El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam

Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

Selection of Packaging Supplier Manufacturing Industry PT. ABC in East Java with An Analytical Hierarcy Process (AHP) Approach

Nicholaus Gede Rio G. M
Airlangga University
nicholaus.gede.rio-2021@feb.unair.ac.id

ABSTRACT

This research was conducted to study and analyze problems related to supplier selection in manufacturing companies. Data collection was carried out by means of interviews, observation and literature study. Data processing uses the AHP approach. The results of data processing using the AHP method can be obtained from several alternative suppliers, namely "GA", "BS", "PO", while the criteria include quality, price and service. Then, using AHP, the results of Suppliers that are recommended to be prioritized by taking into account the three criteria are found in the first order, namely Supplier GA with a priority weight of (0.657), then the second priority order is Supplier BS with a weight of (0.237) and the third priority is Supplier PO with a weight of (0.104).

Keywords: *AHP, Price, Quality, Service, Supplier Selection*

ABSTRAK

Penelitian ini dilakukan untuk mempelajari dan menganalisis permasalahan terkait pemilihan pemasok di perusahaan manufaktur. Pengumpulan data dilakukan dengan cara wawancara, observasi dan studi pustaka. Pengolahan data menggunakan pendekatan AHP. Hasil pengolahan data menggunakan metode AHP dapat diperoleh dari beberapa pemasok alternatif, yaitu "GA", "BS", "PO", sedangkan kriterianya meliputi kualitas, harga dan pelayanan. Kemudian, dengan menggunakan AHP, hasil Supplier yang direkomendasikan untuk diprioritaskan dengan memperhatikan ketiga kriteria tersebut ditemukan pada order pertama yaitu Supplier GA dengan bobot prioritas (0,657), kemudian urutan prioritas kedua adalah Supplier BS dengan bobot (0,237) dan prioritas ketiga adalah Supplier PO dengan bobot (0,104).

Kata Kunci: AHP, Harga, Kualitas, Pelayanan, Pemilihan Pemasok

INTRODUCTION

In the current era of globalization, the manufacturing industry is developing very quickly, supported by major advances in science and technology. This progress makes business competition even tighter. Therefore, companies must be able to provide satisfaction to customers in all aspects of their lives. Maintaining the quality of the products made is one of them. One of the first ways to ensure product quality is maintained is to optimize supply chain management. Managing the supply chain (SCM) is a method or approach for managing the flow of products, information and funds in an integrated manner that involves all parties from upstream to downstream,

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

including suppliers, factories that carry out distribution, and logistics services (Pujawan & Er, 2017).

Suppliers are one of the business partners who play an important role in ensuring the availability of supplies or raw materials needed by the company. Having more than one supplier when meeting a company's needs can cause some problems when selecting a supplier that can continue to work with the company (Lukmandono et al., 2019). To meet needs that a company cannot produce itself, the company needs suppliers who are able to meet standards, in accordance with the company's goals. Thus, it is hoped that there will be no obstacles in meeting production needs due to appropriate prices, timely delivery, adequate quality, and others (March Wijaya et al., 2021).

Supplier selection is a long process and must be done carefully because mistakes in selecting suppliers can disrupt the company's production and operational processes. Suppliers must first be evaluated by the company based on several criteria. There are several criteria for which trade offs often occur during evaluation, such as suppliers who provide high quality goods but have long waiting times. It is very difficult to find the best supplier if there are more criteria. So, to choose a supplier, you need a way to make decisions in choosing a supplier (Ningsih & Rosyada, 2024). Supplier selection is formed from a multi-criteria problem involving quantitative and qualitative factors that can influence supplier selection. As a result, an approach is needed that can combine both in measurement. Analytical Hierarchy Process (AHP) is one method that can be used to select suppliers (Rahmayanti, 2010).

The Analytical Hierarchy Process (AHP) aims to determine the priority order of company criteria and sub-criteria. AHP is also designed to prioritize alternatives when multiple criteria need to be considered, and allows decision makers to organize complex problems into a hierarchy or series of integrated levels, by comparing them with each other. The Analytical Hierarchy Process (AHP) method is used by companies to determine which suppliers are most suitable to maintain and which ones might be replaced with new suppliers.

