



# Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:  
[https://semarakilmu.com.my/journals/index.php/applied\\_sciences\\_eng\\_tech/index](https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index)  
ISSN: 2462-1943



## Multi-Criteria Decision Analysis on the Preference of Courier Service Providers with Analytic Hierarchy Process Model

Pei Fun Lee<sup>1</sup>, Weng Siew Lam<sup>1,\*</sup>, Weng Hoe Lam<sup>1</sup>, Wein Kei Muck<sup>1</sup>

<sup>1</sup> Department of Physical and Mathematical Science, Faculty of Science, Universiti Tunku Abdul Rahman, Kampar Campus, Jalan Universiti, Bandar Barat, 31900 Kampar, Perak, Malaysia

### ARTICLE INFO

#### Article history:

Received 9 July 2023

Received in revised form 29 November 2023

Accepted 8 December 2023

Available online 19 December 2023

#### Keywords:

Analytic hierarchy process; courier service; e-commerce; preference

### ABSTRACT

The rising interest in E-commerce has increased the reliance on courier service providers in Malaysia. However, the logistical performances of the courier service providers in Malaysia still require improvement especially in the enhancement of information system adoption as the providers are suffering from bottlenecks in some hubs and centres which affect the satisfaction of clients and the reputation of the online retailers. Online retailers place high concern in the performances of the courier service providers as their services affect the sales and revenues of the online retailers. Therefore, the goal of this study is to propose a framework to determine and rank the factors that affect the selection of courier service providers among online retailers in Malaysia with Analytic Hierarchy Process (AHP) model. This study found that real time notification, cost and timeliness are the three most important factors of consideration while GDEX is the highly preferred courier service provider among the online retailers. This study can serve as a guide to the courier service providers to improve based on the top factors that influence the selection of their services.

## 1. Introduction

Digital literacy is one of the compulsory skills for working adults and students in performing their daily tasks. According to Abdullah *et al.*, [1], there are approximately 20 million internet users in Malaysia in 2019, with half of them engaging in online transactions such as e-commerce. The United Nations has also projected that greater than 80% of the populations in developing countries will make up the urban community in 30 years [2]. Therefore, more individuals will engage in this digitalized supply chain. The number of clients in e-commerce is also expected to exceed 75% of the total population in 2022 as the market volume is expected to keep increasing over the years, particularly as COVID-19 became a major force for e-commerce adoption during the pandemic [1]. With e-commerce, the parcel volume to be delivered is increased as courier service providers perform logistical activities such as route planning, sorting and last mile delivery.

\* Corresponding author.

E-mail address: lamws@utar.edu.my

<https://doi.org/10.37934/araset.35.2.94103>

In Malaysia, even though some courier service providers have invested in smart warehouses and hubs with immersive technology and automation to allow machine interaction to reduce human error and expedite the delivery process, smaller hubs and centers still rely largely on human capital to process all orders [3]. Some hubs and centers suffer bottlenecks which affect their competitiveness and increase their volatility. Moreover, Nekhoroshkov *et al.*, [4] found that Malaysia has a below average rating among countries in Asia Pacific in logistical performances. This is a disadvantage which adds on to one of the drawbacks of e-commerce which is the inability to obtain instant possession of products ordered. As the lead time between the order placement and the successful delivery of products increases, there will be higher uncertainty in the order which may lead to dissatisfaction of clients that will reflect on the bottom line and reputation of the online retailers. As such, online retailers will perform thorough consideration when selecting the courier service providers.

