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SUPPLIER EVALUATION AT TIRTA MULIA KARIMUN REGIONAL PUBLIC COMPANY USING THE ANALYTICAL HIERARCHY PROCESS (AHP) METHOD

Aida Noorsaila Shahab¹, Abdurrahman Faris Indriya Himawan^{2*}

¹Management Business of Telecommunication and Informatics, School of Economic & Business, Telkom University, Bandung, Indonesia

 aidashahab@student.telkomuniversity.ac.id

 <https://orcid.org/0009-0006-3392-8827>

²Management Business of Telecommunication and Informatics, School of Economic & Business, Telkom University, Bandung, Indonesia

 farislike@telkomuniversity.ac.id

 <https://orcid.org/0000-0003-4842-2600>

*Corresponding Author

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Abstract:

Water is a very important source of life for society. The need for water for daily use in each region certainly varies, depending on the level of water consumption. Fulfillment of clean water for the people of Karimun Regency is managed by Regional Public Company Tirta Mulia Karimun. As a clean water service provider, the company must have strategies and more than one supplier as a precautionary measure to meet future needs that will continue to grow. With right suppliers, company can save on material costs, increase profits, and reduce the risk of disruptions. This study aims to evaluate supplier performance using AHP method to conduct an in-depth assessment of various criteria that are relevant in supplier evaluation. Supplier performance evaluation is measured based on criteria as indicators such as quality, delivery, cost price, warranties and claims, supplier profile, and relationship and communication. The results of this study show that cost price criteria are the most important criteria in evaluating supplier performance with a weight value of 0.226. Followed by warranties and claims, supplier profile, delivery, relationship and communication, and quality. This indicates that when evaluating supplier performance at the company, respondents place greater emphasis on the cost price than on other criteria. In this study on supply chain management, the indicators used to measure cost/price criteria are discounts conformity and the overall cost or price. While the first rank of suppliers who have the most superior performance based on AHP is Supplier A with a weight value of 45.6313. Followed by Supplier B and Supplier C. This research is

expected to help company in evaluating supplier performance to improve operational efficiency and potentially enhance customer satisfaction based on criteria that are indicators in assessing supplier performance.

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Analytical Hierarchy Process, Public Sector, Supplier Evaluation, Supplier Performance, Water Service Provider



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Introduction

One of the essential sources of life for all living beings is water. Its presence influences the majority of life aspects, encompassing various basic needs as well as economic activities. According to the World Health Organization (WHO), the minimum daily requirement of drinking water is 5.3 liters per person per day, although daily water needs vary across regions (Rahman, 2024). These variations depend on water consumption levels and the population size of each area. With the rapid demographic growth occurring in Indonesia, the population in various regions continues to increase. As of June 28, 2024, Indonesia's Central Statistics Agency (Badan Pusat Statistik) recorded a total population of 281,603.8 thousand people (Badan Pusat Statistik Indonesia, 2024). One of the regions experiencing significant population growth is Karimun Regency. Karimun Regency is an archipelagic region consisting of 198 islands, of which 67 are inhabited by a population of 272,391 people spread across 13 districts (Dispendukcapil Kabupaten Karimun, 2024). This population growth has naturally led to a corresponding increase in the demand for adequate clean water. As a result, local governments and water service providers are required to enhance both the capacity and quality of drinking water distribution to ensure sufficient access for all residents. This is also critical in supporting economic development and improving the overall quality of life in Karimun Regency. In accordance with Karimun Regency Regional Regulation No. 1 of 2020, the Tirta Mulia Karimun Regional Public Company is responsible for the provision of clean water for the residents of Karimun Regency.

As the clean water service provider, the Tirta Mulia Karimun Regional Public Company must establish a solid foundation throughout the entire production process, from inception to distribution. Every stage within the supply chain must be well-managed to ensure smooth and uninterrupted operations. Supply Chain Management (SCM) plays a critical role in linking suppliers with the procurement process, forming an inseparable relationship. To fulfill its

operational activities, Tirta Mulia Karimun requires various materials to support both clean water treatment and distribution to consumers. Currently, according to internal company data, each category of material has its designated supplier. However, all suppliers are located outside of Karimun Island. This geographical separation often results in delivery delays that hinder operational activities. The list of suppliers of the Tirta Mulia Karimun Regional Public Company, along with their respective strengths and weaknesses, is presented in Table 1.

Table 1: Material Supplier of Tirta Mulia Karimun Regional Public Company

Name	Address	Supplier Material	Duration Of Partnership	Strengths	Weakness
Supplier A	Tanjung Pinang	HDPE Pipes and Water Meters	3 Years	Offers high-volume availability at competitive prices	The supplier's off-island location often leads to delays in delivery schedules
Supplier B	Tanjung Balai Karimun	Accessories	3 Years	order processing speed	Price escalation
Supplier C	Pekanbaru	Chemical Materials	3 Years	fast lead time	The supplier's distant location Causes Frequent Delivery Delays Due to Adverse Weather Conditions

Source: Company Data

Literature Review

Operations management is defined as a set of activities that transform inputs into outputs to create value in the form of goods or services (Heizer et al., 2020). Heizer et al. (2020) identified ten strategic operational management decisions, one of which is supply chain management. Supply chain management is a strategic function within business organizations that aims to integrate supply and demand, involving the planning and coordination of activities related to the procurement of materials and services, transformation processes, and logistics (Stevenson, 2021). The procurement process must be designed with the objective of enhancing supply chain surplus. A well-structured procurement process can improve forecasting accuracy through better planning and facilitate coordination with suppliers (Heizer et al., 2020). Suppliers are entities responsible for providing raw materials and play a crucial role in determining product quality and ensuring the smooth flow of production processes. Supplier evaluation is an essential component of the procurement process, as it plays a critical role in the administration of purchasing activities (Lou et al., 2022). Qureshi et al. (2023), in their research conducted within a high-technology public sector organization in Pakistan, identified six parameters that serve as criteria or indicators in supplier evaluation, namely:

Quality

Quality is defined as the capability of a product or service to meet or exceed customer expectations (Heizer et al., 2020). The parameters used to assess quality criteria encompass the product's ability to meet and exceed consumer expectations, including aspects such as reliability, durability, accuracy, ease of use, and functionality (Kotler et al., 2023). Quality can also be evaluated based on the presence of appropriate product certifications. According to the Regulation of the Minister of Public Works No. 18/PRT/M/2007 concerning the Implementation of Drinking Water Supply System Development, the use of equipment must be accompanied by a factory warranty certificate and must employ high-quality, laboratory-tested, or certified chemical substances. Furthermore, the utilization of technology can support companies in enhancing product quality (Anggraeni & Maulani, 2023).