One of the most commonly used methods for determining suppliers is the integration of the Analytical Hierarchy Process (AHP). This method has the ability to provide the best performance from each supplier (Taufik et al., 2014). Currently, the business has identified three potential suppliers, and the best one will be selected. Companies are expected to gain direct and indirect benefits by choosing the right supplier. According to Kang and Lee (2010), supplier selection analysis has been widely carried out. Although there are many studies on suppliers, each study is different. The difference lies in the methods they use. The methods used are adapted to the objectives and research subjects. The tool for evaluating suppliers is the evaluation method.

There are several studies that examine supplier selection, including research conducted by (Handayani, 2017) using the criteria of quality, delivery and price, product, service. Study(Wardhana & Prastawa, 2017)using the criteria of quality, cost,

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

delivery accuracy, flexibility and responsibility. Study (Rivaldi et al., 2023) using the criteria of quality, price, delivery, quantity accuracy, and service. Study(Mawarni & Azizah, 2023)using the criteria of quality, delivery, price, service and payment. Study(Abdullah et al., 2022)using the criteria of Quality, Price, Service, Delivery. Study(Narti et al., 2019)using the criteria of cost, school quality, final destination of graduates, as well as talents and interests. (Niqotaini, 2023) using the criteria of attendance, dedication, discipline, cooperation, communication, responsibility. And research (Agusli et al., 2020) And (Sinaga et al., 2020) which uses the AHP method to determine the decision support system in employee selection. This research is different from other research, in this research the researcher uses criteria, quality, price and service. The method used uses the AHP method. Based on the background above, the researcher took the title "Selection of Packaging Suppliers for the Manufacturing Industry PT. ABC in East Java with the Analytical Hierarchy Process (AHP) approach."

LITERATURE REVIEW

Supplier Selection

Suppliers are companies or individuals who have the ability to provide resources, namely goods or services needed by other businesses (Pujawan & Er, 2017). One important aspect in choosing a supplier is the criteria used. These criteria are very important for family businesses because they can influence the production process. Businesses with low costs and fast response will have a competitive advantage because raw materials are high quality and delivered on time. The standards used must of course be in accordance with the supply chain strategy and product features to be supplied.

Each company has different standards for selecting suppliers, depending on the company's goals. Many companies make mistakes in choosing suppliers because they only pay attention to product price, product quality, and on-time delivery, without considering overall costs. In fact, companies usually require additional standards that the company considers important (Widiyanesti & Setyorini, 2012).

According to Syuprihatin (2011), there are several criteria for selecting suppliers, namely:

a. Product Quality: This criterion assesses suppliers based on the quality of their products. One component that is very important for business is raw materials. For companies that do not make their own raw materials
b. Price: Every business really considers the price criteria for material costs provided by suppliers.
c. Time: Between This criterion assesses providers based on the services they offer in terms of delivery of raw materials.
d. Stock Availability: This criterion is evaluated based on the stock available by the provider.

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

e. Ease of Payment: This criterion assesses suppliers based on how payments are made in transactions.
f. Warranty Level: This criterion assesses whether the supplier provides a guarantee for the goods ordered.
g. Level of Cooperation and Information Exchange: This criterion looks at how much the supplier collaborates with the company and how much information is exchanged about the raw materials the company needs.
h. Speed of response to complaints: This criterion assesses how suppliers respond to company complaints in cases of errors or shortages of raw materials that have been ordered.

AHP method

Thomas L. Saaty created the first Analytical Hierarchy Process (AHP) model with additive weighting in (Kadarsyah, 1998). It is called AHP because the arithmetic operation used to get the total weight is addition. Process Analytical Hierarchy (AHP) is a way to break down complex and unstructured situations into several components in a hierarchical order. The AHP method does this by giving a subjective rating of how important each variable is relatively and determining which variable most influences the outcome of the situation.

