloyd, *Ocean Network Express (ONE)*, Evergreen. The brand has dominated the container market for a long time so it has built a brand name that has been widely known globally. Based on (Alphaliner, 2025), each of these shipping companies is ranked 2nd, 5th, 6th, and 7th as the largest logistics company in the world.

Batam is a region located in the Strait of Malacca and is passed by world trade ships which is also the gateway for imported goods from Singapore and Malaysia. Due

to its strategic location, Batam has a port that supports the loading and unloading process with qualified facilities and utilities. In 2024, unloaded containers will amount to 673,343 TEUs, an increase of 8 percent from the previous year which was worth 624,061 TEUs. Of the lift, 493 thousand TEUs came from the export-import process (BP Batam, 2025). Therefore, the need for containers is increasing and research on the selection of container brands has become possible to be researched.

The container rental business is a profitable business because of the level of international trade that is always carried out every day. The rental process is carried out by customers choosing the type of container and its size, then the condition or grade of the desired container. The customer contacts the tenant and negotiates the price to be incurred. Then, other negotiations such as the length of the lease are authorized by the lease contract. Customers then use the services of a surveyor to inspect and examine the equipment needed before and after renting a container. Finally, the container is transported to a place that has been determined by the tenant.

In line with the development of global trade, maritime transportation is the backbone of the world's supply chain. Post-Covid-19, container prices have become volatile and availability and brand reliability have become obstacles in choosing a good container brand (Ergin & Alkan, 2023a). In the supply chain, the main goal of its management is to reduce logistics costs and facilitate the availability of means of transportation so that logistics activities become easier. This makes research on container brand selection open to find out the possibility of choosing a reliable and transparent brand.

Many brands can confuse the users of container services, containers are rented from companies that provide their services and are used according to the needs of the tenant. But several factors can cause the tenant's decision to change, such factors can be in the form of cost, container quality, operational performance, and also service range can affect the buyer's decision. Based on research by (Ergin & Alkan, 2023), *Transportation Cost* and *Reliability* are important factors in choosing an ocean carrier.

In the logistics industry, especially in the *Freight Forwarding sector*, the selection of container containers is an important factor that affects the smooth and efficient distribution process of goods. Containers not only function as a means of transporting goods, but are also an integral element that plays a role in ensuring the safety and maintaining the quality of the products delivered, thus becoming a crucial component in the global supply chain system (Fransoo & Lee, 2013). Therefore, it is necessary to conduct in-depth research on containers based on price, quality, reliability, and service network indicators.

Price is an initial consideration in the procurement of containers because it is directly related to the operational costs incurred by customers. The rental price of containers ranges from 2.5 million to 6 million per day at 40ft size, this is also influenced by the negotiation ability of the buyer and also the purpose of the container below, so it does not have a fixed rate and this makes the price indicator included in the purchase criteria because the various liner container providers have limited ability to manipulate prices.

Quality is also an important indicator because of its impact on customer perception of brand image. Furthermore, reliability reflects the consistency and resilience of the container brand's performance in the long term. In addition, a wide and responsive service network can be an indicator of operational continuity, especially in terms of *maintenance* and handling of technical obstacles in various locations (Johan et al., 2023).

Taking these criteria into account, this study is an urgency for logistics companies that rent containers under the brand to ensure that the selection of containers is carried out based on careful and effective considerations. Then, the criteria set in this study will then be tested using *the Analytical Hierarchy Process (AHP)*. *The Analytical Hierarchy Process* is a decision selection using multiple criteria and arranged based on ranking (Pratiwi, 2020). This method is used because several criteria prepared for each brand are equalized so that after testing the appropriate results are found based on the decisions of the participating respondents.