Delivery

Delivery refers to the process of transferring goods or services from suppliers to companies (Hasiani et al., 2021). The indicators used to assess delivery criteria include the speed of order fulfillment, commonly referred to as lead time, the extent of delivery delays, and the adequacy of safety measures implemented during the product delivery process.

Warranties and Claims

Warranties and claims refer to guarantee services associated with the reliability of goods or services (Nikseresht et al., 2024). The parameters for measuring warranties and claims criteria include the manner in which suppliers provide after-sales services. After-sales service encompasses product support activities that involve various customer-oriented services designed to enhance product sales, such as warranty provisions (Ardiansyah et al., 2024), as well as the ease of filing claims in cases where discrepancies or nonconformities occur in the delivered orders.

Cost Price

Cost Price refers to the total expenditure required to acquire goods or services (Sinaga, 2024). The indicators used to evaluate the cost/price criterion include the appropriateness of the overall cost or purchase price and the supplier's ability to offer satisfactory discounts.

Supplier Profile

Supplier profile refers to the operational performance and environmental information of a supplier company (Xin et al., 2024). The parameters used to assess the supplier profile criterion include the reputation of the supplier company, the financial stability of the supplier, and the expertise of the supplier's team in handling orders.

Relationship and Communication

Relationship and communication refer to the roles, influences, and connections between company performance and communication strategies in fostering relationships and managing conflicts (Zulkeifli et al., 2023). The parameters for assessing the relationship and communication criterion include the effectiveness of the communication system between the

company and the supplier, as well as the ease of establishing and maintaining relationships with the supplier.

Related Work

Supply chain management is a strategic function within business organizations, aimed at integrating supply and demand through the planning and coordination of activities such as the procurement of materials and services, transformation processes, and logistics (Stevenson, 2021). In general, supply chain management refers to the administration of a network of organizations involved in the delivery of a company's goods or services (Heizer et al., 2020). In supply chain management, there exists a strong and inseparable relationship between suppliers and the procurement process. The procurement process must be designed with the objective of increasing supply chain surplus. A well-structured procurement process can improve forecasting and planning, as well as facilitate coordination with suppliers (Heizer et al., 2020). Intelligent companies typically engage with more than one supplier as a precautionary measure to accommodate large-volume orders (Purba et al., 2024)

This study aims to examine the current supplier performance at the Tirta Mulia Karimun Regional Public Company based on the theoretical framework previously outlined. Qureshi et al. (2023) conducted a study on a high-technology public sector organization in Pakistan that manufactures specialized equipment and tools. The researchers identified evaluation criteria as illustrated in Figure 1.

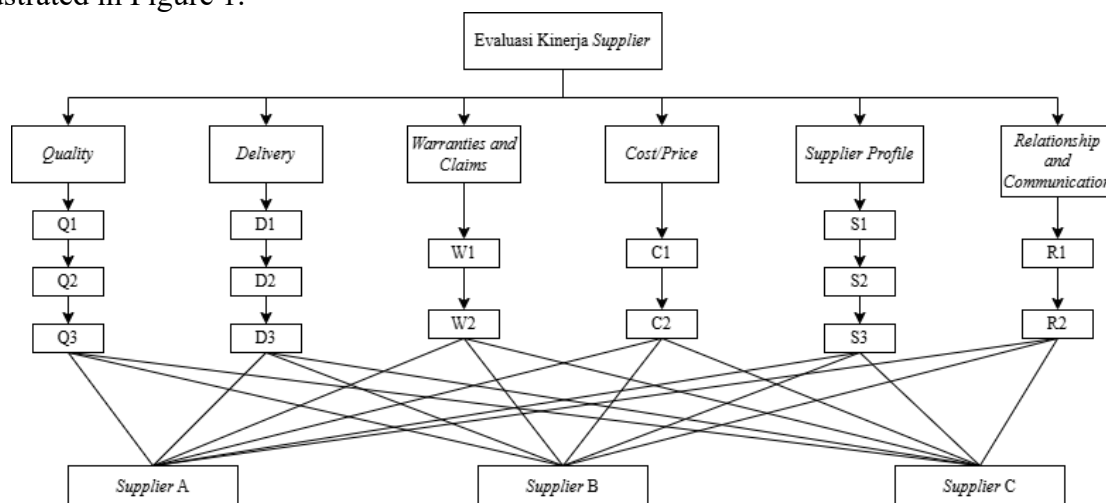


Figure 1: Framework

Source: Qureshi et al. (2023)

Methodology

The research method is a series of systematic stages involving data collection, analysis, and interpretation in accordance with the objectives of the study (Sugiyono, 2022). This research employs a quantitative approach. Based on its purpose, the study is classified as descriptive research, which involves collecting and analyzing data using frequency, percentage, and mean to illustrate the characteristics of a population or phenomenon (Cresswell, 2018). Strategically, this study utilizes a survey method, and in terms of researcher involvement, it is categorized as non-participatory research. This means that the researcher does not engage directly in the

processes being studied within the unit of analysis, thus allowing for more objective data collection (Sugiyono, 2022). The unit of analysis in this study is an institutional unit, specifically the Tirta Mulia Karimun Regional Public Company.

In this study, the selected population consists of all 60 employees at the headquarters of the Tirta Mulia Karimun Regional Public Company. The sample refers to a portion of the number and characteristics within that population (Sugiyono, 2022). This research uses snowball sampling technique, which, according to Sugiyono (2022), technique that starts with a small number and then gradually develops like a rolling snowball. In this technique, the initial respondent recommends other people to be part of the sample (Hildawati et al., 2024). Therefore, the sample in this study is a stakeholder who has a lot of information about suppliers in the company, namely the Head of General and Personnel.

