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Criteria for selecting third-party logistics service providers: systematic literature review

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ABSTRACT

Third-party logistics (3PL) is a strategic business partner for companies in carrying out company business activities that are outsourced or cannot be handled themselves. Mistakes in choosing a 3PL can have negative impacts on the company such as financial losses, reducing service quality, reducing customer trust, reducing the company's image, and so on. This article aims to classify third-party logistics based on current issue trends, the methods used in selecting criteria, and what criteria they produce. Using Systematic Literature Review, researchers reviewed, classified, and analyzed 56 relevant articles published in the 2020-2023 period from the Scopus database. The results of this review reveal that 3PL providers can be classified based on issue trends and company goals in selecting them, namely Traditional 3PL, Sustainable 3PL, Sustainable-resilient 3PL, Green 3PL, Gresilient 3PL, Traditional Third-Party Reverse Logistics, and Sustainable Third-Party Reverse Logistics. The priority criteria in selecting a 3PL provider are closely related to the 3PL classification, the industrial sector and business activity being outsourced, the country where the company operates, and the dimensions or attributes used in developing the criteria.

1. Introduction

To remain competitive in today's market, companies concentrate on their core competencies and utilise outsourcing as a strategic solution to enhance service quality and reduce costs for both core and non-core processes. By using strategic third-party logistics provider (3PLP) partnerships in integrated logistics, companies can reduce logistics costs, logistics assets, and order cycle times (Sople, 2017) and avoid large investments (Kumar & Singh, 2012). A 3PL service provider is a company that provides various logistics activities for its clients, such as operating distribution centres, managing product delivery through its transportation fleet or performing value-added services such as repackaging (Christopher, 2023).

3PLP involves a long-term perspective between buyers and sellers, and the parties have a relationship perspective, not just a transactional perspective (Murphy & Knemeyer, 2018). Various positive benefits obtained by companies that outsource their non-core processes to 3PLP have been widely revealed by researchers, such as reducing labour costs, reducing excess inventory, reducing the number of warehouses, reducing vehicle and depreciation costs (Rajesh et al., 2013), operational efficiency, flexibility, and increased customer satisfaction (Angkiriwang et al., 2014) which ultimately improves performance and customer satisfaction (Aguezzoul, 2014).

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However, outsourcing a company's non-core processes to a 3PLP is not always smooth; there are risks that the company must bear. For example, when the relationship with the 3PLP fails (Tsai et al., 2012) or the customer's assessment of the 3PLP is poor. For example, in the e-commerce business, couriers are part of the 3PLP, which delivers orders and meets customers directly. When the courier is assessed negatively by consumers, it is likely that the consumer will not order from that e-commerce again (Setyawan et al., 2022). Therefore, deciding which 3PLP will become a business partner needs to be carefully considered and evaluated. Even in a global context, outsourcing increases control costs (Handley & Benton, 2013).

The evaluation process of prospective 3PLPs is an important step in selecting strategic business partners (Jung, 2017), because this decision is a strategic decision and has a long-term impact on the organization's customer service capabilities. In the last four years (2020 to 2023), at least 414 articles have been published by researchers at Scopus that review the selection of 3PLP or Suppliers. This shows that academic circles are also paying attention to this matter.

Several researchers have also synthesised using the systematic review of research results related to 3PL selection. For example, (Rashidi et al., 2020) tried to explore this by applying Bibexcel and Gephi, using many combinations of categorical keywords and broader review domains, presenting possible interconnections and common applications between different methods and criteria, and applying co-cite analysis based on the references of each article. Meanwhile, (Granillo-Macías & González-Hernández, 2021) focus on grouping methodologies, approaches, models applied, magazine attributes, and industries that use these external logistics providers.

In contrast to the two previous researchers, (Resende et al., 2021) in reviewing supplier selection from the perspective of modelling, implementation and validation of decision models in Industry 4.0, while (Rösner, 2023) looks at it from the perspective of process stage orientation and technical orientation. As a novelty of this article, we look at it from the perspective of developing trend issues considered when selecting third-party logistics criteria, the methods used in selecting third-party logistics criteria and what criteria are produced. Based on this gap, this article aims to classify third-party logistics based on emerging issue trends, analyze the methods used in selecting criteria, and identify what criteria are priorities in selecting a 3PLP.

2. Methods

This research uses the systematic literature review (SLR) method. SLR is a transparent method for collecting, synthesising, and evaluating research findings on a specific topic or question (Jesson et al., 2011). This review examines journals published between 2020 and 2023, sourced exclusively from the Scopus database. The data collection technique uses the help of Harzing's Publish or Perish application, which can be downloaded on Publish or Perish on the Microsoft Windows page (harzing.com). In the data collection process, researchers only used sources from Scopus using the keywords: "third-party logistics selection", "3PL selection", and "supplier selection".

The population in this study is a research title consisting of 414 articles obtained consecutively, namely 147 articles with the keyword "third-party logistics selection", 67 articles with the keyword "3PL selection", and 200 articles with the keyword "supplier selection". The research sample consisted of 56 articles, the final result of the process carried out through the Covidence application. The results can be accessed at https://app.covidence.org/. This process includes screening titles and abstracts. At this stage, identical articles (duplicates) will be excluded. The next stage is the full-text article review process. At this stage, the researcher looks at the suitability of each article's content with the objectives of this research. If appropriate, it will be included (include), and if it does not meet the expected objectives, it will be excluded (exclude). The include and exclude criteria are presented in Table 1.

Table 1 Include and exclude criteria

Include		Exclude	
Criteria	**Description**	**Criteria**	**Description**
Journal about selecting third-party logistics providers (3PLP)	Only article titles containing keywords are accepted.	Irrelevant content	Content does not match expectations.
All countries	There are no country restrictions.	Not in English	Limited understanding of other foreign

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Include		Exclude	
Criteria	**Description**	**Criteria**	**Description**
			languages
Logistics industry	Only those related to the logistics industry	Not yet published	Journal pre-proof
Open acces	Can be downloaded	Can not be accessed	Paid journal
Empirical research	Research-based articles	Non-empirical research	Literature / Systematic review
Quality of scientific journals	Published through a peer review process	Non-Scientific Journal	Proceeding
		Wrong outcome	Not as expected
		Wrong design	Testing about influence or relationships

In reporting this process, researchers used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) table, which aims to maintain transparency regarding the reasons for conducting the review, what was done, and what was found (Page et al., 2021). The results are as follows:

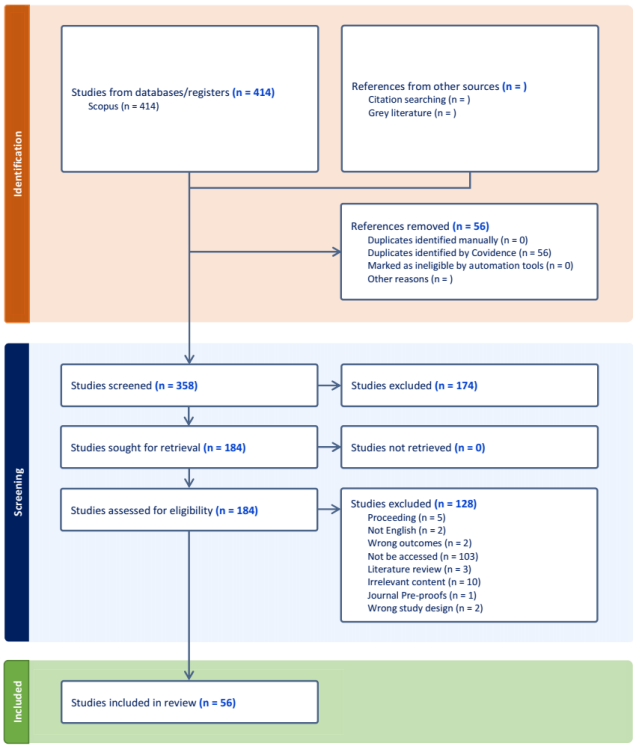

Fig. 1 PRISMA Process Output**.**

3. Results and Discussion

Trend issues in choosing a Third-Party Logistics Providers

Based on emerging issue trends in selecting 3PLP, we classify 3PLP based on the issues raised by researchers into seven types, namely traditional third-party logistics, sustainable third-party logistics, sustainable third-party logistics, green third-party logistics, gresilient third-party logistics, traditional third-party reverse logistics, and sustainable third-party reverse logistics. of the 56 articles studied, the issue trend is spread over the last three years and is still dominated by articles about choosing traditional third-party logistics. However, issues regarding sustainability, resilience, and green third-party logistics are also starting to be widely researched, as shown in Table 2.