Therefore, the goal of this study is to propose a framework to determine and rank the factors affecting the selection of courier service providers among the online retailers in Malaysia. Since there are several factors which can affect the selection of courier service providers, this is a multi-criteria decision making (MCDM) problem, analytic hierarchy process (AHP) can be used to rank the factors and alternatives [5,6]. Based on our understanding, past studies have not applied AHP to analyze the factors affecting the selection of courier service providers among the online retailers in Malaysia. AHP has been used to simulate the thoughts of decision makers to rank the preferences of a given domain with respect to a certain criterion [7,8]. AHP has been largely adopted to study supplier selection [9-12], strategy selection [13,14] and location selection [15,16] while also ranked public implementations [17,18]. Therefore, AHP is used to rank the factors affecting the selection of the courier service providers and the alternatives which are the courier service providers. In Malaysia, there are five major players in the courier services segment. They are DHL, GDEX, Pos Laju, City-Link and Skynet, which will be used in this study.

## 2. Methodology

This paper aims to determine the factors affecting the selection of courier service providers among the online retailers in Malaysia. This multi-criteria problem can be solved with analytic hierarchy process (AHP) developed by Saaty [19]. In AHP, the scenario will be decomposed into a hierarchy to determine the optimal decision criteria and alternative [20]. The strength of AHP is in the determination of the prime criteria and alternative that match the goal of the study by using pairwise comparisons at the respective hierarchical level [21]. A hierarchy structure with three levels is proposed as the conceptual framework to analyze the factors affecting the preference of courier service providers in Malaysia, with this goal making up the top level of the hierarchy. There are six (6) decision criteria, which are in the middle of the hierarchy, as they are made up of cost, timeliness, order accuracy, simplicity of order placement, payment option and real time notification [22,23]. The bottom of the hierarchy structure consists of the decision alternatives which include five prominent courier service providers in Malaysia with high market capitalization [24]. They are DHL, GDEX, Pos Laju, City-Link and Skynet. In AHP, there is no defined method to determine the sample size as there is no direct comparison of attributes [25-27]. Therefore, in this study, 33 online retailers have participated to identify the factors affecting the preference of courier service providers in Malaysia.

There are seven (7) steps to develop the AHP model for this study [28-30].

- i. Step-1: Formation of hierarchy structure with three levels consisting of goals, criteria and alternatives using the decomposition principle. Table 1 presents the proposed framework of hierarchy structure in determining the preference of courier service providers in Malaysia.

**Table 1**  
 Proposed framework

Levels	Items
Goal	To determine and rank the factors affecting the preference of courier service providers among online retailers in Malaysia
Criteria	Cost Timeliness Order accuracy Simplicity of order placement Payment option Real time notification
Alternative	DHL GDEX Pos Laju City-Link Skynet

- ii. Step-2: Transformation of the AHP model into a two-way Likert scale pairwise comparison questionnaire to be distributed to the target respondents.
- iii. Step-3: Formation of matrix structure using the results of the questionnaires as in Eq. (1).

$$A_{n \times n} = \begin{pmatrix} 1 & a_{12} & a_{13} & a_{14} & a_{15} \\ a_{21} & 1 & a_{23} & a_{24} & a_{25} \\ a_{31} & a_{32} & 1 & a_{34} & a_{35} \\ a_{41} & a_{42} & a_{43} & 1 & a_{45} \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{pmatrix} \quad (1)$$

- iv. Step-4: Pairwise comparison among criteria and among alternatives to identify the relative importance using the comparative judgement principle. This comparative judgement principle follows the Saaty’s scale as presented in Table 2 [31].

**Table 2**  
 Saaty’s Scale for Comparative Judgement Principle

Ratings	Definitions
1	Equal importance
3	Slight importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Intermediates

- v. Step-5: Normalization of matrix to determine the weights of criteria and alternatives. Normalization is performed by first obtaining the column sum of each matrix and then divide each element by the sum to create a normalized matrix. The mean of each row of the normalized matrix indicates the weight of the criteria or alternative as shown in Eq. (2).

$$c_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}}, \quad i = 1,2,3,4,5 \text{ and } j = 1,2,3,4,5 \quad (2)$$

- vi. Step-6: The final weights of the alternatives can be calculated to determine the prioritization using matrix  $Y$ , with the following formulation in Eq. (3).

