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Vendor Selection for Subcontracted Greige Fabric A Case Study of PT X

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Abstract

The limitations of internal production capacity, especially in textile companies, resulted in the company having to implement a greige fabric subcontracting strategy to meet the company's needs. The purpose of this study was to analyze planning, implementation, and evaluation, as well as to analyze improvement efforts in selecting subcontracting vendors using the Analytical Hierarchy Process (AHP) method and assisted by Expert Choice software. The research method used was qualitative with data collection techniques through interviews, observations, and documentation. This study used a purposive sampling technique, and the criteria used in vendor selection were price, quality, delivery accuracy, and quantity accuracy. The results showed that the first priority performance vendor was Cemara vendor with a weight of 41.4% (MS. Excel Processing) 41.4% (Expert Choice Processing), priority 2 was Ajutex vendor with a weight of 32.5% (MS.Excel Processing) 33.1% (Expert Choice Processing), and priority 3 was Daese vendor 26.1% (MS.Excel Processing) 25.5% (Expert Choice Processing). So it can be concluded that the best vendor recommendation for PT. X is Cemara, because Cemara has the highest priority value.

INTRODUCTION

In an era of increasingly competitive industries, particularly in the textile sector, companies are required to compete effectively to meet consumer needs in a timely manner and provide increasingly better service and product quality. To maintain competitiveness, companies must undertake various strategic efforts, one of which is optimizing business processes, including supply chain management and production capacity. The textile industry has the potential to become a viable economic sector for future development to drive Indonesia's economic growth; its development can encourage increased domestic investment, strengthen capital formation, and expand employment opportunities in the national economy (Faradilla & Hakim, 2022). Furthermore, in a dynamic and competitive business environment, understanding the factors that drive entrepreneurial innovation is crucial to strengthening company competitiveness and supporting sustainable industrial growth (Ludiya et al., 2026).

Selecting a resilient and sustainable supplier or vendor is a crucial element in supply chain management (Rahmawati & Salimi, 2022). Therefore, selecting the right outsourcing or subcontracting vendor is a key strategy in achieving this goal. Outsourcing refers to a business strategy in which a company transfers part of its business functions or processes to a third party (vendor) (Pang et al., 2021). However, the success of this strategy is greatly influenced by the vendor's ability to manage resources and carry out operational processes effectively. This is in line with Ludiya et al. (2024), who stated that organizational capability refers to the ability of an organization to effectively utilize its resources to achieve strategic goals and enhance performance. One company that implements a subcontracting vendor selection strategy is PT. X.

PT. X, located in Bandung Regency, is a company engaged in the textile industry. It produces fabric containing 100% polyester and implements a make-to-order production system, namely production based on orders. With a large market but limited internal production capacity, the company uses a subcontracting strategy. Therefore, A decision support system is needed that can assist as much as possible in selecting a more effective and efficient vendor so that it can make it easier for PT. X to make a decision on selecting the best vendor with the criteria standards that match the company's desires. Previously, PT. X's vendor selection was still carried out based on intuition or relationships alone but was not accompanied by the right methods and criteria, of course this was less effective to do.

Where the selection of vendors carried out like that will result in the emergence of various problems, such as mismatched product quantities, products sent not as desired, and delays in delivery. This has been experienced by PT. X, where PT. X was faced with an obstacle, namely the delay in vendors in delivering products which caused disruption to operational activities which resulted in goods being unavailable which resulted in production constraints carried out by PT. X. Delayed delivery has an impact on the company's finances and operations (Joanna et al., 2024).

Therefore, to optimize supplier selection for effectiveness and efficiency, a decision-making method using the Analytical Hierarchy Process (AHP) is required. This method is used to solve complex problems by weighting or prioritizing them. This method provides a solution for companies or business owners to select the right vendor with the highest priority value among the vendors being compared. AHP is effective for solving supplier selection problems with multiple criteria (multi-criteria). This method can produce measurable priority weights for each criterion and sub-criteria (Abdullah et al., 2022).