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Table 2 Classification of third-party logistics selection issues

Election Orientation	2020	2021	2022	2023	Total
Third-Party Logistics Traditional	9	9	3	2	23
Sustainable Third-Party Logistics	5	3	3	0	11
Sustainable-resilient Third-Party Logistics	-	1	1	1	3
Green Third-Party Logistics	5	5	1	-	11
Gresilient Third-Party Logistics	-	-	1	-	1
Third-Party Reverse Logistics	1	3	1	-	5
Sustainable Third-Party Reverse Logistics	1	-	1	-	2
Total	**21**	**21**	**11**	**3**	**56**

Traditional Third-Party Logistics Providers

Initially, company executives choosing 3PLP aimed to improve better customer service, reduce costs (Kaya & Aycin, 2021; Wiangkam et al., 2022), quality and delivery time (Ozcan & Ahiskali, 2020), improve logistics performance (Ulutaş, 2021), and gain competitive advantage (Naseem, 2021). Based on the motives of these company executives, we classify 3PL as traditional third-party logistics.

Sustainable Third-Party Logistics Providers

In further developments, company executives realise the various benefits of achieving sustainability. They consider economic, social, and environmental issues (Hoseini et al., 2021; Tavana et al., 2017) when choosing a 3PL. We classify this issue as sustainable third-party logistics.

Sustainable-resilient Third-Party Logistics Providers

In addition to economic, social, and environmental concerns, company executives are now also taking into account their ability to recover quickly and efficiently from disruptions (Afrasiabi et al., 2022; Behzadi et al., 2020; Fallahpour et al., 2021). Based on these considerations, we classify third-party logistics into sustainable-resilient third-party logistics.

Green third-party logistics Providers

In the next development, company executives are not only pursuing economic benefits and sustainable development in choosing a 3PL, but they must also consider government regulations and other stakeholders in terms of demands for environmental protection or environmental friendliness if they want to survive in the global market (Fazlollahtabar & Kazemitash, 2021; Pınar et al., 2021; Qu et al., 2020). These company executives should implement various strategies to mitigate the adverse environmental effects of their products in multiple countries. Therefore, the arguments above are the goal of choosing an environmentally friendly 3PL. We classify the third-party logistics in question as green third-party logistics.

Gresilient Third-Party Logistics Providers

In the next trend, company executives are also considering green aspects and resilience or the ability to quickly recover from adversity, considering that many things have happened dramatically, such as the outbreak of the new coronavirus, which has greatly disrupted the global supply chain network (Mahmoudi et al., 2022). We classify third-party logistics based on these considerations into gresilient third-party logistics.

Traditional Third-Party Reverse Logistics Providers

In reverse logistics, trend issues in forward logistics are also considered when choosing third-party reverse logistics provider (3PRLP). Company executives are starting to realize the limited resources on earth, waste disposal and the resulting environmental damage (Song et al., 2022). As an implementation, they need a 3PLP that can help them recover used resources through the collection, inspection, dismantling, reprocessing, redistribution and reuse of used products and disposal of related waste (Rostamzadeh, 2020). We classify this 3PL as traditional third-party reverse logistics.

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Sustainable Third-Party Reverse Logistics Providers

Besides considering cost reduction, company executives also consider environmental protection when choosing 3PRL (X. Zhang & Su, 2020). We classify the 3PRLP chosen with these considerations as sustainable third-party reverse logistics.

Methods for Selection of Third-Party Logistics Providers

Selecting a third-party logistics (3PL) provider can be a challenging task for company executives due to the multitude of factors that must be taken into consideration during the decision-making process. In choosing a 3PL provider, most researchers (66.1%) used a multi-criteria decision-making (MCDM) approach, 17.9% used a hybrid approach, 5.3% used a multiple attribute group decision-making (MAGDM) approach, and the rest each -1.8% each used the multiple criteria group decision-making (MCGDM), ordinal priority approach, multiple-attribute decision-making (MADM), Kano model, hyper hybrid, and dominance degree-based heterogeneous linguistic decision-making (DD-BHLDM). The approaches and methods based on the trend issue are present in Table 3.

Criteria for Selecting Third-Party Logistics Providers

The 3PLP criteria are determined by considering the main criteria and sub-criteria originating from theory, expert opinion, and weight values due to the calculation method used. Table 3 present the most prioritized criteria in selecting 3PLP according to their classification.

Table 3 Third-party logistics selection method

Trend Issues	Approach	Methods to determine	
		Criteria weights	**The best rank**
Green 3PL	Hybrid	FANP, FDEMATEL	MOMILP
	MCDM	AHP method	Fuzzy TOPSIS
		BWM	Item-scores
		BWM	Fuzzy TOPSIS
		FBWM	WASPAS and COPRAS
		Fuzzy TOPSIS	Fuzzy ELECTRE I.
		PROMETHEE I	PROMETHEE II
		q-ROFN	q-ROF TOPSIS
		Cloud model	TOPSIS
	MAGDM	*PULAS*	PUL-CODAS
		CRITIC	Novel picture fuzzy COPRAS
Gresilient 3PL	OPA	OPA	Fuzzy OPA (OPA-F)
Sustainable 3PL	Hybrid	FBWM	FIS model
	Kano	Fuzzy Kano	Type IV Kano model
	MCDM	AHP	TOPSIS
		CRITIC	CoCoSo
		FIS	Fuzzy MCDM
		HF-SWARA	COPRAS
		PFEE	Extended VIKOR
		SF-AHP	G-COPRAS
		Shannon Entropy	IVIF-E-VIKOR and IVIF-MARCOS
		TOPSIS	ANFIS
		SWARA and LBWA	MARCOS-D
Sustainable-Resilient 3PL	Hybrid	FBWM	Fuzzy GRA-TOPSIS
	Hyper Hybrid	FDEMATEL, FBWM, and FANP	FIS
	MCDM	FRN, MACBETH	FRN - CODAS
		Entropy and CRITIC	ARAS
		FAHP	FVIKOR
Traditional 3PL	Hybrid	ANN	Hybrid DEA and TOPSIS
		HFS, IFS, and RN	IFSRN
		SERVQUAL and FAHP	TOPSIS
		SWARA	CODAS
		Entropy weight	Z-MABAC
		AHP and TOPSIS	Goal Programming (GP)
	MCDM	AHP	AH-GTMA
		AHP	DEA
		Entropy weight	TOPSIS Method and GRA

