SUPPLIER SELECTION USING AHP-TOPSIS: CASE STUDY IN TAIGERSPRUNG RESTAURANT

Bevin Ottismalleo Tjindana[1]
Parahyangan Catholic University, Indonesia

Katlea Fitriani [2]
Parahyangan Catholic University, Indonesia

Yeremias Budi Irawan[3]
Parahyangan Catholic University, Indonesia

ABSTRACT

The Taigersprung restaurant in Yogyakarta, operating in the food and beverage industry, plans to expand after two years of establishment. To meet the needs of the new branch, the restaurant needs to increase production but faces obstacles such as fluctuating raw material prices and issues with shrimp suppliers that do not meet quality standards. The restaurant aims to add shrimp suppliers by evaluating several potential ones. The lack of a structured supplier evaluation method makes choosing the best supplier challenging for the restaurant. This research aims to identify criteria for selecting shrimp suppliers and finding the best one. Through interviews with the restaurant owner and literature studies, the research utilizes the Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods. The research results indicate that quality criteria are the top priority in selecting shrimp suppliers, followed by price, delivery, service, and flexibility. Based on TOPSIS calculations, supplier B becomes the restaurant's top priority for collaboration.

Keyword **:** Supplier, Supplier Selection, AHP, TOPSIS

ABSTRAK

Restoran Taigersprung di Kota Yogyakarta, bergerak di industri food and beverage, berencana melakukan ekspansi setelah berdiri selama dua tahun. Untuk memenuhi kebutuhan di cabang baru, restoran perlu meningkatkan produksi, namun menghadapi hambatan seperti fluktuasi harga bahan baku dan masalah dengan pemasok udang yang tidak memenuhi standar kualitas. Restoran ingin menambah pemasok udang dengan mengevaluasi beberapa pemasok potensial. Kekurangan metode evaluasi pemasok yang terstruktur membuat restoran kesulitan memilih pemasok terbaik. Penelitian ini bertujuan untuk mengidentifikasi kriteria pemilihan pemasok udang dan menemukan pemasok terbaik. Melalui wawancara dengan pemilik restoran dan studi literatur, penelitian ini menggunakan metode Analytical Hierarchy Process (AHP) dan Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Hasil penelitian menunjukkan bahwa kriteria kualitas menjadi prioritas utama dalam pemilihan pemasok udang, diikuti oleh harga, pengiriman, pelayanan, dan fleksibilitas. Berdasarkan perhitungan TOPSIS, pemasok B menjadi prioritas utama restoran untuk kerja sama.

Kata Kunci **:** Pemasok, Pemilihan Pemasok, AHP, TOPSIS

Klasifikasi JE : C52

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia

1. INTRODUCTION

In a company, purchasing activities are crucial for the smooth production process. Businesses must identify low-cost, quick, and high-quality items, and they must involve distributors, operators, and suppliers. This idea is summed up in the supply chain management concept (Moore, 2008) in(Purwoko & Hassan, 2023). Companies must set appropriate criteria when interacting with suppliers to ensure the products produced satisfy consumers and minimize problems with suppliers. Every industry, including the culinary industry, such as restaurants,

must have clear criteria for suppliers to satisfy consumers properly. As time goes by, restaurants that have been around for a long time plan to expand their market to expand their market share and increase profits. However, this expansion requires careful preparation and a good strategy, especially when choosing suitable suppliers. Restaurants must be prepared to overcome problems during expansion, such as shortages of raw materials due to increased production needed to meet increasing consumer demand.

Taigersprung, a food and beverage industry in Yogyakarta, presents a variety of dim sum dishes such as dumplings, salted egg buns, fried mantou, and others to its consumers. After operating for two years, this restaurant has the ambition to expand the market to expand its market share. In facing increased production for new branches, Taigersprung needs to add suppliers, considering unmet needs and high demand. Currently, the restaurant only partners with one shrimp supplier, supplier A on Jl. Bhayangkara, Yogyakarta. However, Taigersprung often experiences problems with supplier A regarding the quality of the shrimp not meeting standards, often not being fresh, and difficulties in fulfilling quantities. Therefore, Taigersprung wants to add shrimp suppliers by evaluating Supplier B, supplier C, and Supplier D, located in Klaten and Yogyakarta respectively. The aim of adding suppliers is to minimize problems with supplier A, ensure the availability of good raw materials, and maintain smooth restaurant operations.