METHOD

Operations Management

In general, the goal of operations management is to increase efficiency by producing goods and services effectively and meeting customer needs. According to Malik et al. (2024), operations management focuses on effectively overseeing production activities, from input procurement to output delivery, while maintaining product and service quality. Operations management is a series of activities that cover various aspects, from production planning to product distribution to customers. According to Wolniak (2020), the main functions of operations management in manufacturing companies include planning, scheduling, controlling, quality control, and inventory control as part of efforts to improve the effectiveness of operational processes. However, the success of operations management is not only determined by the company's internal activities, but also by the smooth flow of raw materials, information, and products involving external parties. Therefore, a supply chain management (SCM) approach is needed to integrate the company's operational processes with suppliers and customers to support operational effectiveness and efficiency.

Supply Chain Management

In producing goods or services, companies require third-party support to ensure smooth production processes, particularly from suppliers as key input providers. According to Khedr and Rani (2024), supply chain management involves the strategic coordination of business functions within an organization to optimize procurement processes, improve overall organizational performance, and enhance customer satisfaction. In this context, managing supplier relationships is a crucial component of supply chain management, thus requiring Supplier Relationship Management (SRM) as a strategic approach to building, managing, and evaluating supplier performance to support the sustainability and effectiveness of a company's operational processes.

Supplier Relationship Management (SRM)

In the upstream supply chain, managing supplier relationships is a key focus in the procurement process. Fitriasyach et al. (2024) stated that Supplier Relationship Management (SRM) plays a crucial role in managing a company's relationships with suppliers, with vendor selection being a crucial step in ensuring suppliers' ability to meet the company's needs. The success of SRM is determined not only by contractual aspects but also by the quality of communication between the company and vendors. Ludiya et al. (2024) emphasized that an organization's capability to utilize resources effectively contributes to improved performance, making good communication a crucial element in maintaining sustainable supplier performance.

Vendor Selection

Before deciding to collaborate with a vendor, the company needs to first carry out a selection process, namely by determining the criteria for the selected vendor candidates. The research variables are the vendor criteria criteria referring to Abdullah et al. (2022), which are then adjusted to the company PT. X as follows:

1. Price is an element of marketing strategy that plays a role in generating revenue for a company. Furthermore, price is also one of the main criteria considered in the supplier selection process (Latif & Wahyuning, 2024).
2. Quality Quality is the supplier's ability to provide products or services that meet the standards set by the company, both in terms of specifications, consistency, and reliability (Latif & Wahyuning, 2024) this is in line with This is in line with Nugraha et al. (2022) who stated that a strong commitment will enhance the quality of the company's products or services.
3. Delivery accuracy
   The delivery process aims to optimize product distribution by selecting the appropriate shipping method. (Santoso et al., 2024)
4. Accuracy of Quantity
   The accuracy of production quantity and timing is influenced by supplier performance. (Cahyani & Basuki, 2020)

To determine the importance weight of each criterion and determine the priority of the best vendors objectively, this study uses the Analytical Hierarchy Process (AHP) method with the help of Expert Choice software.

Analytical Hierarchy Process (AHP).

Decision-making in vendor selection can be done using various methods, one of which is the Analytical Hierarchy Process (AHP). According to Noviawan (2025), AHP is a multi-criteria decision-making method that uses pairwise comparisons to determine the importance weight of each criterion. In this study, the AHP calculation process was assisted by Expert Choice software version 11 to facilitate analysis and ensure the consistency of the resulting assessments.

In qualitative research, the methods commonly used are interviews, observation, and documentation (Rahmawati et al., 2025). In this study, the data collection methods used were:

1. Observation

Observation can be defined as a data collection technique that relies on direct or indirect sensing of the object being studied (Sutikno & Hadisaputra, 2020). In this study, observations were conducted at PT.X.

2. Interview
   Interviews are a method of collecting information that involves a direct question and answer process between the interviewer and the informant (Sutikno & Hadisaputra, 2020), the informants here are the Purchasing Supervisor, Head of PPIC, and Head of Purchasing Department.
3. Documentation
   Documentation in research is a record of past events containing relevant data, which can be in the form of writing, images, or other works. It is often used by researchers as a source of information (Syamil et al., 2023). The document in this study is a vendor selection evaluation document. It contains prices, delivery history, and daily production capacity. This data is used by PT. X
   At the interview stage with the three informants. The questionnaire table is paired between criteria consisting of price, quality, delivery accuracy, and quantity accuracy. In order to obtain the assessment weight of each variable, this questionnaire table will be filled out by 3 respondents, namely the Purchasing Supervisor, Head of PPIC, and Department Head. The way to fill out the questionnaire is to provide a check mark (√) on the level of importance of the assessment scale with the prioritized criteria variables. As a guideline for obtaining the assessment weight of the level of importance, respondents choose a comparison scale of 1 to 9 as described in the table below.