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Trend Issues	Approach	Methods to determine	
		Criteria weights	**The best rank**
		Entropy-AHP weight value of	
		TOPSIS	Novel entropy-AHP TOPSIS
		D numbers	D-MARCOS
		FAHP	TOPSIS
		Fuzzy SWARA	Fuzzy CORPRAS
		Interval type 2 fuzzy AHP	COPRAS-G
		ROC	Fuzzy TOPSIS
		SWARA	CoCoSo
		SWARA	TOPSIS
		VIKOR technique with q-RIVOFN	q-RIVOF-VIKOR
	MADM	UTAUT	LIP Features
	MCGDM	IVPFULS	IVPFULG and IVPFULHG
	MAGDM	INS	CPT-IN-TODIM
		FAHP	FTOPSIS
		Fuzzy values	FARAS
	MCDM	LDFN	LDFPWA and LDFPWG
3PRL			HWAO, TOPSIS, VIKOR, GRA,
		ANP	and ER
		BCFS	CRITIC-MULTIMOOR
Sustainable	DD-BHLDM	LTs, HFLTSs, and PLTSs	PL-BP
3PRL	Hybrid	FF-CRITIC	FF-EDAS

Criteria for Selection of Traditional 3PL Providers

The priority criteria decision-makers consider when selecting a traditional 3PL provider vary greatly. This diversity is caused by the company's goals in choosing the 3PL provider and the industrial field in which the company operates, such as the e-commerce business industry, which involves three different 3PLP partners in its operations. In payment services, the priority criteria in selecting third-party payment service providers in China, respectively, based on their weight values, are safety, ease of use, application cost, popularity, market share, and frequency of netizens (Shi et al., 2021). The ease of use criterion is one of the factors that makes users interested in using it sustainably (Gultom et al., 2023).

The second partner is the aggregator sector. Aggregator is a business model that collects product information from more than one 3PL partner and then sells the products to customers using its platform. The priority criteria in selecting a 3PL aggregator provider in Indonesia are on-time score, commission from 3PL, shipment cost, complaint score, and promised delivery time (Hidayad & Utama, 2022). This aggregator service is growing, driven by the development of e-commerce (Fatoni et al., 2023; Soepriyadi, 2021). The final partner is delivery services; the priority criteria in choosing a 3PLP in Faisalabad, Pakistan, are the areas of delivery, delivery cost, lead time, payment settlement time, service quality, flexibility, and IT capabilities (Naseem, 2021). Service quality is one of the factors that influences companies to use their services (Fatoni & Hardianti, 2020).

Still in terms of shipping, but specifically for cold chains in the EU. In this sector, the priority criteria in choosing a 3PL cold chain provider are price, quality of service from customer experience, territorial coverage, delivery service, and flexibility (Jovčić, 2021). This territorial coverage factor is the basis for determining the route network (Haradongan et al., 2023). For export companies in Vietnam, the priority criteria in choosing a 3PL cold chain provider are quality of product, logistics costs, the innovation and effectiveness of cold chain processes, customer experience, and CO emissions of refrigerated vehicles (Ozcan & Ahiskali, 2020). Meanwhile, the main criteria for 3PL cold chain logistics providers for the food industry in Thailand are on-time delivery, transportation system standards, transportation costs, trust, and accessibility of contact persons in urgency (Wiangkam et al., 2022) and the main criteria for 3PL cold chain logistics providers for fresh agricultural products in China are wastage reduction of fresh agricultural products; advanced service concept; technical level of cold chain; the intelligence degree of cold chain information system; the distance from logistics point to producing area of fresh agricultural products (D. Zhang et al., 2021).

In selecting vendor-managed inventory in the health sector in Thailand, (Sumrit, 2020) found that 3PL providers were selected with the main criteria being institutional trust, information sharing and exchanging, information technologies readiness, part delivery performance, investment cost, project

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implementation time, supply chain process integration, supplier flexibility, and risk/reward sharing, while for selecting 3PL providers for Medical Consumption Products in China, the priority criteria are transportation convenience of suppliers, improved environmental quality, environmental competencies, and green image (Gao et al., 2020).

The next case concerns the selection of 3PLP in the outsourcing business sector in China. The criteria for selecting the best 3PLP for outsourcing business are development potential, logistics costs, service quality, operational capability, and risk factors (Fan et al., 2020). Meanwhile, Tuljak-Suban & Bajec (2020) found that Slovenia's best criteria for warehousing services are cost, service, infrastructure and superstructure, information technology (IT), human resources, and risk management.

Another case is the choice of 3PL provider by textile companies in Turkey. The priority criteria to be considered are quality, cost/price, delivery, intelligent transportation systems such as GPS, RFID and dynamic sensors, smart warehouse and shelving system, capacity, internet of things (IoT) implementation, use of autonomous machines, employee training on industry 4.0, and big data and cloud computing (Kaya & Aycin, 2021), while (Ulutaş, 2021) states that the main priority criteria for selecting 3PLP by textile companies in Turkey are cost, delivery, quality, service, reputation, flexibility, and financial position.

For global manufacturing companies, the main criteria in choosing 3PLP are the mutually beneficial capacity to cooperate, knowledge-matching ability, innovation capacity, and service quality (Naeem et al., 2021). Meanwhile, in Nigeria, the main criteria in choosing a 3PLP are service level, cost, financial capability, reputation and long-term relationship (Ejem et al., 2021).

Two research teams are researching 3PLP in the logistics services industry in Vietnam. In their research, (Luyen & Thanh, 2022) produced the main criteria that are taken into consideration in choosing a provider, namely reliable staff, suitable facilities, good service experience, able to deal with the required order, attractive facilities, modernized facilities, precise time-span of service, data confidentiality, timely service providers, reliable and trustworthy brand, timely service, understand customer demand, experienced staff, reliable support, and can provide customized service, while according to (Wang, Nguyen, et al., 2021) the criteria for selecting the best 3PL provider are reliability and delivery time, voice of the customer, logistics costs, network management, quality of service, IT and R&D systems, financial stability, environmental laws, environmental pollution, financial risk, green operations, reputation, flexibility and responsiveness, operational risk, and health and safety.

In the iron and steel industry, the main criteria for choosing a 3PL provider in India are product quality, delivery compliance, price, technological capability, production capability, financial strength, and electronic transaction capability (Chattopadhyay et al., 2020). For capital companies in Taiwan, the criteria that are the main consideration in choosing the best 3PL provider are delivery on time ratio, rate of qualified products, supply capacity, product price, new product development rate, delivery time, and rate of product market share (Chen, 2020).

In the case of selecting 3PLP for the procurement of automotive projects in Latvia, the priority criteria to be considered are the number of cases of non-compliance, submission of reports on time and orders accepted on time with the lowest cumulative total, collection of goods on time, delivery of goods on time, preparation of invoices according to contractual conditions, previous experience of cooperation, acceptance of contractual conditions, industry experience, shipment tracking capabilities, certification and IT support (Kotlars & Skribans, 2023). The number of cases with non-compliance criteria can be interpreted as past performance (Kurniawati et al., 2013).

At an airport company in China, (Liu et al., 2020) found that the criteria for selecting the best 3PL airline supplier were total assets, customer satisfaction, transport costs, personalized service, and technical level. In practice, the criteria for personalized service and technical level depend on the quantity and quality of human resources (Majid et al., 2022). The final traditional 3PLP criteria selection case study concerns the oil industry in Vietnam. In their research, (Wang et al., 2020) concluded that the 3PLP criteria to be considered for selection are reliability, capability, agility, costs, and effective asset management.