Several other journals' literature to overcome similar problems use the AHP and TOPSIS methods. In the Journal (Alhafa Ardhy & Salim Dahda, 2022) researched PT. XYZ is a company that sells and provides coconut processing services. PT. XYZ frequently experiences problems with its coconut suppliers, including poor quality due to rot, processing obstacles, fluctuating prices, late deliveries, and unsatisfactory service, all contributing to bottlenecks in coconut shipments. The use of AHP and TOPSIS in this journal produces several conclusions. The first conclusion is that Singaraja farmers are the best suppliers with the highest scores. In contrast, if sorted based on the highest to lowest scores, they are Bali Karang Asem coconut farmers, Pacitan coconut farmers, and Banyuwangi coconut farmers. The second conclusion: The criteria that most influence and are considered when selecting a coconut supplier are the cost criteria followed by the order of weight, namely quality, delivery, and service.

The Analytical Hierarchy Process (AHP) method can be used for structured supplier assessment and selection so restaurants can add new suppliers. The Analytical Hierarchy Process (AHP) method is used to prioritize alternatives when several criteria must be considered, enabling decision-making to solve a complex problem (Heo et al., 2012). However, in decision-making, AHP is considered not good at overcoming the possibility of perceptual uncertainty and ambiguity resulting from human judgment being converted into numbers. So, given the uncertainty of perception that can be provided by the AHP method, the author needs to combine the Analytical Hierarchy Process (AHP) method with the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS).

Based on this problem, the question raised is about the order of criteria and suppliers that have the most influence and must be considered by Taigersprung. This research aims to understand

the most important criteria in decision-making. In addition, This research also selects the best supplier by combining AHP and TOPSIS. These two things can help eliminate uncertainty and elements of subjectivity in the multi-criteria decision-making process through a more robust and structured approach. This approach can be adopted in various situations, including supplier selection, project assessment, or strategic decision-making in various fields.

2. LITERATURE REVIEW

Supply chain management can be defined as an activity encompassing the distribution of goods from the initial raw materials to the final product delivered to the end consumer (Anwar, 2013). Within the supply chain, activities between suppliers and consumers form an inseparable unit. The role of suppliers is crucial as they are the main process in the supply chain where companies purchase raw materials from them. Therefore, companies must be selective in choosing the suppliers they want to use. According to (Munawar et al., 2021), supplier relationship management is an effort by companies to approach or collaborate with their suppliers. It can be concluded that companies not only need to build relationships with consumers but also need to foster good interactions with suppliers, creating mutually beneficial relationships.

Supplier evaluation is a process to assess the performance of several suppliers as a reference for companies to make decisions on whether the suppliers have met the company's expectations (Purnomo & Sunardiansyah, 2021). In this context, the Analytical Hierarchy Process (AHP) method is used to aid in decision-making by breaking down complex problems into a hierarchical structure of goals, criteria, sub-criteria, and alternatives (Saaty, 1990). AHP aims to prioritize various alternatives when multiple criteria need to be considered, allowing decision-makers to organize complex problems into a hierarchy.

TOPSIS, introduced by Kwangsun Yoon and Hwang Ching-Lai in 1981, is a Multi-Criteria Decision Making (MCDM) method used for practical decision-making. TOPSIS aims to determine positive and negative ideal solutions (Dwiyana et al., 2018)). TOPSIS can be combined with AHP to address the uncertainties inherent in AHP. This combination is based on the perspective of positive ideal solution values to maximize benefit criteria and minimize cost criteria, whereas negative ideal solutions maximize cost criteria and minimize benefit criteria. Ardhy & Dahda (2022) explain the steps of the TOPSIS method as follows:

1. Compiling the decision matrix normalization
2. Determining the weighted normalization matrix
3. Calculating positive and negative ideal solutions
4. Calculating the separation measure
5. Equation of distance and ranking of alternative suppliers