Table 1 Analytical Hierarchy Process (AHP) Assessment Scale

INTENSITY	LIGUISTIC SET
1	Comparison of the same elements (Just Equal)
3	One element is more important than the others
5	One element is more important than the others (Strongly Important)
7	One element is more important than the others (Very Strong)
9	One element is absolutely more important than the others (Extremely Strong)
2,4,6,8	Intermediate

RESULTS AND DISCUSSION

Hierarchical Arrangement

The results of the vendor performance assessment at PT. X were conducted using the Analytical Hierarchy Process (AHP) assisted by Expert Choice v.11 software. In the AHP method, criteria are usually arranged in a hierarchical form. The criteria elements used in this study are the criteria used by the company in selecting vendors, which were obtained from the results of preliminary interviews. The problem of vendor selection at PT. X is as follows:

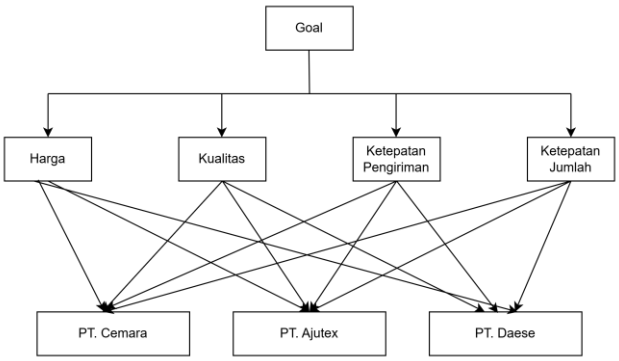

Figure 1 Hierarchical Structure of PT. X

In the AHP method, the pairwise comparison matrix must have a single value. Therefore, if the assessment is obtained from more than one respondent, the assessment must be carried out using the average (geometric mean) to obtain a single representative value.

Table 1 Pairwise Comparison Between Criteria

Criteria	Price	Quality	Delivery	Amount
Price	1,000	0.235	0.712	0.512
Quality	4,255	1,000	3,123	2,070
Delivery Accuracy	1,462	0.324	1,000	0.700
Accuracy of Quantity	1,953	0.490	1,450	1,000
Amount	**8,670**	**2,049**	**6,285**	**4,282**

Table 2 Work Priority Weight Value

Criteria	Price	Quality	Delivery	Amount	Weight	Percentage
Price	0.115	0.115	0.113	0.120	0.116	11.6%
Quality	0.491	0.488	0.497	0.483	0.490	49.0%
Delivery Accuracy	0.169	0.158	0.159	0.163	0.162	16.2%
Accuracy of Quantity	0.225	0.239	0.231	0.234	0.232	23.2%

λmax : 4.021
CI : 0.007
CR : 0.008

In manual inter-criteria calculations, MS. Excel can be declared eligible because CR <0.1.

Based on the results of manual comparison matrix processing using MS.Excel, the criteria with the highest weighting were quality, which was 49%, followed by quantity accuracy of 23.2%, thirdly there was delivery accuracy of 16.2% and finally there was price with a weighting of 11.6%.

Furthermore, the results of manual MS.Excel comparison matrix processing of each criterion with alternative vendors selected as priority vendors are Cemara with a weight of (41.4%),

and the second priority supplier is Ajutex (32.5%), and the last priority is Daese (26.1%). Can be seen in the table below:

Table 3 Supplier Weight

Supplier	Weight	Percentage	Priority
Daese	0.261	26.1%	III
Ajutex	0.325	32.5%	II
Pine	0.414	41.4%	I

Next, a consistency test was performed on each criterion to ensure that the resulting weights were consistent. This consistency test was conducted using the Consistency Ratio (CR), where a pairwise comparison matrix is declared consistent if CR < 0.1. The results of the consistency test for each criterion are presented in the following table.