The Analytical Hierarchy Process (AHP) method helps solve complex problems by creating a hierarchy of standards, stakeholders, results, and assigning weights or priorities by considering various considerations. This method also combines the powers of perception and logic involved in various problems, and then combines various considerations to produce results that match the intuitive estimates that have been made (Alam Syah, 2014). The steps in the AHP method according to Lukmandono et al., 2019) includes:

a. Determine the problem and find a solution.
b. Create a hierarchical structure at various levels, including the top of the hierarchy, criteria and sub-criteria which are sequential from the intermediate level to the lowest level (alternative).
c. Create a pairwise comparison matrix, where comparisons are made based on the considerations of the decision maker by comparing items with other items.
d. Carry out pairwise comparisons to obtain a total conclusion of nx [(n-1)/2], where n is the number of elements being compared.
e. Calculating eigenvalues and checking their consistency; if the results are inconsistent, data collection is repeated.
f. Repeat steps 3, 4 and 5 for the entire hierarchy level.
g. Calculate the eigenvector of each pairwise comparison matrix; The eigenvector value is the weight of each element. This step is carried out to synthesize decisions about determining which elements should be given priority at the lowest hierarchical level until the goal is achieved.

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

h. Checking hierarchy consistency. A value of more than 10% requires improved decision data assessment; However, if the consistency ratio (CI/IR) is less than or equal to 0.1, then the calculation results can be considered correct.

Table 1. Pairwise Comparison Rating Scale

Intensity of Interest	Definition	Information
1	Equally Important	Both elements are equally important
3	A little more important	One element is slightly more important than the other elements
5	More important	One element is more important than the other elements
7	Very important	One element is clearly more important than the other
9	Absolutely more important	One element is proven to be absolutely preferable to its counterpart, at the highest level of confidence
2,4,6,8	Middle value	Given when there is doubt in the assessment between two adjacent assessments
The opposite	Aij = 1/Aij	If activity i gets a number when compared to activity j, then j has the opposite value when compared to i

Source: Thomas L Saaty, 1994

Table 2. Random Index (RI) Values

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R1	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Source: Thomas L Saaty, 1994

The comparison between CI and RI for a matrix is defined as the consistency ratio, CR = ! "! (7) The comparison matrix is acceptable if the consistency ratio (CR) value is ≤ 0.1.

RESEARCH METHODS

Methods In this research, it includes problem identification, data is collected, and then analyzed to find the criteria for the best supplier, then decision makers provide quantitative values. In this research, all respondents knew suppliers who partnered with manufacturing companies, and they all understood and were able to provide an assessment of each supplier through a questionnaire. The benefit of this research is the ability to use the Analytical Hierarchy Process (AHP) method to select the best supplier.

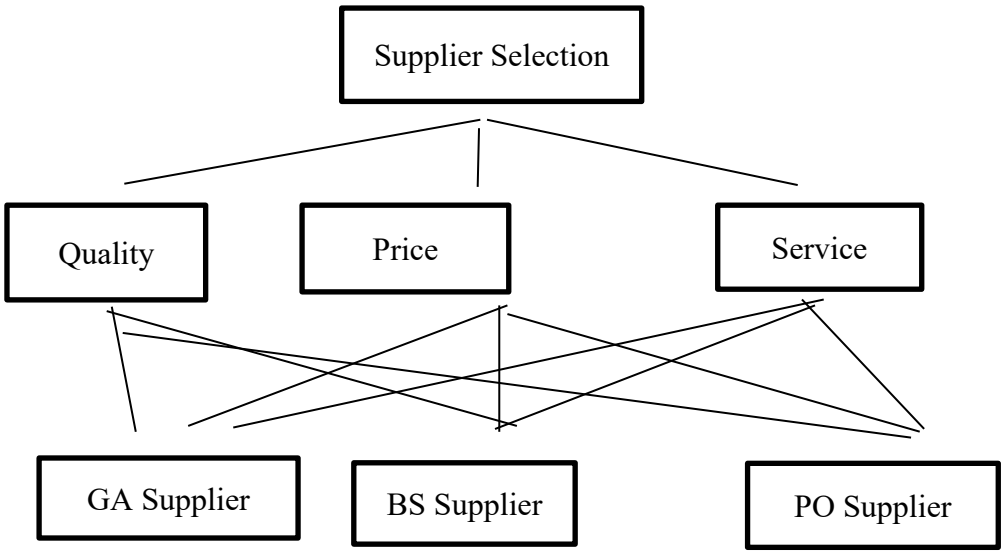
El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

This research data was obtained from interviews and questionnaires. Interviews are conducted with experts responsible for decision making. In the supplier selection process, the interview results are very representative because the respondents are experts, manager experts and business experts. The questionnaire was given to three respondents who really understand the company's situation and are responsible for decision making.