Previous research shows various approaches in effective supplier selection. Muharam et al. (2019) showed how AHP-TOPSIS could be applied in the selection of cassava suppliers at PT. Pusaka Kurnia. Muharam et al. (2019) determined supplier B as the top choice for PT Pusaka Kurnia with quality, delivery, service, and financial criteria. Ardhy & Dahda (2022) used AHP-TOPSIS for the selection of coconut suppliers at PT XYZ. (Ardhy & Dahda, 2022) identified Singaraja farmers as the best supplier of coconut at PT XYZ based on cost, quality, delivery, and service criteria. Prasatia and Prassetiyo (2022) highlighted quality, delivery, and price as the main criteria in selecting rice suppliers at Ayam Sawce Restaurant. Dwiyana et al. (2017) found that quality was the most important criterion for supplier selection of Fresh Fruit Bunches at PT SUAN, with Mustafa as the most potential supplier. Merry et al. (2014) concluded that alternative A is the

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia

best supplier for PT Hero Supermarket, Tbk based on the criteria of delivery, quality, service, supplier profile, price, document completeness, and risk. The studies showed which was the best supplier, and the study successfully showed the most influential criteria in the supplier selection process. Thus, combining AHP and TOPSIS can be an effective method for supplier evaluation and making more accurate and balanced decisions.

3. METHOD AND DATA

This research is applied research, which is research that has the aim of making something researched better, more efficient, and more practical. Apart from that, this applied research also looks for solutions to certain problems(Iriana, 2017). The research method used in this research is descriptive. Descriptive research is a research method whose aim is to create a systematic, actual, and accurate picture through data as it is (Tanjung & Nababan, 2016).

The author obtained data collection techniques through interview techniques and literature studies. An unstructured interview was conducted with the owner of the Taigersprung restaurant by asking the restaurant owner several questions so that the author could find out what the restaurant's problems were. Apart from knowing the problems experienced by restaurants, this interview gives the author information about how Taigersprung restaurants choose suppliers, assess suppliers, and how companies deal with problems that occur with their suppliers. Meanwhile, structured interviews were conducted by the author to obtain priority comparison data between restaurant criteria. Meanwhile, the literature study itself functions to help the author examine several theories related to the problem being researched.

The data analysis technique that was first carried out was to group several raw materials owned by the Taigersprung restaurant, then select the raw materials that wanted to be researched, and the author got the raw material, namely shrimp. After that, the author also used the Analytical Hierarchy Process (AHP) method and the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) method. The tools combination was also used by Napitupulu (2019) to determine the priority level of sugar suppliers. AHP is used to organize the problem's decision hierarchy and perform a consistency check. Lastly, the possibilities are ranked using TOPSIS (Sharma et al., 2020). According to TOPSIS, the optimal course of action is the one that is most distant from the negative ideal solution (NIS) and most near the positive ideal solution (PIS) (Ghorui et al., 2020). AHP-TOPSIS is a very noticeable Multi Criteria Decision Making that arranges different options and creates optimal results. The results attained are not quite as horrible as it could be, but they are closer to the best (Panwar et al., 2020).

Criteria and Indicators will be used to assess each potential supplier of Taigersprung restaurants. Meanwhile, the indicators are only to equalize the perception of criteria between the author and the restaurant. (Criteria and indicators are based (Prasatia & Prassetiyo, 2022) which have been adapted to object conditions.)

Table 1. Criteria and Indicators

Criteria	Definition	Indicator
Price	Price is all forms of costs sacrificed by consumers to have goods and services but can also be interpreted as several values provided by	1. Price offer provided by the supplier 2. Discounts given by suppliers to restaurants 3. Delivery costs provided by the supplier to the restaurant

	customers to gain profits (Kotler & Armstrong, 2012).	
Quality	Quality can be interpreted as a product's ability to perform all its functions to satisfy promised needs (Heizer et al., 2020).	1. Fresh raw materials 2. Raw materials according to restaurant specifications (shrimp weight measuring 50 - 70)
Service	Service can be interpreted as an effort to meet consumer needs and desires and become a benchmark for whether the services provided can balance consumer desires (Tjiptono, 2014).	1. Suppliers are easy for restaurants to contact 2. Raw materials are always available 3. Ease for restaurants to get replacements for defective products
Delivery	Delivery is an important series or process in the supply chain because it is used to send goods and services (Oktaviani et al., 2018)	1. Timely delivery of raw materials to restaurants 2. Accuracy in the quantity of raw materials in the delivery process 3. Flexible delivery of raw materials

4. DISCUSSION

4.1 Analytical Hierarchy Process (AHP)

Comparison Matrix between Criteria using the AHP method

Through interviews with the Taigersprung restaurant. A comparison table between the criteria for the Taigersprung restaurant is attached in Table 2.