Table 4 Consistency Ratio (CR) Value

Paired Comparison	Consistency ratio (CR)	Consistency
Inter-Criteria	0.008	Consistent
Inter-Alternatives on Price Criteria	0.002	Consistent
Inter-Alternatives on Quality Criteria	0.002	Consistent
Inter-Alternative On Delivery Timeliness Criteria	0.002	Consistent
Between Alternatives on the Accuracy Quantity Criteria	0.004	Consistent

The consistency test results show that all criteria are consistent, as the Consistency Ratio (CR) is <0.1. The inter-criteria comparison yields a CR of 0.020. Furthermore, the comparison of price, quality, and delivery accuracy criteria yields the same CR of 0.002, while the accuracy of quantity criterion yields a CR of 0.004. Therefore, all pairwise comparison matrices meet the consistency requirements and can be used in the next analysis stage.

The results of the vendor selection calculations with the help of the Expert Choice system version 11 are presented as follows:

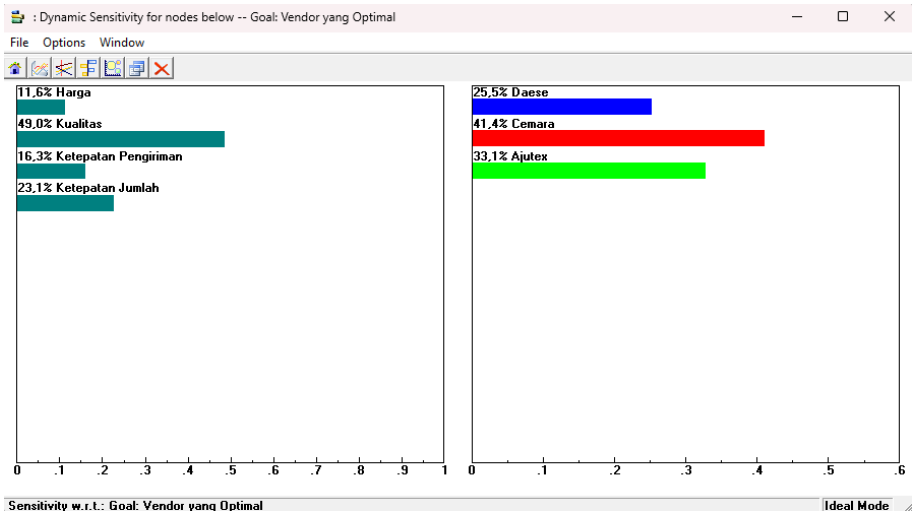

Figure 1.1 Weighting of Criteria and Selected Alternatives

The results of the AHP method assisted by the Expert Choice v.11 system show that the price criteria are 11.62%, quality is 49.0%, delivery accuracy is 16.3%, and quantity accuracy is 23.1%. Furthermore, alternative vendors show that the top priority is Cemara with a weight of 41.43%, the second priority is Ajutex with a weight of 33.1%, and the third priority is 33.1%.

DISCUSSION

The results of data processing show that the weight of each criterion is almost the same as that obtained from MS. Excel. The difference in value is quite small, this is due to the difference in rounding numbers between Ms. Excel and Expert Choice Meri et al. (2023). Based on the calculation results, the consistency ratio CR value is obtained as 0.008. Consistent because it meets the requirements of CR <0.1 (Abdullah et al., 2022). Therefore, it can be concluded that the pairwise comparison matrix between criteria is declared consistent because the CR value is <0.1. If CR <0.1 then the pairwise comparison value in the given criteria matrix is consistent Meri et al. (2023).

Based on the criteria and alternatives compared between MS Excel and Expert Choice, PT. X has a recommendation for priority one vendor, namely Cemara with a weight of 41.4% (MS.Excel Processing) 41.4% (Expert Choice Processing), priority 2 Ajutex with a weight of 32.5% (MS.Excel Processing) 33.1% (Expert Choice Processing), and priority 3 Daese 26.1% (MS.Excel Processing) 25.5% (Expert Choice Processing). Therefore, the best vendor recommendation for PT. X is Cemara. Because Cemara has the highest priority value.