Criteria for Selection of Sustainable 3PL Providers

Selecting a sustainable third-party logistics (3PL) provider depends on the company decision-makers' awareness of the benefits of achieving sustainability. Therefore, when choosing a 3PL provider, they should consider economic, social, and environmental factors. The implementation of this awareness is reflected in several research results examining companies that consider these three

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factors when deciding on their 3PLP. For example, (Salimian et al., 2022) researched the selection of 3PLP in the healthcare devices sector in Iran. In their research, they concluded that the best criteria for choosing a 3PL provider in the healthcare devices sector are quality, reliability, pollution control, delivery on time, education, policies, contributions, credibility, information revelation, security acts, considering the requirements of ISO, price, employee benefits and rights, management, safety, environmental suitability, and management systems of the environment.

Two teams are researching the selection of sustainable 3PLP in India's Iron and steel industry. (Jain & Singh, 2020) concluded that the best criteria for choosing a 3PLP in this field are economic (product development, JIT, reciprocal arrangement, and packaging capability), environmental (carbon footprint tax and green transportation), and social (human resource capability). Meanwhile, (Jain et al., 2020) concluded that the best criteria and sub-criteria are economic sustainability (warranties and claim policies, amount of past business, long-term relationship, product development, jit, reciprocal arrangement, and packaging ability), environmental sustainability (green warehousing, carbon footprint tax and green transportation), and green transportation (wages and human resource capability).

In the construction industry, the selection of sustainable 3PLP was conducted by two teams from two countries. In their research in Malaysia, (Hoseini et al., 2021) show that the priority criteria in selecting sustainable 3PLP are cost, quality, pollution control, hazardous wastes, workers' contracts, air emissions, service, re-use, work safety and labour health, environmental performance evaluation, wastewater, flexibility, green certification, eco-labelling, delivery, standard working hours, employment insurance, discrimination, and overtime pay. Meanwhile, (Marzouk & Sabbah, 2021) concluded that the criteria that are prioritized in choosing a sustainable 3PL provider in Egypt are rights of stakeholders, safety practices, contract labour, national origin, wages, stakeholder relations, ethnicity, the annual number of accidents, colour, occupational health and safety management system, technical training of employees, child labour, working hours, social management commitment, social code of conduct, donations for sustainable projects, and gender diversity.

The main criteria that are most prioritized in choosing a sustainable 3PLP in the FMCG Retail industry in Nigeria are advanced technology, cost, on-time delivery, reliability, quality, availability, local community influence, rights of employees, social responsibility, workers' safety, customer service, waste management system, pollution control, and environmental competencies (Okwu & Tartibu, 2020), while in trading companies in India, they are health and safety, industry reputation, pollution, cost, quality, eco-design, sustainable materials, and production capacity (Rani et al., 2020). In the Vietnamese automotive industry, the primary factors considered when selecting a 3PL provider are quality, cost/price, supply capacity, delivery reliability, and the use of IT for customer demand prediction. Other important criteria include adherence to regulatory changes, financial capability, and the use of personal protective equipment to ensure safety and health practices. Additionally, staff training programs, economic recovery programs, waste and pollution management, environmental responsibility, and social responsibility are also taken into account (Dang et al., 2022).

In selecting sustainable 3PLP in chemical manufacturing enterprises in China, company executives prioritize 3PL providers whose main criteria are environmentally friendly technology, environmental protection management system, eco-design, information disclosure, industry reputation, technical capability, health and safety, cost, sustainable materials, production capacity, quality, on-time delivery rate, finance, and pollution (Peng et al., 2020).

One of the tasks of the procurement department is to choose the right supplier. The 3PLP criteria that are the main priority for the procurement department in the supply chain industry in Iran are employee and stakeholder rights, reverse logistics management, social responsibility, pollution control program, ethical issues and legal compliance, delivery allowance and flexibility, financial stability, energy management, health and safety plan system, green manufacturing system, product quality, environmental management system, and training and education programs (Yazdani et al., 2021), while the results of research in Spain, (Yazdani et al., 2022) suggest that when selecting a 3PLP, it is important to consider criteria such as delivery flexibility, ecological practices, price, environmental management systems, pollution control, social responsibility, sustainability of suppliers, plant environment, and the quality and appropriateness of species and varieties originating from North America. Additionally, viticulture practices, including training, trellising, pruning, canopy management, and harvest, should also be taken into account. Both cases in Iran and Spain include social

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responsibility criteria, indicating that the companies are aware of the social impact of their business activities (Rosyidi et al., 2022).

Criteria for Selection of Sustainable-resilient 3PL Providers

In this type, the 3PL Provider selected is not only based on its suitability to meet sustainable aspects but also must meet the resilience criteria (the ability to recover quickly). Afrasiabi et al. (2022) applied it to the case of selecting a 3PL provider in Iran's valve, fitting and pipe industry. They concluded that the priority criteria in selecting 3PLP were pollution control, environmental management system, risk awareness can aid in increasing resilience capacity, green design capability, technological abilities, vulnerability detection and reaction plans, vital capacity, quality, green products, price, safety and health of workers, employee interests and rights, respect for policies, innovativeness, on-time delivery, and finally reputation.

In Malaysia, research regarding the criteria for selecting 3PLP based on sustainable-resilient aspects was carried out by Fallahpour et al. (2021) in the palm oil industry. When selecting 3PLP, the main priorities are quality, cost, delivery, flexibility, service, turnover, resource consumption, eco-labelling, pollution control, green certification, re-use, air emissions, wastewater, hazardous wastes, workers' contracts, employment insurance, standard working hours, overtime pay, the provision of appropriate equipment in the workplace, growth in the workplace, consideration of religious issues in the workplace, wages, robustness, responsiveness, cooperation, agility, visibility, risk reduction, excess stock and vital capacity.

In selecting 3PL providers for healthcare products in Turkey, Pamucar et al. (2023) concluded that the most prioritized criteria are technical, environmental, and social. Technical criteria include payment strictness, reliability, transportation quality, delivery time, price, flexibility, and robustness. Environmental criteria include restrictions on pollutants, green R&D, environmental competencies, and recyclability. Social criteria include training stakeholders on green practices, ensuring stakeholder rights, creating jobs, and implementing occupational health and safety systems.

Criteria for Selection of Green 3PL Providers

Green 3PLP is a type of 3PLP focuses on pursuing economic benefits and environmentally friendly sustainable development (Ahi & Searcy, 2013). Fazlollahtabar & Kazemitash (2021) examined the selection of green 3PLP in Iran automotive companies and suggested the main criteria, namely green product, green design, quality, delivery, service, environmental management, cost, and green image. Still in the same industry, Ramakrishnan & Chakraborty (2020) examined the criteria for selecting green 3PLP in India. The research indicates that the chosen 3PL providers are those with the highest weighted scores in areas such as quality, finance, service, delivery, supplier capability, environmental management, management competency, corporate social responsibility, pollution control, green product, green image and hazardous material management. Meanwhile, in the Iranian automotive parts industry, the selection of green 3PLP is based on three main criteria: quality, on-time delivery, and circularity. Quality is evaluated based on the quality control system, previous customers' satisfaction, and the quality of after-sales service. On-time delivery is assessed based on on-time and efficient production, time management, and delivery time. Finally, circularity is evaluated based on air pollution, environmental standards, eco-friendly raw materials, eco-design, eco-friendly packaging, eco-friendly transportation, and clean technology (Govindan et al., 2020).

Two research teams applied green suppliers to 3PLP selection in electronics companies. In their research, Qu et al. (2020) propose criteria for the best green 3PLP for electronics companies in China. These criteria include: management support for supply chain management, use of environmentally friendly materials, reduction of harmful substances, compliance with legal environmental requirements and policies, development of ecological products, sustainable recycling design, use of environmentally friendly technologies and equipment, ISO14001 certification, lean management, quality after-sales service, and internal environmental management evaluation of suppliers. While Pınar et al. (2021) suggest that electronics companies in Turkey when choosing a 3PL provider, should choose a 3PL provider that has the following main criteria, namely quality, sustainability, green manufacturing system, green application, environmental management and control, cost, technology, green supplier image, service and delivery, and cooperation.