Table 2. Comparison between criteria and the AHP scale

Criteria	Price	Quality	Service	Delivery	Weight	Adjusted weight
Price	0,293	0,256	0,400	0,429	0,344	4,257
Quality	0,585	0,513	0,333	0,429	0,465	4,257
Service	0,049	0,103	0,067	0,036	0,063	4,039
Delivery	0,073	0,128	0,200	0,107	0,127	4,089
Consistency Calculation					λmax	4,160
					CI	0,053
					CR	0,05938
					Consistency	YES

Based on the calculations above, it can be interpreted or concluded that Price, Quality, Service, and Delivery have an influence on Taigersprung Restaurant in selecting suppliers. Quality Criteria is the first criterion with a value of 0.465. Then followed by the Price criterion with a value of 0.344, Delivery criteria with a value of 0.127, and Service criteria with a value of 0.063.

According to the Taigersprung Restaurant, quality criteria are considered important because the freshness of the shrimp has a big impact on the restaurant's ability to maintain the quality of the food. Apart from the freshness of the shrimp, the restaurant considers that the size of the shrimp provided by the supplier is also important because if it does not match the size the restaurant wants, it will change the shape of the food. According to the restaurant, the price criteria itself is a criterion that is no less important because the price can determine the cost of each food containing shrimp. The delivery criterion is the restaurant's third priority after the price criterion.

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia

This criterion is also considered by the restaurant because the timeliness of delivery of raw materials to the restaurant, the accuracy of the number of raw materials in the delivery process, and the flexible delivery of raw materials by suppliers are important indicators for companies in assessing suppliers. Meanwhile, the service criteria are considered the last priority for restaurants.

From the comparison matrix between criteria using the AHP method, consistency has also been calculated and a consistency value (CR) of 0.059 has been obtained. The CR number is less than 0.1, so it can be concluded that the pairwise comparison matrix in Table 2 is considered consistent and can be used for Supplier Global Weight calculations. After that, it can be continued to calculate the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) method.

Comparison Matrix Between Suppliers in Criteria with the AHP Method

The order of suppliers can be done based on each criterion first. Suppliers B, C, and D are ranked respectively based on the criteria of Price, Quality, Service, and Delivery. Below is a comparison table between suppliers for each criterion.

Table 3 Comparison between Suppliers in Price Criteria with the AHP Scale

Supplier	B	C	D	Weight	The Weight
B	0,690	0,556	0,750	0,665	3,171
C	0,138	0,111	0,063	0,104	3,023
D	0,172	0,333	0,188	0,231	3,068
Consistency Calculation				λmax	3,087
				CI	0,043
				CR	0,07496
				Consistenc y	Yes

Based on the calculations in Table 3, it can be interpreted or concluded that Supplier B is the most superior supplier in terms of price criteria. Supplier B is a supplier located in Klaten.. Even though supplier B is in Klaten. Based on the results of interviews with restaurants, Supplier B can provide low prices for shrimp up to IDR 80,000 per kilogram. This price can be said to be quite far compared to the market price for shrimp which ranges from IDR 90,000 to IDR 100,000 per kilogram used by Taigersprung restaurants. Even though supplier B is in Klaten, supplier B still wins with the lowest costs after adding shipping costs. Meanwhile, suppliers C and D, even though they are located in Yogyakarta, which is close to restaurants, the prices given are not as low as compared to supplier B, even though delivery costs will be much cheaper, they are not superior to supplier B. From the comparison matrix between suppliers in price criteria using the AHP method, consistency has also been calculated and a consistency value (CR) of 0.074 has been obtained. The CR number is less than 0.1 so it can be concluded that the pairwise comparison matrix in Table 3 is considered consistent and can be used to calculate Supplier Global Weight after which it can be continued to calculate the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method.