Furthermore, the criteria show the results compared with the criteria between MS. Excel and Expert Choice. The results obtained are that the quality criteria with a weight of 49% (MS. Excel Processing) 49% (Expert Choice Processing), followed by the accuracy of the amount of 23.2% (MS. Excel Processing) 23.1% (Expert Choice Processing), the third is the accuracy of delivery of 16.2% (MS. Excel Processing) 16.3% (Expert Choice Processing). and the last is the price with a weight of 11.6% (MS. Excel Processing) 11.62% (Expert Choice Processing). With that, the highest criteria in vendor selection at PT. X is the quality criteria.

Price Criteria in Vendor Selection

Nurrohmah et al., (2023) Selecting quality material suppliers not only improves strong cooperative relationships but also opens opportunities for companies to obtain materials at agreed values and prices. In this study, the price criterion has a weight of 11.6% based on the results of the AHP method comparison matrix calculation, which indicates that price remains an important consideration in the vendor selection process. In this case, it is in line with research from Abuzaid et al., (2024) which states that price (cost/finance) as one of the significant supplier selection factors that is statistically relevant to manufacturer performance, indicating that suppliers selected based on competitive pricing contribute positively to business performance. This finding is also supported by research by Ali et al. (2023) who identified material price (cost) as one of the topmost critical supplier selection criteria.

Quality Criteria in Vendor Selection

The quality of products or services offered by vendors is a crucial aspect because it directly impacts customer satisfaction and company performance. In this study, quality criteria were weighted at 49%, indicating that quality is a dominant factor in the vendor selection process. This is in line with Markatos and Mousavi (2023), who stated that quality is a key indicator of

manufacturing competitiveness in the Industry 4.0 era, as it influences customer satisfaction, process efficiency, and defect reduction through approaches such as Zero Defect Manufacturing. Furthermore, Adikoro and Wurjaningrum (2022) explained that quality is one of the main criteria in supplier evaluation using the Vendor Performance Indicator approach, where the supplier's ability to meet company-set standards serves as an important reference in the selection process. This finding is also supported by Salomon et al. (2025), who stated that supplier quality emerges as a critical mediator between supplier selection factors and company performance. Therefore, prioritizing supplier quality can improve operational continuity, competitive advantage, and company sustainability, especially in highly regulated industries.

Delivery Accuracy Criteria in Vendor Selection

Delivery criteria are crucial in vendor selection because punctuality and reliability of delivery significantly impact the smoothness of the production process and the fulfillment of customer requests. In this study, the on-time delivery criterion had a weighting of 16.2%, indicating that delivery performance is a key consideration in the vendor evaluation process. This aligns with research by Adikoro and Wurjaningrum (2022), which states that delivery criteria are among the main indicators in supplier evaluation based on the Vendor Performance Indicator (VPI) approach to selecting suppliers capable of meeting company needs. Furthermore, Noviantoro and Kusrini (2024) explain that delivery is understood as discipline or punctuality of delivery, which is one of the main metrics in evaluating delivery service performance by suppliers. This finding is further supported by Sheykhizadeh et al. (2024), who found that after the COVID-19 pandemic, just-in-time delivery and lead time became among the most important criteria in supplier selection, underscoring the crucial role of delivery performance in mitigating supply chain disruptions.

Criteria for Accurate Quantities in Vendor Selection

Quantity accuracy ensures that vendors are able to meet company demand without experiencing shortages or excess stock that could disrupt smooth production and operational activities. In this study, the quantity accuracy criterion was weighted at 23.2%, indicating that this aspect is a crucial consideration in the vendor selection process. This aligns with research by Cahyani and Basuki (2020), which states that the accuracy of quantity fulfillment and production time is influenced by supplier performance. Furthermore, Samsir and Gunarta (2024) explain that a mismatch between supplier performance and established targets—particularly in fulfilling order quantities—can lead to unstable raw material supply, leading to delays and disrupting planned project schedules. Therefore, a supplier's ability to meet the company's needs is crucial for the smooth running of the production process and the fulfillment of customer demand. Therefore, quantity accuracy can be used as an important indicator in assessing vendor reliability and overall performance.

CONCLUSION

The results of data processing using the AHP method can produce 4 criteria with sequential levels of importance.The results obtained that the priority of quality criteria with a weight of 49% (MS.Excel Processing) 49% (Expert Choice Processing), followed by the accuracy of the amount of 23.2% (MS.Excel Processing) 23.1% (Expert Choice Processing), the third is the accuracy of delivery of 16.2% (MS.Excel Processing) 16.3% (Expert Choice Processing). and the

last is the price with a weight of 11.6% (MS.Excel Processing) 11.62% (Expert Choice Processing). The priority criteria in vendor selection at PT. X is the quality criteria.