RESULTS AND DISCUSSION

For each criterion, a pairwise comparison is carried out, namely comparing each element with other elements. The element importance level values are calculated as qualitative opinions at each hierarchical level in pairs. To find the best supplier, the criteria in this research consist of price, quality and service. Figure 1 shows the hierarchical structure of supplier selection.

Figure 1. Supplier Selection Hierarchy Structure



Source: Research data (2024)

Table 3. Pairwise Comparison Between Criteria

Criteria	Price	Quality	Service
Quality	1	5	3
Price	0.20	1	1
Service	0.33	1	0.33

Table 4. Pairwise Comparison Between Suppliers on CriteriaPrice

Criteria	GA Supplier	BS Supplier	PO Supplier
GA Supplier	1	3	1

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

BS Supplier	0.33	1	3
PO Supplier	1	0.33	1

Table 5. Pairwise Comparison Between Suppliers on CriteriaQuality

Criteria	GA Supplier	BS Supplier	PO Supplier
GA Supplier	1	1	1
BS Supplier	1	1	3
PO Supplier	1	0.33	1

Table 6. Pairwise Comparison Between Suppliers on CriteriaService

Criteria	GA Supplier	BS Supplier	PO Supplier
GA Supplier	1	5	7
BS Supplier	0.2	1	5
PO Supplier	0.14	0.2	1

Data processing

Table 7. Normalized Price Eigen

Criteria	GA Supplier	BS Supplier	PO Supplier	Total	EVN
GA Supplier	2.99	7.67	19	29.66	0.660432
BS Supplier	1.27	3	6.2	10.47	0.233133
PO Supplier	0.51	1.27	3	4.78	0.106435

The highest result on the price criteria is supplier 1 with a value of 0.660, followed by the second supplier with a value of 0.233 and finally the 3rd supplier with a value of 0.106

Table 8. Quality Normalized Eigen

Criteria	GA Supplier	BS Supplier	PO Supplier	Total	EVN
GA Supplier	2.99	2.33	19	24.32	0.614607
BS Supplier	1.27	3	6.2	10.47	0.264594
PO Supplier	0.51	1.27	3	4.78	0.120799

The highest result on the quality criteria is supplier 1 with a value of 0.614, followed by the second supplier with a value of 0.264 and finally the third supplier with a value of 0.120

Table 9. Service Normalized Eigen

Criteria	GA Supplier	BS Supplier	PO Supplier	Total	EVN
GA Supplier	2.98	11.4	39	53.38	0.731033
Supplier 2	1.1	3	11.14	15.24	0.20871

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

PO Supplier	0.32	1.1	2.98	4.4	0.060257

The highest result on the service criteria is supplier 1 with a value of 0.731 followed by the second supplier with a value of 0.208 and finally the third supplier with a value of 0.060

Table 10. Consistency Ratio

Information	E. max	CI	CR
GA Supplier	3.08342611	0.041713	0.071919
BS Supplier	3.06520091	0.0326	0.056208
PO Supplier	3.05693235	0.028466	0.04908

Because the CR result is ≤ 0.1, the assessment is consistent and data processing can be continued to the next calculation.

Table 11. Final Value

Final score	
GA Supplier	0.657783
BS Supplier	0.237542
PO Supplier	0.104675

Based on the final value table, it can be seen that supplier "GA" received the highest final value and was ranked 1st with a value of 0.657, then "BS" was ranked 2nd with a final value of 0.237, "PO" was ranked 3rd. with a final value of 0.104.