In the food industry in Malaysia, the main criteria considered in choosing a green 3PLP are pollution control, green packaging, environmental management system, service provided, delivery, pollution control, cost of products, and quality of products (Akram et al., 2020). Meanwhile, in the food

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industry in Iran, the priorities are price, technology, transportation costs, flexibility, on-time delivery, and failure (Tirkolaee et al., 2021). To improve the services provided and maintain food quality, Rusmana & Setyawan (2021) suggest integrating the supply chain network.

All renewable energy businesses face the Green Supplier Selection (GSS) issue. However, there are differences in the priority criteria for selecting green 3PLP for renewable power generation projects in two countries, such as Iran and China. The research results of Masoomi et al. (2022) in Iran concluded that the criteria most considered were eco-design, service level, environmental management system, pollution control, personnel environmental training, resource consumption, quality, green picture, and cost, while the research results of Lu et al. (2021) in China concluded that the priority criteria are green environmental protection ability, eco-design, resource consumption and delivery. Meanwhile, in the context of research into green supply chain management by (Wei et al., 2021) in China, the main priority criteria in selecting green 3PLP are financial conditions of suppliers, transportation costs of suppliers, environmental competencies, and improved environmental quality.

The main criteria for selecting green 3PLP in Iran in the steel industry are based on environmental management initiatives, research and design initiatives, regulatory obligations, pressures and market demand, environmental investments and economic benefits, resource availability and green competencies, collaborations, and green purchasing capabilities (Javad et al., 2020).

Criteria for Selection of Gresilient 3PL Providers

When selecting a 3PL provider based on resilience, company executives should also consider environmental concerns. Resilience refers to the ability to recover from disruptions in a timely and cost-effective manner, returning to the original or improved state. In their research in China, Mahmoudi et al. (2022) examined the selection of resilient suppliers in manufacturing companies. The results of his study showed that the best resilient suppliers were selected with the main priority being material safety, pollution and environmental management systems (EMS) certifications.

Criteria for Selection of Traditional 3PRL Providers

The selection of a 3PRLP has the same strategic importance as 3PLP. (Song et al., 2022) examined the 3PRLP selection process for cold chain equipment manufacturers in China. The results of his research show that companies choosing 3PRLP prioritize customer satisfaction, corporate reputation, timeliness of response, explicit costs, add-value service capacity, benefit-risk sharing level, value recovery ratio, network coverage, environmental protection effect, implicit costs, cultural and strategic compatibility, communication level, inventory capacity, transportation capacity, and information level.

For companies engaged in electronics recycling, the selection of 3PRLP has different priority criteria, such as research conducted by Rostamzadeh et al. (2021) in Iran. Their study shows that the prioritized criteria are growth, collection, quality and efficiency, reclaim, integrated system, financial considerations, and destination and market coverage. Meanwhile, the criteria for selecting 3PRLP in the electronics industry are pollution control, customer satisfaction, recycling, employee morale, re-manufacturing, on-time delivery, cost, eco-design production, system flexibility, technical innovation, employment stability, transportation, quality management, effective communication, and reuse (Baidya et al., 2021).

In the e-commerce retailers industry, the selection of 3PRLP in Canada prioritizes the criteria of cost, experience, quality, eco-design production, and reputation (Riaz et al., 2021), while the criteria that are prioritized in Vietnam are lead time, customer voice, cost, delivery and service, and quality (Dang, et al., 2021).

Criteria for Selection of Sustainable 3PRL Providers

The sustainable concept in Third-Party Reverse Logistics is 3PRL, which pays attention to sustainability issues. The main criteria in selecting 3PRLP for automotive companies in China are cost, quality, lead time, transportation, health and safety, disposal, operational risk, environmental protection certification, employment stability, delivery and services, eco-design production, and recycling, voice of customer, financial risk, remanufacturing and reuse, and green technology capability (X. Zhang & Su, 2020), while the priority criteria for electronics manufacturing companies in India are education infrastructure, flexibility, cost of green products and eco-design, green R & D and innovation, green warehousing, quality, environmental management system, technology capability,

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health and safety practices, costs, social responsibility, cost of pollution control, and employment practices (Mishra et al., 2022).

4. Conclusions and Recommendations

The criteria for selecting 3PL depend on the company's orientation and objectives, the country and industrial sector in which the company operates, and the aspects or dimensions of the criteria and methods used by researchers. The classification of 3PL includes traditional 3PL, sustainable 3PL, sustainable-resilient 3PL, green 3PL, gresilient 3PL, third-party reverse logistics, and sustainable third-party reverse logistics. The classification is based on the issue being promoted and the company's objectives in selecting a 3PL provider.

The seven classifications have distinct selection criteria. Additionally, the industrial sector and country of origin of the company can also influence the criteria for selecting third-party logistics. It is important to note that these criteria are closely related to the proposed aspects, dimensions, and attributes by the researchers. The selection criteria for third-party logistics providers and the results of the best choices are tools and considerations for company executives. The final decision, however, ultimately rests with the executives themselves.

References

Afrasiabi, A., Tavana, M., & Di Caprio, D. (2022). An extended hybrid fuzzy multi-criteria decision model for sustainable and resilient supplier selection. *Environmental Science and Pollution Research*, *29*(25), 37291–37314. https://doi.org/10.1007/s11356-021-17851-2

Aguezzoul, A. (2014). Third-party logistics selection problem: A literature review on criteria and methods. *Omega*, *49*, 69–78. https://doi.org/10.1016/j.omega.2014.05.009

Ahi, P., & Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production*, *52*, 329–341. https://doi.org/10.1016/j.jclepro.2013.02.018

Akram, M., Shumaiza, & Al-Kenani, A. N. (2020). Multi-criteria group decision-making for selection of green suppliers under bipolar fuzzy PROMETHEE process. *Symmetry*, *12*(1), 1–25. https://doi.org/10.3390/SYM12010077

Angkiriwang, R., Pujawan, I. N., & Santosa, B. (2014). Managing uncertainty through supply chain flexibility: reactive vs. proactive approaches. *Production & Manufacturing Research*, *2*(1), 50–70. https://doi.org/10.1080/21693277.2014.882804

Baidya, J., Garg, H., Saha, A., Mishra, A. R., Rani, P., & Dutta, D. (2021). Selection of third party reverses logistic providers: an approach of BCF-CRITIC-MULTIMOORA using Archimedean power aggregation operators. *Complex and Intelligent Systems*, *7*(5), 2503–2530. https://doi.org/10.1007/s40747-021-00413-x

Behzadi, G., O'Sullivan, M. J., & Olsen, T. L. (2020). On metrics for supply chain resilience. *European Journal of Operational Research*, *287*(1), 145–158. https://doi.org/10.1016/J.EJOR.2020.04.040

Chattopadhyay, R., Chakraborty, S., & Chakraborty, S. (2020). An integrated d-marcos method for supplier selection in an iron and steel industry. *Decision Making: Applications in Management and Engineering*, *3*(2), 49–69. https://doi.org/10.31181/dmame2003049c

Chen, C. H. (2020). A novel multi-criteria decision-making model for building material supplier selection based on entropy-AHP weighted TOPSIS. *Entropy*, *22*(2). https://doi.org/10.3390/e22020259