Recommended vendors for the above criteria with vvendorpriority one, namely Cemara with a weight of 41.4% (MS.Excel Processing) 41.4% (Expert Choice Processing), priority 2 Ajutex with a weight of 32.5% (MS.Excel Processing) 33.1% (Expert Choice Processing), and priority 3 Daese 26.1% (MS.Excel Processing) 25.5% (Expert Choice Processing). So it can be concluded that the best vendor recommendation for PT. X is Cemara which has the highest value.

REFERENCE

Faradilla, C., & Hakim, L. (2022). Aspects of the Growth of the Indonesian Textile Industry in an Effort to Realize Economic Growth: Analysis of Factors Influencing the Growth of the Textile Industry. Journal of Economics and Development, 13.https://doi.org/10.22373/jep

Rahmawati, DU,(Hadisaputra, 2021)& Salimi, N. (2022). Sustainable and resilient supplier selection: the case of an Indonesian coffee supply chain. Journal of Supply Chain Management Science.https://doi.org/10.18757/jscms.2022.6488

Pang, Y., Zhang, S., & Jiang, A.X. (2021). Outsourcing: Overview and Trends.www.intechopen.com

Joanna, D., Simanjuntak, R., & Utomo, AP (2024). Analysis of Unit Delivery Delays Using the Six Sigma Method (Case Study at PT XYZ). IX (3).

Abdullah, F., Paillin, DB, Camerling, BJ, & Tupan, JM (2022). Supplier Selection Analysis Using the Analytical Hierarchy Process (AHP).

Latif, MI, & Wahyuning, HC (2024). Optimizing supplier selection in Indonesia through Analytical Hierarchy Process (AHP): Optimizing supplier selection in Indonesia through analytical hierarchy process (AHP). Procedia of Engineering and Life Science, 5, 628–636.https://doi.org/10.21070/pels.v7i0.1560

Adikoro, HT, & Wurjaningrum, F. (2022). Analysis of Byemi Official Store Fabric Supplier Selection Using Fuzzy AHP and Fuzzy Topsis Methods. Journal of Management and Banking (JUMPA), 9(2), 38–53.https://doi.org/10.55963/jumpa.v9i2.458

Santoso, A., Puspitorini, D., & Wahyudi, B. (2024). Measuring supply chain performance using the Supply Chain Operations Reference (SCOR) method: Deliver as distribution optimization [PDF]. Jurnal Produktiva. Unpublished/online.

Rahmawati, R., Habsy, BA, & Nursalim, M. (2025). Types of Data Collection Methods (Qualitative Research). Tambusai Education Journal, 9(1), 9932–9938.https://doi.org/10.31004/jptam.v9i1.26166

Sutikno, MS, & Hadisaputra, P. (2020). Qualitative research. Bandung: Remaja Rosda Karya.

Syamil, A., Waty, E., & Fahmi, MA (2023). Supply Chain Management Textbook.https://www.researchgate.net/publication/373980212

Meri, M., Fandeli, H., Linda, R., & Rusdi, AM (2023). Analysis of oil supplier selection using the analytical hierarchy process method at the Jeffry Motor workshop. Journal of Science and Social Research, 6(2), 355–361.http://jurnal.goretanpena.com/index.php/JSSR

Nurrohmah, ET, Negoro, YP, & Jufriyanto, M. (2023). Analysis of Supplier Selection in Lime Material Procurement Using the Analytical Hierarchy Process (Case Study of PT. Aneka Jasa Grhadika). Journal of Economic Sciences (JSE) / Serambi Mekkah, Vol. 8 No. 4 (2023).

Abuzaid, AN, et al. (2024). The Effect of Suppliers' Green and Traditional Selection Criteria in Supply Chain Management on Purchasing Firms' Performance. Sustainability, MDPI.https://doi.org/10.3390/su16156276.

Ali, MR, Khan, MA, Rahman, SM, & Hossain, MS (2023).A decision support system for classifying supplier selection criteria. Expert Systems with Applications, 213, 118930.https://doi.org/10.1016/j.eswa.2022.118930.