Data Collection Techniques

Data were collected from both primary and secondary sources. Primary data in this study were obtained through the use of questionnaires. A closed-ended questionnaire was employed, in which the responses were predetermined based on reference journals, and respondents were only required to select options based on the Saaty scale. The criteria that respondents must meet to be classified as experts in this study are: employees who have a deep understanding of the company's procurement processes, possess extensive information about Supplier A, Supplier B, and Supplier C, and have previously worked with Supplier A, Supplier B, and Supplier C. Secondary data were gathered from various sources, including journals, books, and previous research studies, to support the literature review process and provide references for determining the criteria and indicators.

Data Analysis Techniques

The data analysis technique employed in this study is the Analytical Hierarchy Process (AHP) method. According to Saaty (2013), as cited in Ghaffar & Indrawati (2024), the steps of the AHP method are as follows:

1. Identifying the objectives, criteria, and indicators used to assess supplier performance at the Tirta Mulia Karimun Regional Public Company.
2. Constructing a hierarchical structure that represents the various criteria, indicators, and current available alternatives for supplier performance evaluation.
3. Developing a pairwise comparison matrix. Comparisons are made based on respondent preferences using Saaty's nine-point AHP scale, as shown in Table 2.1. The pairwise comparisons are then averaged using the geometric mean method. In matrix A, the element in the i-th row and j-th column (A_{ij}) represents the relative importance of A_i compared to A_j . A value of 1 is assigned when an element is compared to itself.

Table 2: Saaty's Comparison Scale

Scale	Definition	Explanation
1	Equal Importance	Both elements are equally important.
3	Slightly more important	One element is slightly more important than the other.

5	More important	One element is more important than the other.
7	Very important	One element is definitely more important than the other.
9	Absolutely more important	One element is absolutely more important than the other.
2, 4, 6, 8	Intermediate values between adjacent scale ratings	A value between two adjacent judgment values

Source: Saaty & Vargas, (2012)

4. Each value in the columns is divided by the column total and then normalized to determine the eigenvector, which is used to rank the comparison matrix based on the level of importance.
5. The same process is applied to determine the ranking of alternatives at all levels of the hierarchy. This step aims to aggregate the choices to establish the priority of each element in the hierarchy until the overall objective is achieved.
6. A Logical Consistency Test is conducted to ensure that all components are evaluated logically and consistently according to rational criteria. The steps for calculating logical consistency are as follows:
 - a. Multiply each element in the initial comparison matrix by its corresponding weight.
 - b. Multiply the total value of each row by the corresponding weight.
 - c. Calculate $\lambda_{\max}$ by summing the results of the multiplications and dividing by the total number of criteria (n).
 - d. Compute the Consistency Index (CI) and Consistency Ratio (CR) using the following formulas:

Consistency Index (CI)

$$CI = \frac{\lambda - n}{n - 1}$$

Consistency Ratio (CR)

$$CR = \frac{CI}{RI}$$

- e. Random Index (RI)

The Random Index (RI) is directly proportional to the number of alternatives or systems being compared, as shown in Table 3.

Table 3: Random Index

Matrix	RI
1, 2	0.00
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

7. If the Consistency Ratio (CR) < 10%, it indicates that the data is consistent. Conversely, a CR > 10% indicates inconsistency in the data. If inconsistency is detected, the data must be reprocessed until a consistent value is achieved.
8. Conclusion and validation. In this study, the researcher applies a validation technique that will be reviewed and validated by Dr. Moh. Hazeem bin Mohd Sidiq, an expert lecturer in the field of operations management.

Result

Description of Criteria

Table 4: Operational Description

Criteria	Sub Criteria	Operational Description
Quality	Product Quality according to company standards	A product's ability to meet and exceed consumer expectations, such as reliability, durability, accuracy, ease of use, and performance (Kotler et al., 2023)
	Products having the appropriate certification	According to the Regulation of the Minister of Public Works No. 18/PRT/M/2007 concerning the Implementation of Drinking Water Supply System Development, the use of equipment must be accompanied by a factory warranty certificate and must employ high-quality, laboratory-tested, or certified chemical substances
	Use of modern technology	The use of polyethylene pipes, ultrasonic water meters, and other equipment.
Delivery	Order Completion Speed (lead time)	The time between the recognition of an order requirement and when it becomes available for production (Heizer et al., 2020).
	Delivery Delay	The expected delivery time was not met.
	Suitability of Product Delivery Security	Ensuring product safety during shipping to prevent damage or a decline in the quality of the purchased products.
Warranties and Claims	After sales service	After-sales service encompasses product support activities that involve various customer-oriented services designed to enhance product sales, such as warranty provisions (Ardiansyah et al., 2024)
	Ease of Claim for Non-conformity	When there is a discrepancy with an order, the company can easily file a claim with the supplier
Cost/Price	Overall Cost/Price Suitability	The total cost/price is as specified in the purchase agreement.
	Discount	The supplier's ability to offer satisfactory discounts.

Supplier Profile	Supplier company's reputation	A supplier's poor reputation can affect a company's reputation (Chopra & Meindl, 2016).
	Financial strength of the supplier company	Financial strength indicates the level of profit a company generates; the stronger a company's financial position, the more efficiently it uses its funds to ensure the company's success and maintain its stability (Sabila et al., 2024).
Relationship and Communication	Supplier team's composition	The supplier team's expertise in managing orders.
	Expertise	
	Good Communication System	How effective is the communication system between the company and its suppliers.
	Ease of Relationship with Suppliers	How easy is the process of working with suppliers.

Hierarchical Structure

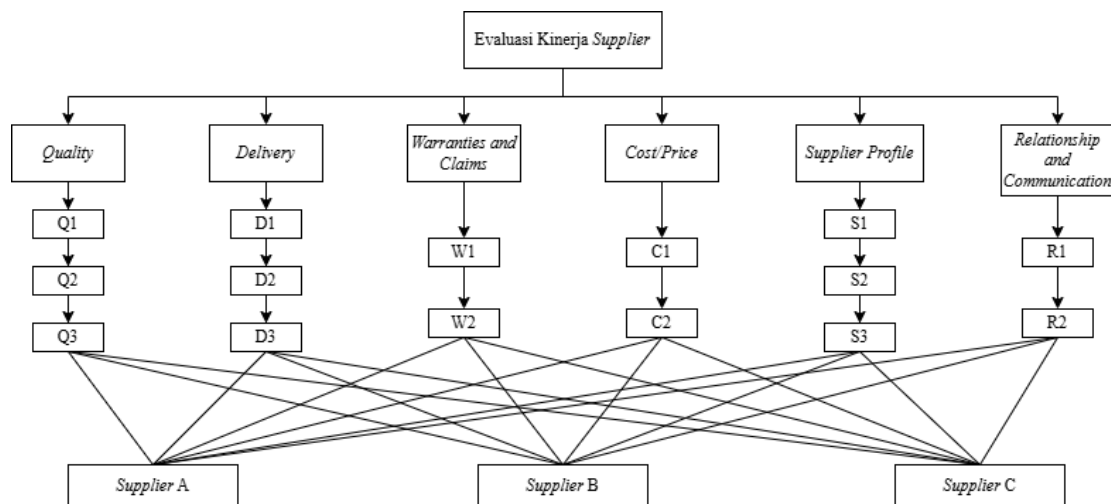


Figure 2: Hierarchical Structure

Source: Qureshi et al. (2023)