Christopher, M. (2023). *Logistics & Supply Chain Management* (6th ed.). Pearson Education Limited. http://library.lol/main/042DCCEE5DC519B03713E6DFC2CFADBA

Dang, T.-T., Nguyen, N.-A.-T., Nguyen, V.-T.-T., & Dang, L.-T.-H. (2022). A Two-Stage Multi-Criteria Supplier Selection Model for Sustainable Automotive Supply Chain under Uncertainty. *Axioms*, *11*(5). https://doi.org/10.3390/axioms11050228

Please cite this article as: Please cite this article as: Bombang, S. (2024). The implementation of FMEA for analyzing the risk of natural disaster logistic activities (case study: CSER project childfund international). *Operations Excellence: Journal of Applied Industrial Engineering*, 15(3), 306-313. doi:http://dx.doi.org/10.22441/oe.2023.v15.i3.096

Ejem, E. A., Uka, C. M., Dike, D. N., Ikeogu, C. C., Igboanusi, C. C., & Chukwu, O. E. (2021). Evaluation and Selection of Nigerian Third-Party Logistics Service Providers Using Multi-Criteria Decision Models. *LOGI - Scientific Journal on Transport and Logistics*, *12*(1), 135–146. https://doi.org/10.2478/logi-2021-0013

Fallahpour, A., Nayeri, S., Sheikhalishahi, M., Wong, K. Y., Tian, G., & Fathollahi-Fard, A. M. (2021). A hyper-hybrid fuzzy decision-making framework for the sustainable-resilient supplier selection problem: a case study of Malaysian Palm oil industry. *Environmental Science and Pollution Research*. https://doi.org/10.1007/s11356-021-12491-y

Fan, J., Guan, R., & Wu, M. (2020). Z-MABAC method for the selection of third-party logistics suppliers in fuzzy environment. *IEEE Access*, *8*, 199111–199119. https://doi.org/10.1109/ACCESS.2020.3035025

Fatoni, A., & Hardianti, D. (2020). Pengaruh Fasilitas dan Kualitas Pelayanan terhadap Keputusan Menggunakan Jasa Transportasi MRT atau Mass Rapid Transit. *Mediastima*, *26*(1), 117–134. https://doi.org/10.55122/mediastima.v26i1.99

Fatoni, A., Setyawan, I., & Pirmansyah, I. (2023). Dampak E-commerce terhadap Munculnya Kreativitas Berwirausaha dan Daya Saing Usaha Mikro Kecil Muslimah Majelis Taqorrub Ilallah (MTI) Bekasi. *Jurnal Ilmiah Universitas Batanghari Jambi*, *23*(1), 145–150. https://doi.org/10.33087/jiubj.v23i1.3071

Fazlollahtabar, H., & Kazemitash, N. (2021). Green supplier selection based on the information system performance evaluation using the integrated best-worst method. *Facta Universitatis, Series: Mechanical Engineering*, *19*(3), 345–360. https://doi.org/10.22190/FUME201125029F

Gao, H., Ran, L., Wei, G., Wei, C., & Wu, J. (2020). Vikor method for MAGDM based on Q-rung interval-years, given the advantages of considering the compromise between and its application to supplier selection of medical consumption products. *International Journal of Environmental Research and Public Health*, *17*(2). https://doi.org/10.3390/ijerph17020525

Govindan, K., Mina, H., Esmaeili, A., & Gholami-Zanjani, S. M. (2020). An Integrated Hybrid Approach for Circular supplier selection and Closed loop Supply Chain Network Design under Uncertainty. *Journal of Cleaner Production*, *242*, 1–16. https://doi.org/10.1016/j.jclepro.2019.118317

Granillo-Macías, R., & González-Hernández, I. J. (2021). Selection and evaluation of third party logistics in the supply chain: A systematic review. *Cuadernos de Gestión*, *21*(2), 7–18. https://doi.org/10.5295/cdg.191141rg

Gultom, J. R., Setyawan, I., & Laksono, R. (2023). Peran kepercayaan dalam memediasi efek persepsi kemudahan dan persepsi nilai digital pada niat penggunaan kontinu e-payment. *Mediastima*, *29*(1), 54–70. https://ejournal-ibik57.ac.id/index.php/mediastima/article/view/707

Handley, S. M., & Benton, W. C. (2013). The influence of task- and location-specific complexity on the control and coordination costs in global outsourcing relationships. *Journal of Operations Management*, *31*(3), 109–128. https://doi.org/10.1016/J.JOM.2012.12.003

Haradongan, F., Widodo, S., Soepriyadi, I., Gugat, R. M. D., Fachrial, P., Liana, E., Suryobuwono, A. A., Perwitasari, E. P., & Yusuf, M. (2023). Optimization Of Road-Based Mass Transportationroad-Based Mass Transport Optimization. *Journal of Namibian Studies : History Politics Culture*, *34*, 3735–3743.

Hidayad, M. K., & Utama, D. N. (2022). Third-Party Logistic Selection for Logistic Aggregator Company using Multi-Criteria Decision Making. *Journal of Computer Science*, *18*(9), 811–820. https://doi.org/10.3844/jcssp.2022.811.820

Hoseini, S. A., Fallahpour, A., Wong, K. Y., Mahdiyar, A., Saberi, M., & Durdyev, S. (2021). Sustainable supplier selection in construction industry through hybrid fuzzy-based approaches. *Sustainability* , *13*(3), 1–19. https://doi.org/10.3390/su13031413

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Jain, N., & Singh, A. R. (2020). Sustainable supplier selection criteria classification for Indian iron and steel industry: a fuzzy modified Kano model approach. *International Journal of Sustainable Engineering*, *13*(1), 17–32. https://doi.org/10.1080/19397038.2019.1566413

Jain, N., Singh, A. R., & Upadhyay, R. K. (2020). Sustainable supplier selection under attractive criteria through FIS and integrated fuzzy MCDM techniques. *International Journal of Sustainable Engineering*, *13*(6), 441–462. https://doi.org/10.1080/19397038.2020.1737751

Javad, M. O. M., Darvishi, M., & Javad, A. O. M. (2020). Green supplier selection for the steel industry using BWM and fuzzy TOPSIS: A case study of Khouzestan steel company. *Sustainable Futures*, *2*(Query date: 2023-12-23 13:34:10104 cites: https://www.scopus.com/inward/citedby.uri?partnerID=HzOxMe3b & scp=85084415702 & origin=inward). https://doi.org/10.1016/j.sftr.2020.100012

Jesson, J. K., Matheson, L., & Lacey, F. M. (2011). *Doing Your Literature Review: Traditional and Systematic Techniques* (1st ed.). SAGE Publications Ltd. https://library.lol/main/EC670A85E58A0C1D6248EF0FCE5D5352

Jovčić, S. (2021). A hybrid mcdm approach in third-party logistics (3pl) provider selection. *Mathematics*, *9*(21). https://doi.org/10.3390/math9212729

Jung, H. (2017). Evaluation of Third Party Logistics Providers Considering Social Sustainability. *Sustainability*, *9*(5), 2–18. https://doi.org/10.3390/su9050777

Kaya, S. K., & Aycin, E. (2021). An integrated interval type 2 fuzzy AHP and COPRAS-G methodologies for supplier selection in the era of Industry 4.0. *Neural Computing and Applications*, *33*(16), 10515–10535. https://doi.org/10.1007/s00521-021-05809-x

Kotlars, A., & Skribans, V. (2023). Development and Practical Application of Hybrid Decision-Making Model for Selection of Third-Party Logistics Service Providers. *Transport and Telecommunication*, *24*(4), 443–458. https://doi.org/10.2478/ttj-2023-0035