Table 4 Comparison between Suppliers in Quality Criteria with the AHP Scale

Supplier	B	C	D	Weight	The Weight
B	0,545	0,600	0,500	0,548	3,030
C	0,182	0,200	0,250	0,211	3,012
D	0,273	0,200	0,250	0,241	3,013
Consistency Calculation				λmax	3,018
				CI	0,009
				CR	0,01579
				Consistenc y	Yes

Based on the calculations in Table 4, it can be interpreted or concluded that supplier B is the most superior supplier in terms of quality criteria. Supplier B is a supplier located in Klaten. Even though supplier B is in Klaten, supplier B is still superior in terms of the quality of shrimp that restaurants want, namely fresh ones and shrimp sizes ranging from 50-70 grams. Even though shrimp is a commodity item where the supplier chosen certainly meets restaurant quality standards, supplier B has the advantage that the delivery car has a freezer to maintain the freshness of the shrimp. So supplier B can reduce the risk of damaged shrimp. Meanwhile, although suppliers C and D are located in Yogyakarta, several times the suppliers provide shrimp that are not fresh and sometimes the size sent to the restaurant does not match the size desired by the restaurant. From the comparison matrix between suppliers in price criteria using the AHP method, consistency has also been calculated and a consistency value (CR) of 0.015 has been obtained. The CR number is less than 0.1 so it can be concluded that the pairwise comparison matrix in Table 4 is considered consistent and can be used to calculate Supplier Global Weight after which it can be continued to calculate the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method.

Table 5 Comparison between Suppliers in Service Criteria with the AHP Scale

Supplier	B	C	D	Weight	The weight Customize d
B	0,125	0,146	0,06 7	0,113	3,024
C	0,625	0,732	0,80 0	0,719	3,189
D	0,250	0,122	0,13 3	0,168	3,049
Consistency Calculation				λmax	3,087
				CI	0,044
				CR	0,07534
				Consistency	Yes

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia

Based on the calculations in Table 5, it is found that supplier C is the most superior supplier in terms of service criteria. Further analysis from the interview, supplier C has the best service compared to other suppliers. One of the things that make Supplier C have the best service is that Supplier C can accept impromptu orders and can send them straight away, which often happens with Taigersprung when there is an overload. Apart from that, Supplier C can directly send orders for the raw materials. No less important, Supplier C is easier to contact than Suppliers B and D, which can provide certainty to Taigersprung about conditions, time, or delivery capabilities. From the comparison matrix between suppliers in price criteria using the AHP method in Table 4.7, consistency has also been calculated and a consistency value (CR) of 0.015 has been obtained. The CR number is less than 0.1, so it can be concluded that the pairwise comparison matrix in Table 5 is considered consistent and can be used to calculate Supplier Global Weight after which it can be continued to calculate the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method.

Table 6 Comparison between Suppliers in Delivery Criteria with the AHP Scale

Supplier	B	C	D	Weight	The weight
B	0,190	0,364	0,176	0,244	3,091
C	0,048	0,091	0,118	0,085	3,023
D	0,762	0,545	0,706	0,671	3,215
Consistency Calculation				λmax	3,110
				CI	0,055
				CR	0,09463
				Consistency	Yes

Based on the calculations in Table 6, it is found that supplier D is the most superior supplier in terms of delivery criteria. This can be supported based on the results of interviews, the location of suppliers C and D is close to restaurants, namely in Yogyakarta, so the delivery time will be shorter compared to supplier B which is in Klaten. Based on further interviews, supplier C makes deliveries according to the delivery route that day, while supplier D can send directly to the restaurant. This will of course affect late delivery and damaged packaging during transit. According to Taigersprung, this makes supplier D superior to supplier C. From the comparison matrix between suppliers in price criteria using the AHP method, consistency has also been calculated and a consistency value (CR) of 0.094 has been obtained. The CR number is less than 0.1 so it can be concluded that the pairwise comparison matrix in Table 6 is considered consistent and can be used to calculate Supplier Global Weight after which it can be continued to calculate the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method.