Pairwise Comparisons

The pairwise comparisons are then averaged using the geometric mean method. In matrix A, the element in the i-th row and j-th column (A_{ij}) represents the relative importance of A_i compared to A_j . A value of 1 is assigned when an element is compared to itself. Each value in the columns is divided by the column total and then normalized to determine the eigenvector, which is used to rank the comparison matrix based on the level of importance.

Table 5: Normalized Pairwise Comparison of the Primary Criteria

	Q	D	W	C	S	R	Weight
Q	0.10	0.07	0.10	0.10	0.14	0.07	0.097
D	0.18	0.12	0.08	0.07	0.23	0.24	0.153

W	0.18	0.29	0.17	0.33	0.08	0.17	0.202
C	0.22	0.36	0.11	0.20	0.17	0.29	0.226
S	0.14	0.10	0.42	0.22	0.19	0.11	0.195
R	0.18	0.12	0.12	0.08	0.19	0.12	0.126
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00

The same process is applied to determine the ranking of sub criteria and alternatives at all levels of the hierarchy. This step aims to aggregate the choices to establish the priority of each element in the hierarchy until the overall objective is achieved.

Consistency Ratio (CR)

The consistency score can be calculated based on the results of pairwise comparisons of the questionnaire responses provided by all respondents. This score indicates that similar ideas are grouped based on their similarities and the strength of the relationships between them as measured by specific criteria, thereby logically reinforcing one another.

Table 6: Determining the Lambda Value of the Primary Criterion

	Q	D	W	C	S	R	Priorit y	Matrix Multiplicati on	Priorit y	Resul t
Q	1.0 0	0.5 8	0.5 8	0.4 8	0.7 4	0.5 8	0.10	0.631	0.10	6.495
D	1.7 1	1.0 0	0.4 3	0.3 5	1.2 6	2.0 0	0.15	0.983	0.15	6.420
W	1.7 1	2.3 2	1.0 0	1.5 9	0.4 2	1.4 4	0.20	1.346	0.20	6.653
C	2.0 8	2.8 8	0.6 3	1.0 0	0.9 4	2.4 7	0.23	1.492	0.23	6.605
S	1.3 6	0.7 9	2.3 8	1.0 6	1.0 0	0.9 6	0.20	1.292	0.20	6.609
R	1.7 1	0.5 0	0.6 9	0.4 1	1.0 4	1.0 0	0.13	0.804	0.13	6.382
									$\lambda \max$	= 6.527

Calculate the consistency index (CI) and consistency ratio (CR) using the following formulas:

$$CI = \frac{\lambda - n}{n - 1} = \frac{6.527 - 6}{6 - 1} = 0.105 \quad (4.1)$$

$$CR = \frac{CI}{RI} = \frac{0.105}{1.24} = 0.0851 \quad (4.2)$$

From the calculation above, it can be seen that the CR value of $0.0851 \leq 0.1$ indicates that the data is consistent and should be moved on to the next stage. Calculate in the same way for each criterion.

Table 7: Consistency Ratio (CR) Of Criteria

Criteria	Consistency Index (CI)	Consistency Ratio (CR)		
Q	0.002	0.0037	$\leq$	0.1
D	0.056	0.096	$\leq$	0.1
W	0.000	0.000	$\leq$	0.1
C	0.000	0.000	$\leq$	0.1
S	0.0005	0.0009	$\leq$	0.1
R	0.000	0.000	$\leq$	0.1

From the above calculation, it can be seen that if the CR value for each criterion is ≤ 0.1 , this indicates that the data is consistent and should proceed to the next stage. Calculate in the same way for each sub criteria.

Table 8: Consistency Ratio (CR) Of Sub Criteria

Sub Criteria	Consistency Index (CI)	Consistency Ratio (CR)		
Q1	0.002	0.003	$\leq$	0.1
Q2	0.025	0.044	$\leq$	0.1
Q3	0.0003	0.0005	$\leq$	0.1
D1	0.002	0.0028	$\leq$	0.1
D2	-0.026	-0.44	$\leq$	0.1
D3	0.001	0.002	$\leq$	0.1
W1	0.03	0.05	$\leq$	0.1
W2	0.0074	0.013	$\leq$	0.1
C1	0.0008	0.0014	$\leq$	0.1
C2	-0.069	-0.118	$\leq$	0.1
S1	0.017	0.0299	$\leq$	0.1
S2	0.00008	0.00014	$\leq$	0.1
S3	0.046	0.079	$\leq$	0.1
R1	0.007	0.013	$\leq$	0.1
R2	0.056	0.097	$\leq$	0.1

From the above calculation, it can be seen that if the CR value for each criterion is ≤ 0.1 , this indicates that the data is consistent and should proceed to the next stage to calculate the weights

Criteria Weights

Based on the data processing and calculations that have been carried out in the previous stage, the following final results can be obtained:

Table 9: Final Ranking of Main Criteria

Criteria	Item	Weight	Priority Ranking
<i>Quality</i>	Q	0.097	6
<i>Delivery</i>	D	0.153	4
<i>Warranties dan Claims</i>	W	0.202	2
<i>Cost Price</i>	C	0.226	1

<i>Supplier Profile</i>	S	0.195	3
<i>Relationship dan Communication</i>	R	0.126	5

Source: Authors' Owns Work

Table 4 illustrates that the main priority criteria for evaluating supplier performance at the Regional Public Company Tirta Mulia Karimun is cost price, with the highest weight of 0.226. The second priority is warranties and claims with a weight of 0.202. The third priority is supplier profile with a weight of 0.195. The next priority, with a weight of 0.153, is delivery, followed by relationship and communication with a weight of 0.126. The last priority is quality with the lowest weight of 0.097. This indicates that in evaluating supplier performance at Perusahaan Umum Tirta Mulia Karimun, the respondents prioritize cost price criterion over other criteria.