$$Y = A \times C \tag{3}$$

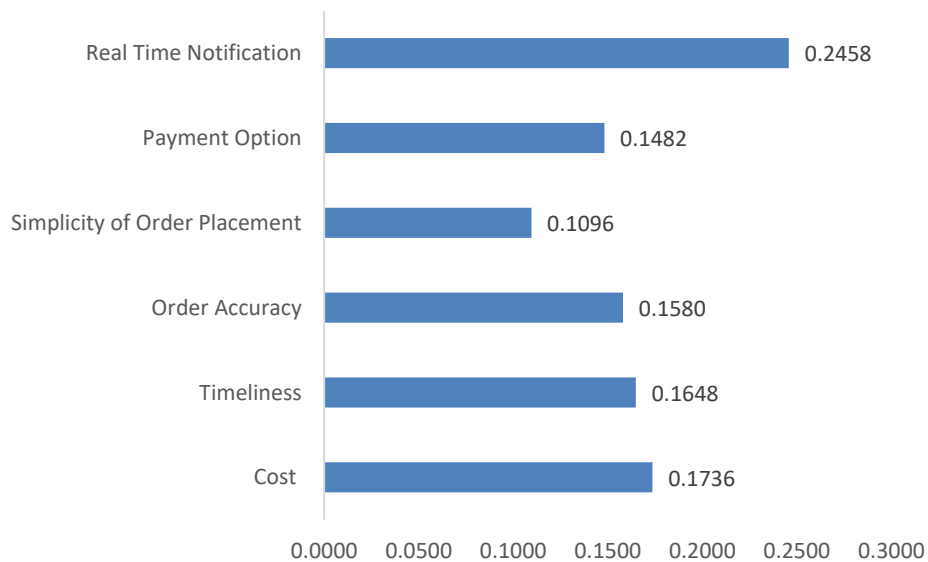
where  $Y$  is the final weights of the alternatives calculated in the matrix,  $A$  is the weights of alternatives with respect to every single criterion and  $C$  is the weights of the criteria.

- vii. Step-7: AHP allows the checking of reliability of a study with consistency ratio ( $CR$ ), which is formulated with the quotient of consistency index ( $C$ ) and random index ( $R$ ).  $CR$  should be less than 0.10 for reliable results with the calculation in Eq. (4) [31].

$$CR = \frac{C}{R} \tag{4}$$

### 3. Results

Figure 1 and Table 3 demonstrates the weightages of the six factors affecting the selection of courier service providers among online retailers in Malaysia.



**Fig. 1.** Weightages of factors affecting the selection of courier service providers among online retailers in Malaysia

Figure 1 and Table 3 show that real time notification is the most important factor in selecting a courier service provider among online retailers in Malaysia with a weightage of 0.2458. The second and third most prominent factors are cost and timeliness, with weightages of 0.1736 and 0.1648 respectively. Order accuracy (0.1580), payment option (0.1482) and simplicity of order placement (0.1096) are ranked fourth, fifth and sixth in the selection of courier service providers among online retailers.

**Table 3**  
Ranking of factors in selecting courier service providers

Factors	Weightages	Ranking
Real Time Notification	0.2458	1
Cost	0.1736	2
Timeliness	0.1648	3
Order Accuracy	0.1580	4
Payment Option	0.1482	5
Simplicity of Order Placement	0.1096	6

Firstly, real time notification is ranked first because tracking and tracing system offers a feature for both retailers and clients to visualize the locations of their parcels, be it in transit or preparing for last mile deliveries so that the clients may plan ahead to receive their orders. This can also prevent parcels from being lost if the parcels are left at the doorstep when the clients are not available for pick up, thus enhancing the security and safety of parcels and reducing the risk of lost as some notification systems come with GPS coordinates and proof of delivery [32]. Real time tracking and notification system also improves transparency whereby this also increases customer engagement and comfortability with their delivery expectations [33]. Moreover, Akter and Wamba [34] noted that visibility is a driver that promotes online purchasing behaviour as clients often feel a sense of relief knowing some key information on the parcel status. This would then increase the sales of the online retailers. Besides, online retailers can also check delivered parcels from the notification system and take appropriate actions such as insurance claims if the parcels are missing or stolen [35].