Table 7 is obtained from the calculation results of the AHP method in tables 2, 3, 4, 5, and 6. From this table, the consistency of each matrix will first be calculated and then it can be used as input for the next method. This matrix will also be used as input for the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) method. The conclusion weight table from the AHP calculation can be seen in the table

Table 7. Conclusion Weights from AHP Calculations

Criteria	Weight for criteria	SUPPLIERS		
		B	C	D
		Weight	Weight	Weight
Price	0,344	0,665	0,104	0,231
Quality	0,465	0,548	0,211	0,241
Service	0,063	0,113	0,719	0,168
Delivery	0,127	0,244	0,085	0,671

4.2 Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

Weighted Matrix Normalization

Table 8 represents the calculations from the Normalized Matrix Results, which include the weights and normalized values for each criterion and supplier. The following is a further explanation of how to calculate the weighted normalization matrix for Supplier B and the Price Criteria:

$V_{ij} = w_j \times r_{ij}$

$= 0.344 \times 0.665$

$= 0.229$

Table 8. Table of Normalized Matrix Results

SUPPLIERS	Criteria			
	Price	Quality	Service	Delivery
B	0,229	0,255	0,007	0,085
C	0,036	0,098	0,046	0,011
D	0,080	0,112	0,011	0,085

The Positive Ideal Solution (A^+) and The Negative Ideal Solution(A^-)

The positive ideal solution matrix contains the maximum value of each row of the normalized matrix, while the negative ideal solution matrix contains the minimum value of each row of the normalized matrix. Table 9 will summarise the maximum and minimum values of the normalized matrix that the author has processed.

Table 9 Normalized Matrix Results

	Price	Quality	Service	Delivery
A+	0,229	0,255	0,046	0,085
A-	0,036	0,098	0,007	0,011

Calculating Alternatives

After calculating positive and negative ideal solutions for suppliers with each criterion, then calculate alternative distances from the positive ideal solution and alternative distances from the negative ideal solution in Table 10.

The following is an example of a manual calculation of the distance to a positive ideal solution at supplier B:

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia

$D^+ = \sqrt{\Sigma^n}(y^+ - y_{ij})^2$

$= (0.229 - 0.229)^2 + (0.255 - 0.255)^2 + (0.046 - 0.007)^2 + (0.085 - 0.085)^2$

$= 0.0384$

The negative ideal for supplier B is as follows:

$D = \sqrt{\Sigma^n}(y_{ij} - y^-)^2$

$= \sqrt{(0.036 - 0.229)^2 + (0.098 - 0.255)^2 + (0.007 - 0.007)^2 + (0.011 - 0.085)^2}$

$= 0.2599$

Table 10. Table of Alternative Distances to Positive and Negative Ideal Solutions

	D+	D-
B	0,0384	0,2599
C	0,2599	0,0384
D	0,2098	0,0876

Sorting Alternative Proximity Distances

After calculating the alternative distance from the positive ideal solution and the alternative distance from the negative ideal solution in Table 10, then calculate the proximity distance of the alternatives in Table 11 to sort the supplier priorities. The numbers in Table 11 were obtained using the proximity distance formula calculation. The following is an example of a manual calculation of proximity distance from supplier B:

V $= D- D-+ D+$

$= 0.2599\ 0.2599+0.0384$

$= 0.8711$

The same calculations are carried out for suppliers C and D and are summarized in Table 11.

Table 11. Table of Alternative Proximity Distances

	V
B	0,8711
C	0,1288
D	0,2945

5. CONCLUSION

It is difficult to choose the best suppliers who can meet organizational demands and set sustainable requirements when it comes to obtaining raw materials (Memari et al., 2019). The result showed that Quality is the most important criterion, followed by Price, Delivery, and Service criteria. Quality is considered important because the quality of shrimp freshness has a great impact on restaurants in maintaining the quality of food. In addition to the freshness of the shrimp, the restaurant considers that the size of the shrimp provided by the supplier is also important because if it does not match the size the restaurant wants, it will change the shape of the food. For Price itself, according to the restaurant, it is a criterion that is no less important because the price can determine the cost of each food containing shrimp. Delivery is the third priority of the restaurant after Price; the restaurant also considers this criterion because of the timeliness of delivery of raw materials to the restaurant, the accuracy of the amount of raw materials in the

delivery process, and the flexible delivery of raw materials by the supplier are important indicators for the company in assessing suppliers.

In addition, the best supplier from the AHP-TOPSIS calculation results is Supplier B, followed by Supplier D and Supplier C. Supplier B has the best performance based on consideration of all aspects of the adjusted criteria. Supplier B has advantages in the Quality criteria and Price criteria, which are the criteria that occupy the first and second most important positions. Supplier B has the advantage that the raw material delivery car has a freezer to maintain the freshness of the shrimp. Apart from that, even though supplier B is located outside the city, namely Klaten, supplier B can provide raw material prices that are much lower, up to half the price compared to other suppliers. However, Supplier B is not superior in-service criteria because Supplier B is tough to contact. For this reason, Taigersprung can consider Supplier C superior in terms of service criteria. Supplier C can accept impromptu orders and be sent immediately, which often happens to Taigersprung when it experiences overload.