2. Theoretical Studies

Containers

A container is a structure used to store smaller containers. Containers are made of steel and are generally used in shipping by sea, air, rail, and truck according to specifications (Llamazares, 2015). Containers are standardized by the International Organization for Standardization (ISO) to ensure they can be used in various modes of transportation. Containers are generally divided into several categories according to their needs, but generally containers are divided into three types, namely: Dry Containers, Refrigerated Containers, and Special Dimensioned Shipping Containers

Dry Containers

Dry Containers are containers that do not have temperature control, and are commonly used for dry cargo. 90% of the world's cargo is loaded into this type of container and this type of container has a wide range of dimensions and variants, such as; 20ft General Purpose, 40ft General Purpose, and 40ft High Cube

Refrigerated Containers

Refrigerated Containers are containers that have a feature to control the temperature inside. These containers are used to store perishable products such as food and flowers. These containers come in a variety of sizes ranging from 20ft, 40ft, 40HC, and 45HC. One type of container is Controlled Atmosphere (CA Container) which can regulate the temperature inside the cargo according to the needs of the goods.

Special Dimensioned Shipping Containers

Special Dimensioned Shipping Containers are a type of container that has a special shape and design to facilitate the loading and unloading process and meet cargo needs. Examples of these containers are Open Top Container, Flat Rack, Platform, and Transportable Tank

Pricing

Price is the amount paid to get a good or service (Olajide et al., 2016). Price is one of the tools in the marketing mix that generates revenue. Therefore, price is an important aspect in a business that can affect customers and competitors (Akdogan, 2021). Setting prices that are too high can have an impact on container service users switching to rival businesses that offer cheaper prices. Price adjustments must be determined by consideration of the target market, the diversity of products, services, and competition (Sihombing et al., 2023).

Quality

According to Alma in (Sihombing et al., 2023), Product Quality is an attribute that can be tangible or intangible, this includes color, price, reputation, and also the services provided that are received by customers to satisfy their desires. A container with good quality will certainly attract the attention of customers and potential customers, therefore, the quality factor is one of the significant things that must be owned by a product or service provider.

Reliability

Reliability in a brand is the belief that a company can achieve the promised value, or in other words, the perception of the brand can meet customer satisfaction (Setiawan & Patricia, 2022). According to (Doganaksoy et al., 2021), product reliability is formally defined as the probability that the product can satisfy customer needs according to the function and operational conditions in a predetermined period. Companies that provide products that can be trusted in their use function and are able to perform their duties will get higher value in the eyes of customers, so reliability is an important thing to consider in the company's image and of course has an impact on the products and services offered

Service Network

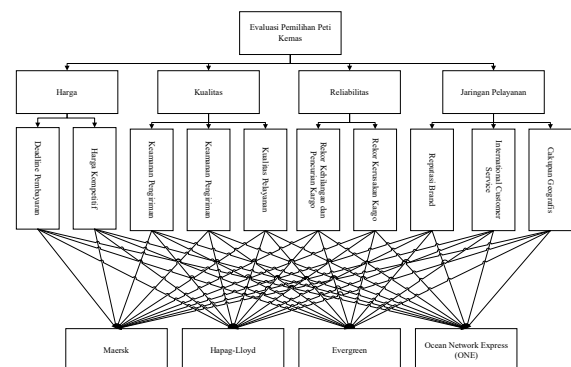
A Service Network is a group of individuals who build relationships with partners who have uniformity and are engaged in specific service fields (Razo-Zapata et al., 2012). In relation to B2B, Service Networks have relationships between each other that are bound by business rules, and strategic alliances to requests as well as obstacles. Cooperation between businesses and also container distribution locations spread domestically and internationally can be factors that make customers decide to use containers. The services provided will be more attractive if they have international services and a wide geographical coverage

3. Research Methods

In determining the number of samples, the determination of the number is carried out using Expert Judgement or Purposive Sampling with the number of samples obtained by distributing a questionnaire to one freight forwarding company in the city of Batam. The study with AHP did not have a minimum number of samples, but the researcher provided a sample limit of 8 as the minimum number based on the selection of expert judgement (Darko et al., 2019).

The Freight Forwarding Company must have experienced employees so that it can be called an Expert. Based on the results of initial observations in Batam city, there are several Freight Forwarding companies that have criteria to be used as research samples.

Data collection is important in research because the data collected is needed to measure the point of view in the research topic to be studied. This study uses the questionnaire distribution method to obtain quantitative data presented in numerical form. Questionnaires are a survey method that is carried out by distributing questionnaires designed to collect information from respondents who fill out (Das, 2024).