This result shows the difference with previous research conducted by Qureshi et al. (2023) on high-tech public sector organizations in Pakistan that produce specialized equipment and tools, the primary priority criterion is quality, followed by cost price as the second-ranked criterion.

Sub Criteria Weights

Based on the data processing and calculations that have been carried out in the previous stage, the final results can be obtained as follows:

Table 10: Final Ranking of Sub Criteria Quality (Q)

Sub Criteria	Item	Weight	Priority Ranking
Product Quality according to company standards	Q1	0.237	2
Products having the appropriate certification	Q2	0.139	3
Use of modern technology	Q3	0.624	1

Source: Authors' Owns Work

Table 5 illustrates that the priority sub-criteria within the Quality (Q) criterion for evaluating supplier performance at the Regional Public Company Tirta Mulia Karimun are the sub-criteria of Use of modern technology (Q3). The second priority is the Product Quality according to company standards (Q1), and the last priority is Products having the appropriate certification (Q2). This condition indicates that respondents prioritize Use of modern technology (Q3) in evaluating suppliers based on the Quality (Q) criterion because using technology can help companies to improve product quality. Examples include the use of polyethylene-based pipes, ultrasonic water meters, and others.

Table 11: Final Ranking of Sub Criteria Delivery (D)

Sub Criteria	Item	Weight	Priority Ranking
Order Completion Speed (lead time)	D1	0.383	1
Delivery Delay	D2	0.339	2
Suitability of Product Delivery Security	D3	0.278	3

Source: Authors' Owns Work

Table 6 illustrates that the priority sub-criteria within the Delivery (D) criterion for evaluating supplier performance at the Regional Public Company Tirta Mulia Karimun are the sub-criteria of Order Completion Speed (lead time) (D1). The second priority is the Delivery Delay (Q2). The last priority is Suitability of Product Delivery Security (D3). This means that respondents place more importance on Order Completion Speed (lead time) (D1) when evaluating suppliers based on the Delivery (D) criterion because, according to the respondents, the longer the order completion time (lead time), the more it will affect the duration of delivery delays and the supplier's ability to ensure product security during the delivery process.

Table 12: Final Ranking of Sub Criteria Warranties and Claims (W)

Sub Criteria	Item	Weight	Priority Ranking
After sales service	W1	0.369	2
Ease of Claim for Non-conformity	W2	0.631	1

Source: Authors' Owns Work

Table 7 illustrates that the priority sub-criteria within the Warranties and Claims (W) criteria for evaluating supplier performance at the Regional Public Company Tirta Mulia Karimun is the sub-criteria of Ease of Claim for Non-conformity (W2). Meanwhile, the After Sales Service (W1) sub-criteria is the second priority. This means that based on the Warranties and Claims (W) criteria, respondents prioritize Ease of Claim for Non-conformity (W2) over After Sales Service (W1) when evaluating suppliers.

Table 13: Final Ranking of Sub Criteria Cost Price (C)

Sub Criteria	Item	Weight	Priority Ranking
Overall Cost/Price Suitability	C1	0.226	2
Discount	C2	0.774	1

Source: Authors' Owns Work

Table 8 illustrates that the priority sub-criteria within the Cost Price (C) criterion for evaluating supplier performance at the Regional Public Company Tirta Mulia Karimun is the sub-criterion of Discount sub-criterion (C2). Meanwhile, the Overall Cost/Price Suitability (C1) is the second priority. This means that based on the Cost Price (C) criterion, respondents prioritize Discount (C2) in evaluating suppliers over the Overall Cost/Price Suitability (C1). This was confirmed when the researcher conducted field observations; each suppliers offer various discounts or rebates.

Table 14: Final Ranking of Sub Criteria Supplier Profile (S)

Sub Criteria	Item	Weight	Priority Ranking
Supplier company's reputation	S1	0.330	2
Financial strength of the supplier company	S2	0.507	1
Supplier team's composition Expertise	S3	0.164	3

Source: Authors' Owns Work

Table 9 illustrates that the priority sub-criteria within the Supplier Profile (S) criterion for evaluating supplier performance at the Regional Public Company Tirta Mulia Karimun are the

sub-criteria of the financial strength of the supplier company (S2). The second priority is supplier company's reputation (S1). The last priority is the expertise of the supplier team's composition (S3). This means that respondents place more importance on the financial strength of the supplier company (S2) when evaluating suppliers based on the Supplier Profile (S) criterion. Financial strength that shows the profitability of the supplier company, the stronger the company's finances, the more efficiently the company manages its funds to determine the success and maintain the company well.

Table 15: Final Ranking of Sub Criteria Relationship and Communication (R)

Sub Criteria	Item	Weight	Priority Ranking
Good Communication System	R1	0.558	1
Ease of Relationship with Suppliers	R2	0.442	2

Source: Authors' Owns Work

Table 10 illustrates that the priority sub-criteria within the Relationship and Communication (R) criteria for evaluating supplier performance at the Perusahaan Umum Daerah Tirta Mulia Karimun are the sub-criteria of Good Communication System (R1). Meanwhile, the sub-criteria of Ease of Relationship with Suppliers (R2) is the second priority. This means that based on the Relationship and Communication (R) criteria, respondents prioritize the Good Communication System (R1) in evaluating suppliers over the Ease of Relationship with Suppliers (R2) because a good communication system will facilitate the company's relationship with suppliers.