Kumar, P., & Singh, R. K. (2012). A fuzzy AHP and TOPSIS methodology to evaluate 3PL in a supply chain. *Journal of Modelling in Management*, *7*(3), 287–303. https://doi.org/10.1108/17465661211283287

Kurniawati, D., Yuliando, H., & Widodo, K. H. (2013). Kriteria Pemilihan Pemasok Menggunakan Analytical Network Process. *Jurnal Teknik Industri*, *15*(1), 25–32. https://doi.org/10.9744/jti.15.1.25-32

Liu, Y., Zhou, P., Li, L., & Zhu, F. (2020). An interactive decision-making method for third-party logistics provider selection under hybrid multi-criteria. *Symmetry*, *12*(5). https://doi.org/10.3390/SYM12050729

Lu, J., Zhang, S., Wu, J., & Wei, Y. (2021). COPRAS Method for Multiple Attribute Group Decision Making Under Picture Fuzzy Environment and Their Application to Green Supplier Selection. *Technological and Economic Development of Economy*, *27*(2), 369–385. https://doi.org/10.3846/tede.2021.14211

Luyen, L. A., & Thanh, N. Van. (2022). Logistics Service Provider Evaluation and Selection: Hybrid SERVQUAL–FAHP–TOPSIS Model. *Processes*, *10*(5). https://doi.org/10.3390/pr10051024

Mahmoudi, A., Javed, S. A., & Mardani, A. (2022). Gresilient supplier selection through Fuzzy Ordinal Priority Approach: decision-making in post-COVID era. *Operations Management Research*, *15*(1), 208–232. https://doi.org/10.1007/s12063-021-00178-z

Majid, S. A., Yundriana, R., Soepriyadi, I., Pahala, Y., Fachrial, P., Setiawan, A., Wardana, A., Soekirman, A., Nofrisel, ., Fahriza, B., Hikmawati, N. K., & Endri, E. (2022). Strategies for Improving Air Connectivity in Indonesia through the Indonesian, Malaysia and Thailand Growth Triangle Cooperation. *Academic Journal of Interdisciplinary Studies*, *11*(5), 62–72. https://doi.org/10.36941/ajis-2022-0125

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Marzouk, M., & Sabbah, M. (2021). AHP-TOPSIS social sustainability approach for selecting supplier in construction supply chain. *Cleaner Environmental Systems*, *2*, 1–9. https://doi.org/10.1016/j.cesys.2021.100034

Masoomi, B., Sahebi, I. G., Fathi, M., Yıldırım, F., & Ghorbani, S. (2022). Strategic supplier selection for renewable energy supply chain under green capabilities (fuzzy BWM-WASPAS-COPRAS approach). *Energy Strategy Reviews*, *40*, 1–17. https://doi.org/10.1016/j.esr.2022.100815

Mishra, A. R., Rani, P., & Pandey, K. (2022). Fermatean fuzzy CRITIC-EDAS approach for the selection of sustainable third-party reverse logistics providers using improved generalized score function. *Journal of Ambient Intelligence and Humanized Computing*, *13*(1), 295–311. https://doi.org/10.1007/s12652-021-02902-w

Murphy, Jr. , P. R., & Knemeyer, A. M. (2018). *Contemporary Logistics* (12th ed.). Pearson Education Limited.

Naeem, M., Qiyas, M., & Abdullah, S. (2021). An Approach of Interval-Valued Picture Fuzzy Uncertain Linguistic Aggregation Operator and Their Application on Supplier Selection Decision-Making in Logistics Service Value Concretion. *Mathematical Problems in Engineering*, *2021*. https://doi.org/10.1155/2021/8873230

Naseem, M. H. (2021). Selection of logistics service provider for the e-commerce companies in pakistan based on integrated gra-topsis approach. *Axioms*, *10*(3). https://doi.org/10.3390/axioms10030208

Okwu, M. O., & Tartibu, L. K. (2020). Sustainable supplier selection in the retail industry: A TOPSIS- and ANFIS-based evaluating methodology. *International Journal of Engineering Business Management*, *12*. https://doi.org/10.1177/1847979019899542

Ozcan, E., & Ahiskali, M. (2020). 3PL service provider selection with a goal programming model supported with multicriteria decision making approaches. *Gazi University Journal of Science*, *33*(2), 413–427. https://doi.org/10.35378/gujs.552070

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 1–9. https://doi.org/10.1136/bmj.n71

Pamucar, D., Torkayesh, A. E., & Biswas, S. (2023). Supplier selection in healthcare supply chain management during the COVID-19 pandemic: a novel fuzzy rough decision-making approach. *Annals of Operations Research*, *328*(1), 977–1019. https://doi.org/10.1007/s10479-022-04529-2

Peng, J., Tian, C., Zhang, W., Zhang, S., & Wang, J. (2020). An integrated multi-criteria decision-making framework for sustainable supplier selection under picture fuzzy environment. *Technological and Economic Development of Economy*, *26*(3), 573–598. https://doi.org/10.3846/tede.2020.12110

Pınar, A., Rouyendegh, B. D., & Özdemir, Y. S. (2021). Q-rung orthopair fuzzy topsis method for green supplier selection problem. *Sustainability (Switzerland)*, *13*(2), 1–14. https://doi.org/10.3390/su13020985

Qu, G., Zhang, Z., Qu, W., & Xu, Z. (2020). Green Supplier Selection Based on Green Practices Evaluated Using Fuzzy Approaches of TOPSIS and ELECTRE with a Case Study in a Chinese Internet Company. *International Journal of Environmental Research and Public Health*, *17*(9), 2–32. https://doi.org/10.3390/ijerph17093268

Rajesh, R., Ganesh, K., & Pugazhendhi, S. (2013). Drivers for logistics outsourcing and factor analysis for selection of 3PL provider. *International Journal of Business Excellence*, *6*(1), 37–58. https://doi.org/10.1504/IJBEX.2013.050575

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Ramakrishnan, K. R., & Chakraborty, S. (2020). A cloud topsis model for green supplier selection. *Facta Universitatis, Series: Mechanical Engineering*, *18*(3), 375–397. https://doi.org/10.22190/FUME200307036R

Rani, P., Mishra, A. R., Krishankumar, R., Mardani, A., Cavallaro, F., Ravichandran, K. S., & Balasubramanian, K. (2020). Hesitant fuzzy SWARA-complex proportional assessment approach for sustainable supplier selection (HF-SWARA-COPRAS). *Symmetry*, *12*(7). https://doi.org/10.3390/sym12071152

Rashidi, K., Noorizadeh, A., Kannan, D., & Cullinane, K. (2020). Applying the triple bottom line in sustainable supplier selection: A meta-review of the state-of-the-art. *Journal of Cleaner Production*, *269*, 122001. https://doi.org/10.1016/j.jclepro.2020.122001

Resende, C. H. L., Geraldes, C. A. S., & Lima, F. R. (2021). Decision Models for Supplier Selection in Industry 4.0 Era: A Systematic Literature Review. *Procedia Manufacturing*, *55*, 492–499. https://doi.org/10.1016/j.promfg.2021.10.067

Riaz, M., Farid, H. M. A., Aslam, M., Pamucar, D., & Bozani´c, D. (2021). Novel approach for third-party reverse logistic provider selection process under linear diophantine fuzzy prioritized aggregation operators. *Symmetry*, *13*(7), 1–31. https://doi.org/10.3390/sym13071152

Rösner, T. (2023). Supplier selection and order allocation in purchasing and supply management: a systematic literature review. *International Journal of Procurement Management*, *16*(1), 31. https://doi.org/10.1504/IJPM.2023.127884