Cost is the second factor affecting the selection of courier service providers. In general, the online retailers aim for value maximization in which the online retailers would select the courier service provider with the lowest cost but has the greatest value and quality. Online retailers often compare the cost and value of the services provided by the courier service provider to make sure that the cost matches the services [36]. Some online retailers also prefer to engage with courier service providers which are affordable and would offer special rates to the long-term clients [37,38]. Moreover, some delivery costs are borne by the clients. High cost of delivery will deter the clients from purchasing from the online retailers as delivery cost affects clients' intentions [39].

The third factor involves timeliness. Timeliness refers to the most favourable duration from order placement to the reception of parcels at the clients' location. Nowadays, with information systems and various optimization software for storage, picking, sorting and transport planning, courier service providers can deliver in lesser time possible and at a higher speed [40]. Timeliness of courier service providers also proves the reliability of the providers as they can deliver within the expected date of delivery [41]. Late deliveries will cause client dissatisfaction especially if the clients have paid for priority shipment. Late delivery may have negative effect on the online retailers as the clients are not satisfied with the services and may refrain from transacting with the online retailers [42,43]. Therefore, online retailers find that timeliness is also among the top three factors to consider when selecting a courier service provider.

Next, order accuracy is the fourth factor under consideration by the online retailers. Order accuracy involves the consistency of client's order with the parcel delivered to the correct location. Delivery to an inaccurate location may eventually cause the parcel to be lost or its content exposed for unintended purposes and may be damaged. However, nowadays, many courier service providers have scanning systems with barcodes or radio frequency identification to reduce order errors during fulfilment. Some major hubs also have automation systems for sorting packages and assigning the right vehicle. Location mapping can also reduce the chances of delivery to the wrong location and

ensure complete deliveries [44,45]. Therefore, this may be a reason that order accuracy is only ranked fourth when selecting a courier service provider.

The fifth factor is payment option. When courier service providers accept a variety of payment modes, it is more convenient for both the online retailers and their clients as they are able to select their preferred mode of payment. As people are moving towards digitization, in Malaysia, there are a number of payment options available such as cash on delivery, online banking, credit or debit cards, E-wallets, payment at convenience store, instalment plans and the option to pay later. These payment options, especially the cash on delivery and pay later options, increases the confidence level of the clients especially to those who worry about non-delivery or non-fulfilment of their orders. Therefore, it may be a less concerning factor to the online retailers [46].

Lastly, simplicity of order placement is the least important factor in selecting a courier service provider among online retailers in Malaysia. Simplicity of order placement does not have a direct relationship with order delivery and client satisfaction, thus does not affect the sales and profit of the online retailers and therefore, may be the reason it is ranked last in this study. Moreover, many courier service providers have developed their websites and mobile applications for delivery order placement and self-printing of the airway bills. Glitches may be observed in the order placement systems but are quickly resolved and smoother and user-friendly interfaces have been designed for order placement [46].

Figure 2 depicts the ranking on the selection of courier service providers among online retailers in Malaysia with respect to each factor.