Alternative Weight

Based on the data processing and calculations that have been carried out in the previous stage, the final results are as follows:

Table 16: Final Ranking of Alternative Based on Quality (Q) Criteria

Product Quality according to company standards (Q1)		
	Weight	Ranking
<i>Supplier A</i>	0.274	3
<i>Supplier B</i>	0.408	1
<i>Supplier C</i>	0.318	2
Products having the appropriate certification (Q2)		
	Weight	Ranking
<i>Supplier A</i>	0.353	2
<i>Supplier B</i>	0.470	1
<i>Supplier C</i>	0.177	3
Use of modern technology (Q3)		
	Weight	Ranking
<i>Supplier A</i>	0.393	2
<i>Supplier B</i>	0.428	1
<i>Supplier C</i>	0.178	3

Source: Authors' Owns Work

Table 11 illustrates that based on the sub-criterion Product Quality according to company standards (Q1), Supplier B excels, followed by Supplier C in second place and Supplier A in third place. Meanwhile, based on the sub-criterion Product has appropriate certification (Q2), the first rank is achieved by Supplier B, followed by Supplier A in second place and Supplier C in third place. In the criterion Use of modern technology (Q3), Supplier B again ranks first, followed by Supplier A in second place and Supplier C in third place. It can be concluded that in the Quality (Q) criteria, respondents prefer Supplier B based on the sub-criteria of Product Quality according to company standards (Q1), Product having appropriate certification (Q2), and the Use of modern technology (Q3).

Table 17: Final Ranking of Alternative Based on Delivery (D) Criteria

Order Completion Speed (lead time) (D1)		
	Weight	Ranking
<i>Supplier A</i>	0.314	2
<i>Supplier B</i>	0.206	3
<i>Supplier C</i>	0.480	1
Delivery Delay (D2)		
	Weight	Ranking
<i>Supplier A</i>	0.344	2
<i>Supplier B</i>	0.208	3
<i>Supplier C</i>	0.448	1
Suitability of Product Delivery Security (D3)		
	Weight	Ranking
<i>Supplier A</i>	0.188	3
<i>Supplier B</i>	0.196	2
<i>Supplier C</i>	0.616	1

Source: Authors' Owns Work

Table 12 illustrates that based on the sub-criteria of Order Completion Time (Lead Time) (D1), Supplier C excels, followed by Supplier A in second place and Supplier B in third place. The same pattern occurs in the calculations based on the sub-criteria of Delivery Delay (D2), with Supplier C ranking first, Supplier A in second place, and Supplier B in third place. Meanwhile, in the criteria of Product Delivery Safety Compliance (D3), Supplier C ranks first, followed by Supplier B in second place and Supplier A in third place. It can be concluded that in the Delivery (D) criteria, respondents prefer Supplier C based on the sub-criteria of Order Completion Speed (lead time) (D1), Delivery Delay (D2), and Product Delivery Security Compliance (D3).

Table 18: Final Ranking of Alternative Based on Warranties and Claims (W) Criteria

After sales service (W1)		
	Weight	Ranking
<i>Supplier A</i>	0.305	2
<i>Supplier B</i>	0.485	1
<i>Supplier C</i>	0.210	3
Ease of Claim for Non-conformity (W2)		
	Weight	Ranking

<i>Supplier A</i>	0.315	2
<i>Supplier B</i>	0.283	3
<i>Supplier C</i>	0.402	1

Source: Authors Own Compilation

Table 13 illustrates that based on the sub-criterion After Sales Service (W1), Supplier B excels, followed by Supplier A in second place and Supplier C in third place. Meanwhile, in the criterion Ease of Claim for Non-conformity (W2), Supplier C ranks first, Supplier A ranks second, and Supplier B ranks third. It can be concluded that in the Warranties and Claims (W) criteria, respondents prefer Supplier B based on the After Sales Service (W1) sub-criteria. Meanwhile, for the Ease of Claiming Non-Conformity (W2) sub-criteria, respondents prefer Supplier C.

Table 19: Final Ranking of Alternative Based on Cost Price (C) Criteria

Overall Cost/Price Suitability (C1)		
	Weight	Ranking
<i>Supplier A</i>	0.364	2
<i>Supplier B</i>	0.379	1
<i>Supplier C</i>	0.257	3
Discount (C2)		
	Weight	Ranking
<i>Supplier A</i>	0.380	1
<i>Supplier B</i>	0.261	3
<i>Supplier C</i>	0.359	2

Source: Authors' Owns Work

Table 14 illustrates that based on the sub-criterion of Overall Cost Price Suitability (C1), Supplier B excels, Supplier A ranks second, and Supplier C ranks third. Based on the sub-criterion of Discount (C2), with Supplier A achieving the top rank, Supplier C in second place, and Supplier B in third place. It can be concluded that in the Cost Price (C) criterion, respondents prefer Supplier B based on Overall Cost/Price Suitability (C1) and Supplier A based on Discount (C2).

Table 20: Final Ranking of Alternative Based on Supplier Profile (S) Criteria

Supplier company's reputation (S1)		
	Weight	Ranking
<i>Supplier A</i>	0.404	1
<i>Supplier B</i>	0.257	3
<i>Supplier C</i>	0.338	2
Financial strength of the supplier company (S2)		
	Weight	Ranking
<i>Supplier A</i>	0.244	2
<i>Supplier B</i>	0.191	3
<i>Supplier C</i>	0.565	1
Supplier team's composition expertise (S3)		
	Weight	Ranking

<i>Supplier A</i>	0.575	1
<i>Supplier B</i>	0.226	2
<i>Supplier C</i>	0.199	3

Source: Authors' Owns Work

Table 15 illustrates that based on the sub-criterion of Supplier Company Reputation (S1), Supplier A excels, followed by Supplier C in second place and Supplier B in third place. Meanwhile, in the calculation based on the sub-criterion of Supplier Company Financial Strength (S2), Supplier C ranks first, Supplier A ranks second, and Supplier B ranks third. In the criterion of Supplier Team Composition Expertise (S3), Supplier A ranks first, Supplier B ranks second, and Supplier C ranks third. It can be concluded that in the Supplier Profile (S) criteria, respondents prefer Supplier A based on the sub-criteria of Supplier Company Reputation (S1) and Supplier Team Composition Expertise (S3). Meanwhile, for the sub-criteria of Supplier Company Financial Strength (S2), respondents prefer Supplier C.