Rostamzadeh, R. (2020). A fuzzy decision-making approach for evaluation and selection of third party reverse logistics provider using fuzzy aras. *Transport*, *35*(6), 635–657. https://doi.org/10.3846/transport.2020.14226

Rostamzadeh, R., Esmaeili, A., Sivilevičius, H., & Nobard, H. B. K. (2021). A Fuzzy Decision-Making Approach for Evaluation and Selection of Third Party Reverse Logistics Provider Using FUZZY ARAS. *Transport*, *35*(6), 635–657. https://doi.org/10.3846/transport.2020.14226

Rosyidi, C. N., Khasanah, A. M., & Laksono, P. W. (2022). Goal Programming Model for Joint Decision Making of Order Allocation, Supplier Selection, and Carrier Selection Considering Corporate Social Responsibility. *Jurnal Teknik Industri*, *24*(1), 45–52. https://doi.org/10.9744/jti.24.1.45-52

Rusmana, A. W., & Setyawan, I. (2021). Pengaruh Integrasi Supply Chain terhadap Kinerja Supply Chain. *Jurnal Bisnis, Logistik Dan Supply Chain (BLOGCHAIN)*, *1*(2), 67–76. https://ejournal-ibik57.ac.id/index.php/blogchain/article/view/329

Salimian, S., Mousavi, S. M., & Antucheviciene, J. (2022). An Interval-Valued Intuitionistic Fuzzy Model Based on Extended VIKOR and MARCOS for Sustainable Supplier Selection in Organ Transplantation Networks for Healthcare Devices. *Sustainability (Switzerland)*, *14*(7). https://doi.org/10.3390/su14073795

Setyawan, I., Laksono, R., & Gultom, J. R. (2022). Kualitas Layanan Last-Mile Delivery: Studi Komparasi Dua Layanan Pesan-Antar Makanan. *Jurnal Ilmiah Universitas Batanghari Jambi*, *22*(3), 2050–2060. https://doi.org/10.33087/jiubj.v22i3.2692

Shi, X., Deng, J., Su, X., & Cao, C. (2021). Third-party Payment Services Selection for Logistics Public Information Platforms. *Journal of Physics: Conference Series*, *1910*(1), 1–10. https://doi.org/10.1088/1742-6596/1910/1/012036

Soepriyadi, I. (2021). Dukungan terhadap Pengembangan Industri Logistik Kargo atau Barang Udara. *Mediastima*, *27*(2), 110–139. https://doi.org/10.55122/mediastima.v27i2.292

Song, J., Jiang, L., Liu, Z., Leng, X., & He, Z. (2022). Selection of Third-Party Reverse Logistics Service Provider Based on Intuitionistic Fuzzy Multi-Criteria Decision Making. *Systems*, *10*(5), 1–27. https://doi.org/10.3390/systems10050188

Sople, V. V. (2017). *Logistics Management: The Supply Chain Imperative* (3rd ed.). Pearson India Education Services Pvt. Ltd. http://library.lol/main/49721681A1982618DBF1F3B89A85B080

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Sumrit, D. (2020). Supplier selection for vendor-managed inventory in healthcare using fuzzy multi-criteria decision-making approach. *Decision Science Letters*, *9*(2), 233–256. https://doi.org/10.5267/j.dsl.2019.10.002

Tavana, M., Yazdani, M., & Di Caprio, D. (2017). An application of an integrated ANP–QFD framework for sustainable supplier selection. *International Journal of Logistics Research and Applications*, *20*(3), 254–275. https://doi.org/10.1080/13675567.2016.1219702

Tirkolaee, E. B., Dashtian, Z., Weber, G.-W., Tomaskova, H., Soltani, M., Mousavi, & Nasim Sadat. (2021). An integrated decision-making approach for green supplier selection in an agri-food supply chain: Threshold of robustness worthiness. *Mathematics*, *9*(11), 1–30. https://doi.org/10.3390/math9111304

Tsai, M.-C., Lai, K., Lloyd, A. E., & Lin, H.-J. (2012). The dark side of logistics outsourcing – Unraveling the potential risks leading to failed relationships. *Transportation Research Part E: Logistics and Transportation Review*, *48*(1), 178–189. https://doi.org/10.1016/j.tre.2011.07.003

Tuljak-Suban, D., & Bajec, P. (2020). Integration of AHP and GTMA to make a reliable decision in complex decision-making problems: Application of the logistics provider selection problem as a case study. *Symmetry*, *12*(5). https://doi.org/10.3390/SYM12050766

Ulutaş, A. (2021). A grey hybrid model to select the optimal third-party logistics provider. *South African Journal of Industrial Engineering*, *32*(1), 171–181. https://doi.org/10.7166/32-1-2126

Wang, C.-N., Dang, T.-T., & Nguyen, N.-A.-T. (2021). Outsourcing reverse logistics for e-commerce retailers: A two-stage fuzzy optimization approach. *Axioms*, *10*(1), 1–22. https://doi.org/10.3390/axioms10010034

Wang, C.-N., Hsiung-Tien Tsai, Thanh-Phong Ho, Thanh-Phong Ho, & Ying-Fang Huang. (2020). Multi-criteria decision making (MCDM) model for supplier evaluation and selection for oil production projects in vietnam. *Processes*, *8*(2). https://doi.org/10.3390/pr8020134

Wang, C.-N., Nguyen, N.-A.-T., Dang, T.-T., & Lu, C.-M. (2021). A compromised decision-making approach to third-party logistics selection in sustainable supply chain using fuzzy ahp and fuzzy vikor methods. *Mathematics*, *9*(8). https://doi.org/10.3390/math9080886

Wei, C., Wu, J., Guo, Y., & Wei, G. (2021). Green supplier selection based on codas method in probabilistic uncertain linguistic environment. *Technological and Economic Development of Economy*, *27*(3), 530–549. https://doi.org/10.3846/tede.2021.14078

Wiangkam, N., Jamrus, T., & Sureeyatanapas, P. (2022). The decision-making for selecting cold chain logistics providers in the food industry. *Engineering and Applied Science Research*, *49*(6), 811–818. https://doi.org/10.14456/easr.2022.79

Yazdani, M., Ebadi Torkayesh, A., Stević, Ž., Chatterjee, P., Asgharieh Ahari, S., & Doval Hernandez, V. (2021). An interval valued neutrosophic decision-making structure for sustainable supplier selection. *Expert Systems with Applications*, *183*, 115354. https://doi.org/10.1016/j.eswa.2021.115354

Yazdani, M., Pamucar, D., Chatterjee, P., & Torkayesh, A. E. (2022). "A multi-tier sustainable food supplier selection model under uncertainty." *Operations Management Research*, *15*(1), 116–145. https://doi.org/10.1007/s12063-021-00186-z

Zhang, D., Su, Y., Zhao, M., & Chen, X. (2021). CPT-TODIM Method for Interval Neutrosophic MAGDM and Its Application to Third-Party Logistics Service Providers Selection. *Technological and Economic Development of Economy*, *28*(1), 201–219. https://doi.org/10.3846/tede.2021.15758

Zhang, X., & Su, T. (2020). The Dominance Degree-Based Heterogeneous Linguistic Decision-Making Technique for Sustainable 3PRLP Selection. *Complexity*, *2020*, 1–18. https://doi.org/10.1155/2020/6102036

Please cite this article as: Please cite this article as: Bombang, S. (2024). The implementation of FMEA for analyzing the risk of natural disaster logistic activities (case study: CSER project childfund international). *Operations Excellence: Journal of Applied Industrial Engineering*, 15(3), 306-313. doi:http://dx.doi.org/10.22441/oe.2023.v15.i3.096