Hierarchy of criteria and sub-criteria for container selection

Data analysis was carried out using the Analytical

Hierarchy Process which was processed using the ExpertChoice 11 application. The research using the AHP method was carried out by compiling a hierarchy of criteria which were then measured using a saaty scale to determine the importance of each criterion.

This process is carried out through several stages, the stages are:

1. Evaluation of container selection. It is arranged to determine the best container based on the criteria that have been compiled
2. Determining the criteria to be measured, in this study 4 criteria and 10 sub-criteria are used to determine the best container brand
3. Determining *Geometric Mean*, *Pairwise Comparison*, *Eigenvalue*, *Consistency Ratio*, and *Consistency Index*

a. Geometric Mean

The *Geometric Mean* must be determined to determine the result of the local priority weighting is not suitable for global weighting so that it cannot be used arithmetically significantly. *Geomean* is done to shape the data to be individual so that it can measure the comparison of the matrix without different changes in the numbers obtained (Krejčí & Stoklasa, 2018)

$$GM = \sqrt[n]{(X_1)(X_2) \dots (X_n)}$$

Where:

GM = *Geometric Mean*

X_1 = First-person rating

X_2 = Second person rating

X_n = Nth person assessment

n = Number of assessors

b. Pairwise Comparison

Pairwise Comparison is a comparison in one or two criteria to obtain accurate and *reliable* data based on results from the respondent's point of view. This step is done by comparing the results of the *Geometric Mean*

c. Nilai Eigen

The *Eigen value* is the value obtained after adding all the elements of the *Pairwise Comparison* in each criterion

column and multiplying by each value from the comparison column. This value is used to determine the ranking of the global weighting results

d. Consistency Index

Consistency Index is the consistency level of the data obtained. The level of consistency is very important and affects the results, if the results do not reach the required consistency measure then the data cannot be used and must be re-researched. The *Consistency Index* is measured by multiplying the value of the comparison matrix by each weight, then multiplying the number on the row by the weight, and calculating the maximum lambda by adding the multiplication result and dividing it by the value of n

$$\lambda_{maks} = \frac{\sum VB}{n}$$

e. Consistency Ratio

Consistency Ratio is the consistency ratio of data that is measured and measured based on the number of criteria obtained from the *Consistency Index* that has been determined. In the AHP this number should not be more than 0.10 or 10% and will be considered invalid if it exceeds that limit. The formula of the *Consistency Ratio* is as follows

$$CR = CI/RI$$

CR = *Consistency Ratio*

RI = *Random Index*

CI = *Consistency Index*

N	RI
1	0
2	0
3	0.52
4	0.89
5	1.11
6	1.25
7	1.35

8	1.40
9	1.45
10	1.49

Table 1 Value of the Republic of Indonesia

- Determine the important or priority value for each variable that exists at level 2 (subcriterion) of each criterion.
- Calculate the relative value or priority for each variable at level 3 (alternative), i.e. compare the weight of each container with each subcriterion.
- After knowing the weight of each subcriterion and the weight of each container, determine the total value of each brand, and then choose the brand that has the best performance.

Results

Selection of the Best Criteria

The research was conducted using the Expert Choice 11 application to accurately calculate the results of respondents who had filled out the previous AHP questionnaire. Based on the test, the following results were obtained.

Ranking table, weighting, criteria and ranking

Criteria	Weighting Figures	Ranking
Evergreen	0.194	2
Shawn Lloyd	0.174	4
Maersk	0.453	1
Ocean Network Express	0.179	3

Criteria	Weighting Figures	Ranking
Pricing	0.143	3
Quality	0.461	1
Reliability	0.254	2
Service Network	0.142	4

The results in the table show the priority weight of each criterion used in the AHP in assessing the importance of the criterion. The table can be described as.

- Quality has the highest ranking in weighting with a value of 0.461, this can indicate that experts are more concerned with quality than all the criteria given
- Reliability ranks second with a weighting criterion value of 0.254 which shows that reliability is

also important in container selection but is not more important than quality

- The price ranks third with a weight value of 0.143 and is not very important in the selection of containers, but it is not the main determining factor compared to quality and reliability

- The service network occupies the last position with a value of 0.143, this shows that the service network is not too important compared to other factors but is quite worthy of consideration.