Table 21: Final Ranking of Alternative Based on Relationship and Communication (R) Criteria

Good Communication System (R1)		
	Weight	Ranking
<i>Supplier A</i>	0.554	1
<i>Supplier B</i>	0.126	3
<i>Supplier C</i>	0.321	2
Ease of Relationship with Suppliers (R2)		
	Weight	Ranking
<i>Supplier A</i>	0.554	1
<i>Supplier B</i>	0.126	3
<i>Supplier C</i>	0.321	2

Source: Authors' Owns Work

Table 16 illustrates that based on the sub-criterion of Good Communication System (R1), Supplier C ranks first, Supplier A ranks second, and Supplier B ranks third. Same calculation based on the sub-criterion of Ease of Relationship with Supplier (R2), Supplier A ranks first, Supplier C ranks second, and Supplier B ranks third. It can be concluded that in the criteria of Relationship and Communication (R), respondents prefer Supplier A based on both of the sub-criterion of Good Communication System (R1) and Ease of Relationship with Supplier (R2).

Final Results of AHP Calculation

Based on the weight values obtained, the percentage weight of each alternative can be calculated and subsequently illustrated in the diagram in Figure 2.

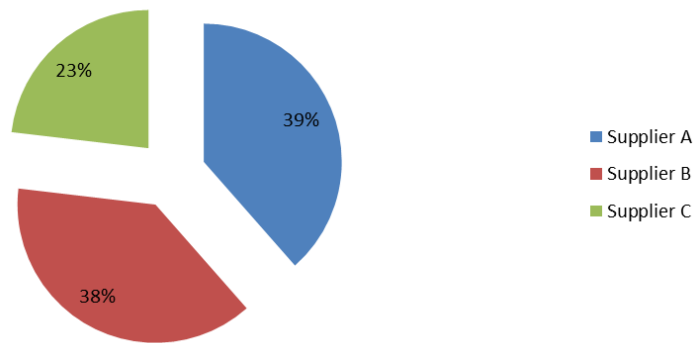


Figure 2: Final Result

As can be seen in Figure 2, the weight values for each alternative based on the largest weight are Supplier A with a weight value of 45.6313 or 38.48%, followed by Supplier B with a weight value of 45.3254 or 38.22%, and Supplier C with a weight value of 27.6357 or 23.30%.

Supplier A, a provider of HDPE pipe materials and water meters located in Tanjung Pinang, maintains a large inventory of goods that meet the company's quality standards at relatively low prices. Regional Public Company Tirta Mulia Karimun has been a regular client of Supplier A for the past three years. Throughout this period, Supplier A has demonstrated strong support systems in its services, facilitating effective communication with the company, as evidenced by the availability of a 24-hour call center. Through the application of the Analytic Hierarchy Process (AHP) method, the company gains a more structured understanding of the criteria that need to be prioritized in the supplier evaluation process. Based on the conclusions drawn, the company can also identify the supplier that best aligns with its objectives and operational requirements.

Conclusion

Based on the calculations using the AHP method, the criteria deemed most suitable to be prioritized in evaluating supplier performance, ranked from highest to lowest weight, are as follows: cost price with a weight of 0.226, warranties and claims at 0.202, supplier profile at 0.195, delivery at 0.153, relationship and communication with a weight of 0.126, and quality at 0.097. These results indicate that the company places primary emphasis on cost price aspect when evaluating supplier performance compared to other criteria.

The sub-criteria deemed worthy of priority in evaluating supplier performance using the Analytical Hierarchy Process (AHP) method, obtained through paired comparison questionnaires and tested for consistency, can be ranked based on the final weight values of each main criterion. For the Quality criterion, the sub-criterion of the use of modern technology has the highest weight of 0.624, followed by product quality in accordance with company standards with a weight of 0.237, and products having appropriate certifications with a weight of 0.139. For the Delivery criterion, the speed of order completion (lead time) receives the highest weight of 0.383, followed by the frequency of delivery delays with a weight of 0.339, and the security level in product delivery with a weight of 0.278. In the Warranties and Claims criteria, the ease of the claims process for product discrepancies is the main sub-criterion with a weight of 0.631, while after-sales service receives a weight of 0.369. Based on the Cost Price

criteria, discounts conformity has a weight of 0.774, while the overall cost or price have a weight of 0.226. In the Supplier Profile criteria, the supplier company's financial strength receives a weight of 0.507, followed by the supplier company's reputation with a weight of 0.330, and the supplier team's expertise or competence with a weight of 0.164. Lastly, for the criteria of Relationship and Communication, a good communication system is the main sub-criteria with a weight of 0.558, while the ease of establishing a relationship with the supplier has a weight of 0.442.

Based on the calculation results using the AHP method, the ranking of suppliers is determined as follows: Supplier A occupies the highest rank with a weight value of 45.6313 or equivalent to 38.48%, followed by Supplier B with a weight of 45.3254 (38.22%), and Supplier C with a weight of 27.6357 (23.30%). Thus, Supplier A is assessed to have the best performance compared to Supplier B and Supplier C, based on all the evaluation criteria established in this study.

Supplier A, located in Tanjung Pinang, has a large inventory of goods that meet the company's quality standards at relatively low prices. The Karimun Regional Public Enterprise Tirta Mulia has been a customer of Supplier A for 3 years. To date, Supplier A has maintained a robust support system for its services, facilitating effective communication with the company, as evidenced by its 24-hour call center. However, because Supplier A is located off the island, delivery delays frequently occur.

Based on these findings, there are a number of recommendations and suggestions that can be taken into consideration, particularly those related to supplier performance evaluation. By applying the AHP method, the company gains a more structured understanding of the criteria that need to be prioritized in the supplier evaluation process. Based on the conclusions outlined above, the company can also identify the suppliers that best align with its operational goals and needs. Nevertheless, maintaining good relationships with other suppliers remains an important consideration to ensure the continuity of harmonious and sustainable cooperation.

Future research is advised to include additional analysis techniques, such as sensitivity analysis, as supplementary information to strengthen the evaluation results. This analysis can provide further insights into the resilience and feasibility of implementing the obtained solutions. Additionally, subsequent researchers may also consider adding more diverse evaluation criteria and expanding the scope of the samples used. The development of research directions can also be carried out by applying alternative methods besides AHP to obtain a more comprehensive perspective and approach.

It is hoped that this research can make a tangible contribution to the Regional Public Company Tirta Mulia Karimun in evaluating supplier performance to support the improvement of the company's operational effectiveness.