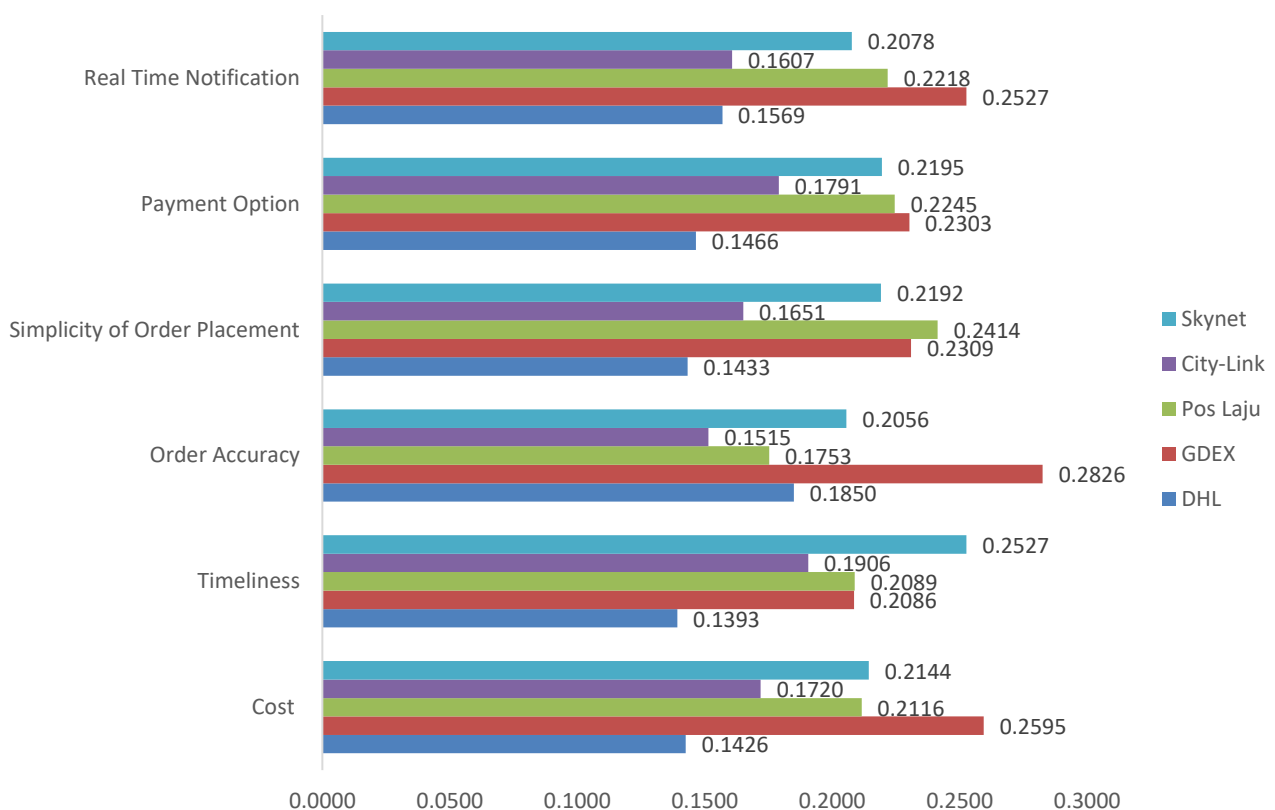


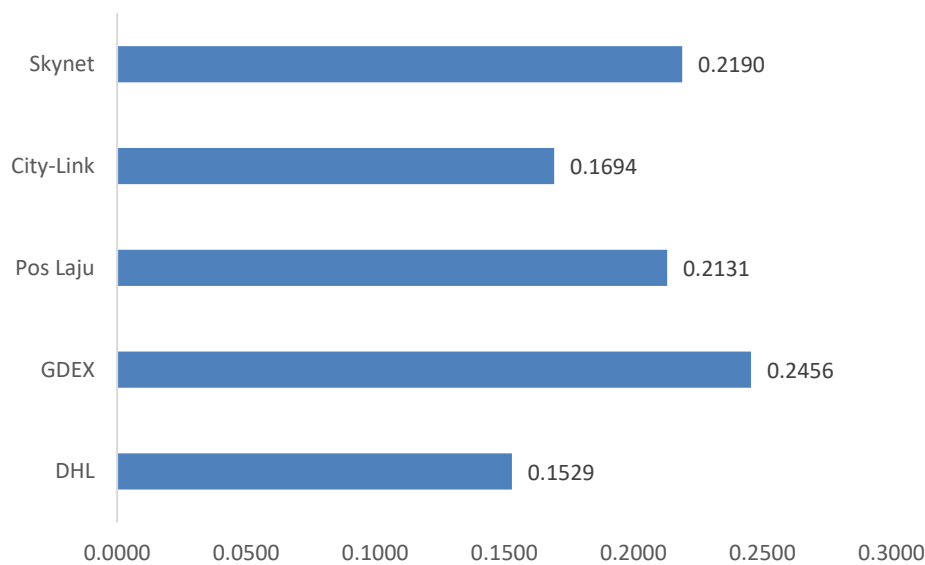
Fig. 2. Selection of courier service providers with respect to each factor