Markatos, N. G., & Mousavi, A. (2023). Manufacturing quality assessment in the Industry 4.0 era: A review. Total Quality Management & Business Excellence.https://doi.org/10.1080/14783363.2023.2194524.

Beltran-Salomon, E. (2025). Critical Success Factors for Supplier Selection and Performance Outcomes in Medical Device Manufacturing. [Journal name]. MDPI Processes, 13(5), 1438.https://doi.org/10.3390/pr.

Adikoro, HT, & Wurjaningrum, F. (2022). Analysis of Byemi Official Store Fabric Supplier Selection Using Fuzzy AHP and Fuzzy TOPSIS Methods. Journal of Management and Banking (JUMPA), 9(2), 38–53.

Sheykhizadeh, M., Ghasemi, R., Rezaei Vandchali, H., Sepehri, A., & Torabi, S. A. (2024). A hybrid decision-making framework for a supplier selection problem based on lean, agile, resilience, and green criteria: A case study of a pharmaceutical industry. Environment, Development and Sustainability.https://doi.org/10.1007/s10668-023-04135-7/.

Cahyani, AD, & Basuki, A. (2020). Supplier Selection and Determination of Optimal Raw Material Purchase Amount at PT. X. Rekayasa, 13(3). Trunojoyo University, Madura.

Samsir, S., & Gunarta, IK (2024). Evaluation of Supplier Performance Effectiveness Measurement using the SCOR (Supply Chain Operations Reference) and ANP (Analytic Network Process) Method Approach (Case Study: Supply of Silica Powder to PT. Freeport Indonesia – JIIPE). Journal of Applied Sciences Management and Engineering Technology, 5(2), 67–7

Malik, YF, Ernawati, DP, & Rizkiyanti, AA (2024). A literature review on operations management and strategy. International Journal of Social Science and Business, 8(2), 311–316.https://doi.org/10.23887/ijssb.v8i2.76906.

Wolniak, R. (2020). Main functions of operations management in industrial enterprises. Production Engineering Archives, 26(1), 33–36. https://doi.org/10.30657/pea.2020.26.07.

Asrol, Y., Yani, M., & Taira, E. (2021). *Industry 4.0 adoption in supply chain operations: A systematic literature review*. International Journal of Technology, 12(5), 955–966. https://ijtech.eng.ui.ac.id/article/view/5958

Khedr, A.M., & Rani, S. (2024). Enhancing supply chain management with deep learning and machine learning techniques: A review. Journal of Open Innovation: Technology, Markets, and Complexity, 10(4), 100379.https://doi.org/10.1016/j.joitmc.2024.100379

Fitriasyach, KP, Priwisastra, K., Putri, SI, & Affifatusholihah, L. (2024). The Role of Supplier Relationship Management (SRM) in Suppliers at PT. Krakatau Pipe Industries. Improvement: Journal of Management and Business, 4(2).https://doi.org/10.30651/imp.v4i2.24360.

Noviawan, DAS (2025). Multi-Criteria Decision Analysis for Sustainable Crop Selection in Northeast Thailand: An Analytical Hierarchy Process Approach. International Journal of Technology, 16(3), 780–795.https://doi.org/10.14716/ijtech.v16i3.7118.

Ludiya, E., Kurniawan, A., Rahayu, A., Mulyadi, H., & Wibowo, L.A. (2024). The mediating role of organizational capability in SMEs' business performance. Minds Journal: Idea Management and Inspiration, 11(2), 443–456. https://doi.org/10.5281/zenodo.18046495

Nugraha, E., Sari, RM, Sutarman, Yunan, A., & Kurniawan, A. (2022). The effect of information technology, competence, and commitment to service quality and implications on customer satisfaction. International Journal of Technology, 13(4), 827–836.https://doi.org/10.14716/ijtech.v13i4.3809.

Ludiya, E., Rahayu, A., Mulyadi, H., Wibowo, LA, & Kurniawan, A. (2026). Business environment, entrepreneurial competence, and innovativeness: Evidence from Bandung's embroidery SMEs. Al-Kharaj: Journal of Islamic Economics and Business, 8(1), 271–xxx. https://doi.org/10.24256/kharaj.v8i1.9157