Discussion

From the results of the AHP analysis above, in selecting suppliers in manufacturing companies, it was found that suppliers recommended for priority by taking into account the three criteria above were in first place, GA Supplier with a weight of 0.657. The next criteria that have an influence are the Supplier BS criteria with a weight of 0.237, the Supplier PO criteria with a weight of 0.104. In choosing suppliers, manufacturing companies consider quality, price and service. From the results of calculating the value of each supplier above, it can be seen that there is no significant difference in value between one supplier and another.

Quality criteria are a dynamic state related to products, services, people, processes and environments that meet or exceed expectations. The opinion above can be interpreted as evidence that the quality offered in relation to the product and its supporting components meets consumer expectations. If the product meets customer expectations, then its quality is better. Thus, it can be said that product quality shows how good customer satisfaction is, which correlates with customer expectations regarding the product quality they feel. Therefore, the quality criterion is the most important when selecting a supplier, with the highest priority over the other two criteria.

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam
Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

Price criteria play an important role in product selection, because purchasing raw materials makes a relatively large contribution to the selling value of the product. It is hoped that the company can increase profits by reducing raw material costs because the price is cheaper. Price can be the amount of money paid for a good or service or the sum of all the values given by the customer to gain benefits from owning or using the good or service. In marketing, price plays a strategic role. The product in question will not be accessible to the target market if the price is too expensive. On the other hand, if the price is too low, it is difficult for the company to make a profit or some customers believe that it is bad.

The service criterion is in third place, consumers must be given good service because service quality has a close relationship with purchasing decisions. If the company provides good service, the company can maintain its business and be able to compete with other competitors. Suppliers who are able to provide good service can help improve the company's operational efficiency. They can reduce disruptions in the supply chain and optimize production processes. Flexible suppliers can help businesses adapt to changing markets or needs. One example of this flexibility could be the ability to customize products, change delivery schedules, or adjust orders.

CONCLUSION

Based on the data processing and analysis that has been carried out in the previous section, the conclusion that can be drawn is to determine Supplier GA as the best supplier. This can be seen by the highest final value in the final AHP calculation, namely 0.657. Quality criteria are a dynamic state related to products, services, people, processes and environments that meet or exceed expectations. Price criteria play an important role in product selection, because purchasing raw materials makes a relatively large contribution to the selling value of the product. It is hoped that the company can increase profits by reducing raw material costs because the price is cheaper. The service criterion is in third place, consumers must be given good service because service quality has a close relationship with purchasing decisions. If the company provides good service, the company can maintain its business and be able to compete with other competitors.

REFERENCES

Abdullah, F., Paillin, D. B., Camerling, B. J., & Tupan, J. M. (2022). Analisis Pemilihan Supplier Menggunakan Analytical Hierarchy Process (AHP). ALE Proceeding, 5. https://doi.org/10.30598/ale.5.2022.85-91

Agusli, R., Dzulhaq, M. I., & Irawan, F. C. (2020). Sistem Pendukung Keputusan Penerimaan Karyawan Menggunakan Metode Ahp-Topsis. Academic Journal of Computer Science Research, 2(2). https://doi.org/10.38101/ajcsr.v2i2.286

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam

Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

Alam Syah, D. P. (2014). Metode Analytical Hierarchy Process: Sistem Rekomender Database Software. Jurnal Informatika, 1(2). https://doi.org/10.31311/ji.v1i2.51

Handayani, rani irma. (2017). Pemilihan Supplier Bahan Baku Bangunan Dengan Metode Analytical Hierarchy Process (Ahp) Pada Pt. Cipta Nuansa Prima Tangerang. Techno Nusa Mandiri, XIV.

Kadarsyah, 1998, Sistem Pengambilan Keputusan: Suatu Wacana Struktural Idealisasi Dan Implementasi Konsep Pengambilan Keputusan. Edisi 1. Bandung: PT. Remaja Rosdakarya.