Based on Figure 2, out of the six factors, GDEX has the highest performance in four factors, namely cost (0.2595), order accuracy (0.2826), payment option (0.2303) and real time notification (0.2527). Skynet is the best performer in timeliness (0.2527) while Pos Laju is having the best order placement

system (0.2414). On the other hand, DHL has the lowest performance in five factors including cost (0.1426), timeliness (0.1393), simplicity of order placement (0.1433), payment option (0.1466) and real time notification (0.1569). City-Link has the lowest weightage in order accuracy (0.1515).

GDEX is a listed company on the main market of Bursa Malaysia and has been gaining profits until 2021 which shows that GDEX is a high performing company especially in the cost and service quality which gain the attention and satisfaction of online retailers. GDEX is also constantly focusing on the improvement of digital and technological competency which eventually helps to speed up the delivery processes, minimize errors, simplify the order and tracking processes while also train its employees to be digital literate and responsible to enhance its services [47].

Figure 3 demonstrates the overall ranking in the selection of courier service providers among online retailers in Malaysia.



**Fig. 3.** Overall ranking in the selection of courier service providers

As seen in Figure 3, GDEX (0.2456) has the highest overall weight and is the most selected courier service provider among the online retailers with respect to cost, timeliness, order accuracy, simplicity of order placement, payment option and real time notification. The second most selected courier service provider is Skynet with a weight of 0.2190, followed by Pos Laju with a weight of 0.2131 and City-Link with a weight of 0.1694. DHL is the least selected courier service provider with the lowest weight of 0.1529. The consistency ratio in this study is 0.0470 which is well below 0.1000. Therefore, the results of this study are acceptable.

#### 4. Conclusions

The study has achieved the goal to determine and rank the factors affecting the selection of courier service providers among online retailers in Malaysia with AHP model. The factors include cost, timeliness, order accuracy, simplicity of order placement, payment option and real time notification. The top three important factors are real time notification, cost and timeliness as they have high influence to client satisfaction and the sales and profitability of the online retailers. GDEX is the most selected courier service provider among the online retailers due to its constant efforts in enhancing its digital competencies to deliver the best services. Based on the factors affecting the selection of courier service providers, DHL may improve by enhancing its real time notification, cost and

timeliness to deliver better services to the online retailers and other clients. Since life is mostly back to normalcy after the outbreak of the COVID-19 pandemic in the end of 2019, future studies can be performed to survey the trends of online retailing as people are gradually moving back to purchasing from physical stores and how this would impact the courier service providers.

## Acknowledgement

This research is supported by the Universiti Tunku Abdul Rahman, Malaysia.