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References

- Anggraeni, R., & Maulani, I. E. 2023. Pengaruh Teknologi Informasi terhadap Perkembangan Bisnis Modern. *Jurnal Sosial dan Teknologi (SOSTECH)*, 3(2).
- Ardiansyah, M. F., Isyanto, P., & Sumarni, N. 2024. Pengaruh Service Quality dan After Sales Service terhadap Customer Loyalty pada OPS Garage. *Jurnal Kajian Ekonomi & Bisnis Islam*, 5(4), 2275-2287.
- Badan Pusat Statistik Indonesia. 2024. Jumlah Penduduk Pertengahan Tahun – Tabel Statistik. *Badan Pusat Statistik*. Retrieved from <https://www.bps.go.id/id/statistics-table/2/MTk3NSMy/jumlah-penduduk-pertengahan-tahun--ribu-jiwa-.html>
- Chopra, S., & Meindl, P. (2016). *Supply Chain Management: Strategy, Plainningm and Operation* (6th ed.). Perason.
- Cresswell, J. W. 2018. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE
- Dispendukcapil Kabupaten Karimun. 2024. Data Penduduk Kabupaten Karimun. Retrieved from <https://dukcapil.karimunkab.go.id/>
- Ghaffar, A. A., & Indrawati. 2024. The Assessment of Usability and Service Quality in E-Commerce Using the Integration of Analytical Hierarchy Process (AHP) and Technique for Order Performance by Similarity to Ideal Solution (TOPSIS). *Asian Journal of Business and Accounting*, 17(1). <https://doi.org/10.22452/ajba.vol17no1.7>
- Hasiani, F. M. U., Haryanti, T., Rinawati, & Kurniawati, L. 2021. Sistem Pendukung Keputusan Pemilihan Supplier Produk Ritel dengan Metode Analytical Hierarchy Process. *SISTEMASI: Jurnal Sistem Informasi*, 10(1), 152-162.
- Heizer, J., Render, B., & Munson, C. 2020. *Operations Management: Sustainability and Supply Chain Management* (13th ed.). Pearson
- Hildawati, Suhirman, L., Prisuna, B. F., Husnita, L., Mardikawati, B., Isnaini, S., Wakhyudin, Setiawan, H., Hadiyat, Y., M, A., & Saktisyahputra. 2024. *Buku Ajar Metodologi Penelitian Kuantitatif & Aplikasi Pengolahan Analisa Data Statistik*. PT. Sonpedia Publishing Indonesia.
- Himawan, A. F. I., Priyana, E. D., & Sidik, M. H. 2022. Analisis Congestion Faktor Pada Logistik Alkes & Obat Rumah Sakit Muhammadiyah Dengan Analytical Hierarchy Process. *Jurnal Manajerial*, 9(3), 316 - 337. <https://doi.org/10.30587/jurnalmanajerial.v9i03.4360>
- Kotler, P., Armstrong, G., & Balasubramanian, S. 2023. *Principles of Marketing* (19th ed.). Pearson.
- Lou, Z., Ye, A., Mao, J., & Zhang, C. 2022. Supplier selection, control mechanisms, and firm innovation: configuration analysis based on fsQCA. *Journal of Business Research*, 139, 81-89.
- Nikseresht, A., Shokouhyar, S., Tirkolae, E. B., Nikookar, E., & Shokoohyar, S. 2024. An intelligent decision support system for warranty claims forecasting: Merits of social media and quality function deployment. *Technological Forecasting & Social Change*, 201.
- Octavian, D., & Himawan, A. F. I. 2021. Supplier Quality Assessment at PT. Polowijo Gosari Through Analytical Hierarchy Process Approach. *UMMagelang Conference Series*, 277 - 289. Retrieved from <http://journal.unimma.ac.id/index.php/conference/article/view/5877%0Ahttps://journal.unimma.ac.id/index.php/>

- Purba, S., Kristina, S., & Setiawati, M. 2024. Analisis Pemilihan Supplier Bahan Baku Daging Halal di Restoran Beken BBQ Bandung Menggunakan Metode Fuzzy AHP. *JEIS (Journal Engineering in Industrial Systems)*, 1(5), 70 - 82.
- Qureshi, S. A., Naseem, A., & Ahmad, Y. 2023. Outsourcing or in-house manufacturing in Hi-tech industry: supply chain process with Delphi-AHP approach. *Emerald Publishing Limited*, 2799-2823. <http://dx.doi.org/10.1108/K-08-2022-1172>
- Rahman, F. 2024. Kebutuhan Air Harian Rumah Tangga, Aksesibilitas dan Kesehatan. *PSLH UGM*. Retrieved from <https://pslh.ugm.ac.id/kebutuhan-air-harian-rumah-tangga-aksesibilitas-dan-kesehatan/>
- Saaty, T. L., & Vargas, L. G. 2012. Models, Methods, Concepts & Applications of the Analytic Hierarchy Process (2nd ed., Vol. 175). Springer US.
- Sabila, K., Murasih, S., & Hendra, J. (2024). Analisis Rasio Likuiditas Pendekatan Empiris dalam Evaluasi Finansial Perusahaan. *Jurnal EK&BI*, 7(1).
- Sinaga, S. O. 2024. Analysis of Determining the Cost of Goods Production Using the Full Costing Method as a Basis for Determining the Selling Price of Rubber Rubber at PT. Sinar Belantara Indah. *Luxury: Landscape of Business Administration*, 2(1).
- Stevenson, W. J. 2021. *Operation Management* (14th ed.). McGraw-Hill Education.
- Sugiyono. 2022. *Metode Penelitian Manajemen*. ALFABETA
- Tarigan, Y., Devano, A. M., Harlan, F. B., Arzaman, A. F. M., Nadia, L., & Rashid, N. 2024. Supplier Selection Analysis for Sand Materials Using AHP in the Indonesian Manufacturing Industry. *Journal Européen des Systèmes Automatisés*, 57(3), 805 - 813. <http://dx.doi.org/10.18280/jesa.570319>
- Xin, Z., Zhang, Z., & Xiang, C. 2024. Do Suppliers Value Clients' ESG Profiles? Evidence from Chinese firms. *International Review of Economic & Finance*, 91, 241-258.
- Zulkeifli, N. Y., Jamri, M. H., Ridzuan, A. R., Khairuddin, K., Rani, N. S. A., Hadi, S. N. I. A., & Ibrahim, N. A. N. 2023. Communication as a Strategy in Enhancing an Organization Performance. *International Journal of Academic Research in Business & Social Sciences*, 13(10), 2041-20