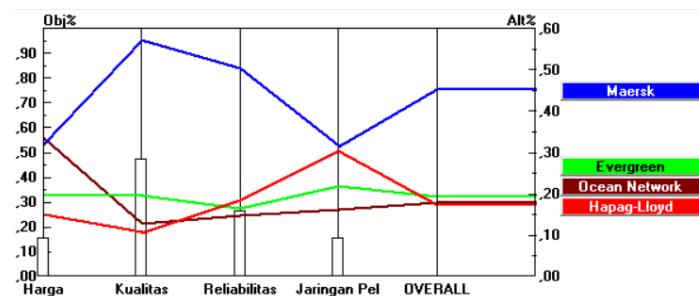
Image ranking criteria in Expert Choice



Selection of the Best Containers

The results from the researcher through the sensitivity test showed that Maersk's score had the best results based on the results of the sensitivity test.

Sensitivity Test Images



The results of the sensitivity can be described in the following table.

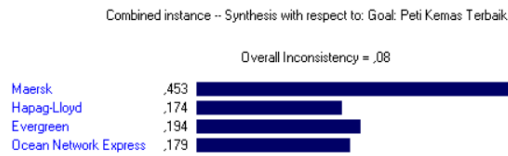
Best container ranking table

- Maersk has the highest rating based on the selection of respondents from logistics experts with a weight value of 0.453 thus. Consideration of the selection of containers for the Maersk brand must be prioritized because this brand gets the highest results and has more positive factors than other brands.
- Evergreen is ranked second with a weight value of 0.194, which shows that although Evergreen is not higher than Maersk, Evergreen can be a second choice alternative because it provides a good positive factor
- Ocean Network Express was ranked third with a weight value of 0.179. Logistics experts who will choose containers can choose ONE as an alternative when both rankings are unavailable, and are able to provide a supportive service based on the results of the

AHP test

4. Hapag-Lloyd ranks fourth with a weight value of 0.179. Even though it is ranked last, Hapag-Lloyd is still a well-known brand and based on the results of observations, it still has an attractive value for customers

Container ranking image on Expert Choice

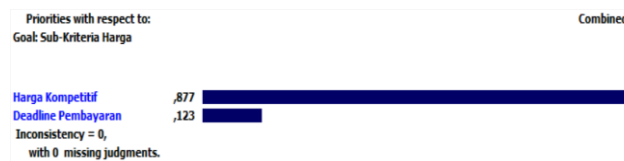


Determination of Best Sub-Criteria

Subcriteria Price

After getting the results of the priority criteria, the next step is to calculate the priority value of the subcriteria. The following is a description of the test results for the subcriteria in Expert Choice 11.

Price subcriteria ranking image



1. Competitive Price has the highest weight with a value of 0.877, making it the main determinant of the price subcriteria. This can happen because price factors similar to other brands can affect buyers' perception in choosing the container.

2. The payment deadline has a weight of 0.123 and is ranked second. The payment deadline is not a significant determinant of choice because generally payments are made automatically so that they do not interfere with other processes needed by the container

Quality Subcriteria



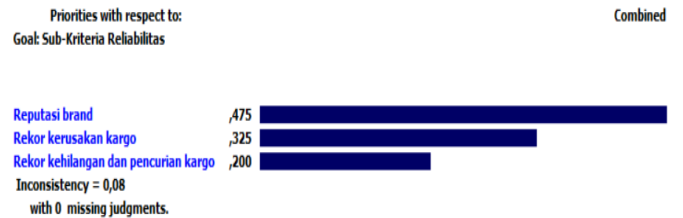
1. Service Quality has the highest rating from other criteria with a value of 0.620. The quality of service is the determinant of buyers' consideration in choosing containers because good service can ensure buyer retention.

2. Data Accuracy ranks second with a value of 0.250. The accuracy of data can ensure good delivery accuracy, making it easier for the regulatory process at the border

so that this criterion can be an appropriate consideration in choosing containers.

3. Shipping Security has a value of 0.130 which is the last rank of the quality sub-criteria.

Reliability Subcriteria



1. Brand reputation has the first rank with a value of 0.475 so it is the main consideration in the selection of containers. This is because containers that have a reputation will attract more attention from customers than containers that have never been heard of

2. Cargo Damage Record ranks second with a value of 0.325. The record of cargo damage is concurrent in second place because cargo damage is considered to be detrimental to companies that use container services, so ensuring that the contents of the container intact are one of the main tasks of container service providers.