Lukmandono, L., Basuki, M., Hidayat, M. J., & Setyawan, V. (2019). Pemilihan Supplier Industri Manufaktur Dengan Pendekatan AHP dan TOPSIS. OPSI, 12(2). https://doi.org/10.31315/opsi.v12i2.3146

Maret Wijaya, H., Deswantoro, G., & Hidayat, R. (2021). Analisis perencanaan supply chain management (scm) pada pt. Kylo kopi indonesia. Jurnal Ekonomi Manajemen Sistem Informasi, 2(6). https://doi.org/10.31933/jemsi.v2i6.653

Mawarni, C., & Azizah, F. N. (2023). Penerapan Metode AHP Pemilihan Supplier dalam Pengadaan Bahan Baku di PT XYZ. STRING (Satuan Tulisan Riset Dan Inovasi Teknologi), 7(3). https://doi.org/10.30998/string.v7i3.14584

Narti, N.-, Sriyadi, S., Rahmayani, N., & Syarif, M. (2019). Pengambilan Keputusan Memilih Sekolah Dengan Metode AHP. Jurnal Informatika, 6(1). https://doi.org/10.31311/ji.v6i1.5552

Ningsih, A. W., & Rosyada, Z. F. (2024). Analisis Pemilihan Supplier Dengan Metode Analytical Hierarchy Process (Ahp) Pada Bahan Baku Rotan (Studi Kasus Pada CV. Lucky Furnicraft). E-Journal Undip, 13(1).

Niqotaini, Z. (2023). Penerapan Dan Perbandingan Metode Ahp Dan Topsis Untuk Sistem Pendukung Keputusan Pemilihan Karyawan Terbaik. Technologia: Jurnal Ilmiah, 14(2). https://doi.org/10.31602/tji.v14i2.10280

Pujawan, I. N., & Er, M. (2017). Supply Chain Management Edisi 3. Surabaya: Guna Widya.

Rahmayanti, R. (2010). Analisis Pemilihan Supplier Menggunakan Metode Analytical Hierarchy Process (AHP) (Studi Kasus Pada PT Cazikhal). Skripsi: Universitas Sebelas Maret.

Rivaldi, D., Pulansari, F., & Kartika, A. P. (2023). Analisis Pemilihan Supplier Baut Menggunakan Metode Ahp-Topsis PT. Stechoq Robotika Indonesia. J@ti Undip: Jurnal Teknik Industri, 18(2). https://doi.org/10.14710/jati.18.2.79-87

El-Mãl | Jurnal Kajian Ekonomi & Bisnis Islam

Vol 5 No 7 (2024) 3869 – 3879 P-ISSN 2620-295 E-ISSN 2747-0490
DOI: 1047467/elmal.v5i7.4164

Saaty, T. L. (1993). Pengambilan keputusan bagi para pemimpin, proses hirarki analitik untuk pengambilan keputusan dalam situasi yang kompleks. Jakarta: Pustaka binama pressindo

Sinaga, J. Y., Amalia, F., & Santoso, E. (2020). Pengembangan Sistem Rekomendasi Produk Perawatan Kulit Berbasis Web Menggunakan Metode AHP. Jurnal Pengembangan Teknologi Informasi Dan Ilmu Komputer, 4(11).

Suprihatin, E. (2011). Penerapan Multi-Choice Goal Programming (MCGP) untuk Pemilihan Supplier dan Alokasi Order Bahan Baku di PT. X" Menggunakan Analisa Taguschi Loss Function dan AHP". Jurnal FMIPA-ITS.

Taufik, R., Sumantri, Y., & Tantrika, C. F. M. (2014). Penerapan Pemilihan Supplier Bahan Baku Ready Mix Berdasarkan Integrasi Metode AHP dan TOPSIS (Studi Kasus Pada PT Merak Jaya Beton, Malang). Jurnal Rekayasa Dan Manajemen Sistem Industri.

Wardhana, D. A. K., & Prastawa, H. (2017). Analisis Pemilihan Supplier dengan Menggunakan Metode Analytical Hierarchy Process (Studi Kasus: UMKM Diana Bakery). E-Journal Undip, 18(1).

Widiyanesti, S., & Setyorini, R. (2012). Penentuan Kriteria Terpenting Dalam Pemilihan Supplier Di Family Business Dengan Menggunakan Pendekatan Analytic Hierarchy Process (AHP)(Studi Kasus Pada Perusahaan Garmen PT. X). IMAGE: Jurnal Riset Manajemen, 1(1). https://doi.org/10.17509/image.v1i1.2321