The combination of the AHP method with the TOPSIS method can overcome the possibility of uncertainty of perception and ambiguity due to human assessment results that are converted into numbers. With the TOPSIS method, it can help authors avoid the uncertainty of opinions given from AHP data. In addition, TOPSIS can also help authors find ideal solutions by providing priority order based on the perspective of positive and negative ideal solution values, where this method can maximize benefits compared to costs.

Further study may include the sustainability aspect of the supplier. As Taigersprung's business expands, it must begin to take sustainability criteria into account. Businesses now have a greater obligation to take sustainability into account in a variety of business fields due to rising community expectations, stringent government regulations, and expanding sustainability awareness (Roy et al., 2019). Sustainability is being included in supply chain management networks by the public and private sectors. These networks cover the entire product lifecycle, from the procurement of raw materials to distribution and final manufacture (Roy et al., 2019). Taigersprung may be able to compete with similar businesses because of this.

REFERENCE

Alhafa Ardhy, M., & Salim Dahda, S. (2022). Pemilihan Supplier Buah Kelapa dengan Metode AHP dan TOPSIS di PT XYZ. *Serambi Engineering*, *VII*(2), 3181–3190.

Anwar, S. N. (2013). Manajemen Rantai Pasokan (Supply Chain Management) : Konsep Dan Hakikat. *Jurnal Dinamika Informatika*, *III*(2).

Ardhy, M. A., & Dahda, S. S. (2022). Pemilihan Supplier Buah Kelapa dengan Metode AHP dan TOPSIS di PT XYZ. *Serambi Engineering*, *VII*(2), 3181–3190.

Dwiyana, R., Djumiati Sitania, F., & Kartika Rahayu, D. (2017). Pemilihan Supplier Tandan Buah Segar (TBS) Menggunakan Metode Analytical Hierarchy Process (AHP) dan Topsis Pada Pabrik Pengolahan Kelapa Sawit. *PROSIDING SEMINAR NASIONAL TEKNOLOGI IV*, 89–98.

Dwiyana, R., Sitania, F. D., & Rahayu, D. K. (2018). Pemilihan Supplier Tandan Buah Segar (TBS) Menggunakan Metode Analytical Hierarchy Process (AHP) Dan TOPSIS pada Pabrik Pengolahan Kelapa Sawit. *Prosiding Seminar Nasional Teknologi, Inovasi Dan Aplikasi Di Lingkungan Tropis,* , 89–98.

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia

Ghorui, N., Ghosh, A., Algehyne, E. A., Mondal, S. P., & Saha, A. K. (2020). AHP-TOPSIS inspired shopping mall site selection problem with fuzzy data. *Mathematics*, *8*(8), 1–21. https://doi.org/10.3390/math8081380

Heizer, J., Render, B., & Munson, C. (2020). *Operations Management: Sustainability and Supply Chain Management* (S. Wall, Ed.; 12th ed.). PEARSON.

Heo, E., Kim, J., & Cho, S. (2012). Selecting hydrogen production methods using fuzzy analytic hierarchy process with opportunities, costs, and risks. *International Journal of Hydrogen Energy*, *37*(23), 17655–17662. https://doi.org/10.1016/j.ijhydene.2012.09.055

Iriana, F. (2017). *Metode penelitian terapan* . Parama Ilmu.

Kotler, P., & Armstrong, G. (2012). *Prinsip – Prinsip Pemasaran: Vol. Jilid 1* (13th ed.). ERLANGGA.

Memari, A., Dargi, A., Akbari Jokar, M. R., Ahmad, R., & Abdul Rahim, A. R. (2019). Sustainable supplier selection: A multi-criteria intuitionistic fuzzy TOPSIS method. *Journal of Manufacturing Systems*, *50*, 9–24. https://doi.org/10.1016/j.jmsy.2018.11.002

Merry, L., Ginting, M., & Marpaung, B. (2014). Pemilihan Supplier Buah Dengan Pendekatan Metode Analytical Hierarchy Process (AHP) dan TOPSIS: Studi Kasus Pada Perusahaan Retail. *Jurnal Teknik Dan Ilmu Komputer*, *3*(9), 48–58.