3. The Cargo Loss and Theft Record is in third place with a value of 0.200. Loss and Theft of Cargo is detrimental to the company, but it is not a top priority in the reliability criteria because Reputation and Damage Record are more important.

Subcriteria of Service Network



1. International Customer Service is ranked first with a score of 0.829. This is because if there are obstacles, customers want to complain about these obstacles so that the existence of International Customer Service is important in the consideration of research.

2. Geography Coverage has a value of 0.171 and is ranked second. Geographic Coverage is not much of a consideration by buyers.

Discussion

Based on the results of the test criteria and subcriteria, results are obtained that are consistent with each test having a Consistency Ratio value below 0.10 so that the results are valid. From the results of weighting these criteria, Quality is the result that has the highest priority with a number of 0.461, quality can maintain

customer retention by providing a perception of satisfaction in the services provided and affecting the brand reputation (Jang et al., 2014).

Reliability has the second highest number with a value of 0.254 and is an important factor in the consideration of container selection, based on these results forwarders can make reliability a reason in selection because a reliable service provider can be a valuable option in critical situations, this is also in line with research by (Ergin & Alkan, 2023c) which obtained test results that reliability is an important factor in liner selection containers.

The price ranks third based on priority selection in the AHP test with a value of 0.143. Price is a sufficient consideration factor but it is no more important than quality and reliability, the appropriate price is a consideration factor that can make customers interested in using the service, the results of this review are also relevant from the research conducted by (Puspitasari et al., 2021) on the price of the selection factor for shipping services.

The Service Network has a value weight of 0.142 which makes it the last rank in the selection of priority criteria. A good service network will certainly make connections between container service providers more accurate and integrated, but this is not very important for buyers, this result is also supported by previous research on service networks that received seventh place based on analysis using the Analytical Network Process (Ergin & Alkan, 2023)

The subcriteria between each criterion also provide an idea of what factors are preferred by customers. The price subcriteria are determined by competitive prices because each business has its own budget and by choosing the cheapest one can save a business. In the quality criteria, service quality has the highest role in determining the criteria. This is because good service quality can provide a sense of trust to re-lease. A container that has a reputation will attract more attention from customers than a container that has never been heard of. The subcriteria of the service network have *International Customer Service* as a determinant of the criteria because of the constraints, the customer wants to complain about these obstacles so that the existence of *International Customer Service* is important in the consideration of the research.

The best brand selection was based on the results of the test with Expert Choice getting Maersk as the best container brand, followed by Evergreen, ONE, and Hapag-Lloyd. Based on these results, container service users are advised to choose Maersk because consideration through the criteria that have been tested gets positive results from respondents who are logistics experts.

Conclusion

The results of the analysis using the Analytical Hierarchy Process method measured by the Expert Choice 11 application concluded that the most important factor in the selection of containers is Quality, this is obtained based on the weight value on the criterion, which is 0.461 which is ranked first from other criteria. This shows that logistics professionals rely on quality based on consideration by the quality of service, data accuracy, and security in decision-making. Then, reliability with a value of 0.254, followed by Price with a value of 0.143 and Service Network with a value of 0.142.

In terms of container brand selection, Maersk received the highest weight with a score of 0.453, followed by Evergreen with a score of 0.194, then Ocean Network Express with 0.179 and finally Hapag-Lloyd with a score of 0.174. Overall, Quality and Reliability are two important factors that should be considered in the selection of containers, while price and service network are not very important in the consideration of selection.

Suggestions

Suggestions for further research

This research can be refined by using a mix method to be more accurate in obtaining the results of considerations in decision selection. Researchers can then combine the Analytical Network Process method, and thematic analysis to produce consistent data with effective results.

Advice for logisticians

From the results of this study, quality is the most important factor in the selection of containers. Therefore, logistics experts can consider in great detail this factor in choosing a container. In addition, Maersk is a brand with the best potential in providing services based on predetermined factors so that Maersk can be the main consideration when choosing containers.

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