Moore, K. (2008). *Value Mapping Framework Involving Stakeholders For Supply Value Mapping Framework Involving Stakeholders For Supply Chain Improvement When Implementing Information Technology Chain Improvement When Implementing Information Technology Projects Projects STARS Citation STARS Citation*. http://library.ucf.edu

Muharam, H., Cahyadi, U., & Taptajani, D. S. (2019). Pemilihan Supplier Bahan Baku Rangining Singkong dengan Pendekatan Metode Analitycal Hierarchy Process dan TOPSIS2. *Jurnal Kalibrasi*, *17*(2), 52–58. http://jurnal.sttgarut.ac.id/

Munawar, Z., Zainal Musadad, D., Komalasari, R., & Putri, N. I. (2021). MODEL MATURITAS SISTEM MANAJEMEN RELASI PEMASOK DI RUMAH SAKIT. *Jurnal Sistem Informasi-J-SIKA*, *3*(1), 22–32.

Napitupulu, H. L. (2019). Determining the priority level of suppliers by using AHP and TOPSIS. *IOP Conference Series: Materials Science and Engineering*, *505*(1). https://doi.org/10.1088/1757-899X/505/1/012154

Oktaviani, N., Merlina, N., & Nurmalasari. (2018). Pemilihan Jasa Pengiriman Terbaik Menggunakan Metode Simple Additive Weighting (SAW). *Jurnal Sistem Dan Teknologi Informasi (JUSTIN)*, *6*(4).

Panwar, A., Kumar, R., Thakur, R., Pathania, A., Goel, B., Rana, A., & Aggarwal, V. (2020). Himachal Pradesh), India. 4 Assistant Professor. *International Journal on Emerging Technologies*, *11*(2), 0–000. www.researchtrend.net

Prasatia, F. E., & Prassetiyo, H. (2022). Usulan Pemilihan Supplier Beras di Restoran Ayam Sawce dengan Menggunakan Metode Analytical Hierarchy Process (AHP) dan Data Envelopment Analysis (DEA). *Prosiding Diseminasi FTI*.

Purnomo, E. D. H., & Sunardiansyah, A. (2021). IMPLEMENTASI METODE ANALYTICAL HIERARCHY PROCESS (AHP) UNTUK EVALUASI PEMASOK KAYU PADA INDUSTRI FURNITUR. *JISO: Journal Of Industrial And Systems Optimization*, *4*(1), 1–7.

Purwoko, P., & Hassan, Z. Bin. (2023). Impact of Innovation Leadership on Supply Chain Efficiency: The Role of Process Improvement. *Jurnal Manajemen Bisnis*, *14*(2), 257–273. https://doi.org/10.18196/mb.v14i2.18816

Roy, S. A., Ali, S. M., Kabir, G., Enayet, R., Suhi, S. A., Haque, T., & Hasan, R. (2019). A framework for sustainable supplier selection with transportation criteria. *International Journal of Sustainable Engineering*, *13*(2), 77–92. https://doi.org/10.1080/19397038.2019.1625983

Saaty, T. L. (1990). The analytic hierarchy process in conflict management. *International Journal of Conflict Management*, *1*(1), 47–68.

Sharma, D., Sridhar, S., & Claudio, D. (2020). Comparison of AHP-TOPSIS and AHP-AHP methods in multi-criteria decision-making problems. *Int. J. Industrial and Systems Engineering*, *34*(2), 203–223.

Tanjung, S. H., & Nababan, S. A. (2016). PENGARUH PENGGUNAAN METODE PEMBELAJARAN BERMAIN TERHADAP HASIL BELAJAR MATEMATIKA SISWA MATERI POKOK PECAHAN DI KELAS III SD NEGERI 200407 HUTAPADANG. *Jurnal Bina Gogik*, *3*(1).

Tjiptono, F. (2014). *Pemasaran Jasa Prinsip, Penerapan, dan Penelitian*. Andi.

[2] *Corresponding author:* Katlea Fitriani, Parahyangan Catholic University, Indonesia