## References

- [1] Abdullah, Lazim, Razamin Ramli, Huda Omar Bakodah, and Mahmud Othman. "Developing a causal relationship among factors of e-commerce: A decision making approach." *Journal of King Saud University-Computer and Information Sciences* 32, no. 10 (2020): 1194-1201. <https://doi.org/10.1016/j.jksuci.2019.01.002>
- [2] Vaithilingam, Santha, Mahendhiran Nair, Mary Macharia, and Viswanath Venkatesh. "Mobile communication and use behavior of the urban poor in a developing country: A field study in Malaysia." *International Journal of Information Management* 63 (2022): 102440. <https://doi.org/10.1016/j.ijinfomgt.2021.102440>
- [3] Kumar, Amit, Vishrut Landge, and Sumeet Jaiswal. "E-commerce, industry 4.0, & transportation—identifying the potentiality & problems." In *1st Indian International Conference on Industrial Engineering and Operations Management, IEOM 2021*, pp. 553-563. 2021.
- [4] Nekhoroshkov, Vladimir P., Alyona A. Aroshidze, Evgeniy V. Nekhoroshkov, Kim Yuchzhong, Evgeniy F. Avdokushin, Aleksey G. Kotenko, and Kirill M. Timukhin. "Logistics Efficiency of APEC Economies: Diagnosis, Interconnections and Digital Experience for Russia." *Transportation Research Procedia* 61 (2022): 118-124. <https://doi.org/10.1016/j.trpro.2022.01.020>
- [5] Menon, Rakesh R., and V. Ravi. "Using AHP-TOPSIS methodologies in the selection of sustainable suppliers in an electronics supply chain." *Cleaner Materials* 5 (2022): 100130. <https://doi.org/10.1016/j.clema.2022.100130>
- [6] Kiracı, Kasim, and Ercan Akan. "Aircraft selection by applying AHP and TOPSIS in interval type-2 fuzzy sets." *Journal of Air Transport Management* 89 (2020): 101924. <https://doi.org/10.1016/j.jairtraman.2020.101924>
- [7] Saaty, Thomas L. "A scaling method for priorities in hierarchical structures." *Journal of mathematical psychology* 15, no. 3 (1977): 234-281. [https://doi.org/10.1016/0022-2496\(77\)90033-5](https://doi.org/10.1016/0022-2496(77)90033-5)
- [8] Xu, Yuan, Shifeng Liu, Jun Wang, and Xiaopu Shang. "Consensus checking and improving methods for AHP with q-rung dual hesitant fuzzy preference relations." *Expert Systems with Applications* 208 (2022): 117902. <https://doi.org/10.1016/j.eswa.2022.117902>
- [9] Kumar, Anil, Amit Pal, Ashwani Vohra, Sachin Gupta, Suryakant Manchanda, and Manoj Kumar Dash. "Construction of capital procurement decision making model to optimize supplier selection using Fuzzy Delphi and AHP-DEMATEL." *Benchmarking: an international journal* 25, no. 5 (2018): 1528-1547. <https://doi.org/10.1108/BIJ-01-2017-0005>
- [10] Ahmad, Md Tanweer, and Sandeep Mondal. "Dynamic supplier selection approach for mining equipment company." *Journal of Modelling in Management* 14, no. 1 (2019): 77-105. <https://doi.org/10.1108/JM2-04-2018-0046>
- [11] Tusnial, Anirudh, Satyendra Kumar Sharma, Parth Dhingra, and Srikanta Routroy. "Supplier selection using hybrid multicriteria decision-making methods." *International Journal of Productivity and Performance Management* 70, no. 6 (2021): 1393-1418. <https://doi.org/10.1108/IJPPM-04-2019-0180>
- [12] Yu, Chunxia, Zhiqin Zou, Yifan Shao, and Fengli Zhang. "An integrated supplier selection approach incorporating decision maker's risk attitude using ANN, AHP and TOPSIS methods." *Kybernetes* 49, no. 9 (2020): 2263-2284. <https://doi.org/10.1108/K-04-2019-0223>
- [13] Abdul Jawwad, Abdul Kareem, and Ibrahim AbuNaffa. "Applying analytical hierarchy process (AHP) in selecting best maintenance strategies for newly established chemical fertilizers plants." *Journal of Quality in Maintenance Engineering* 28, no. 3 (2022): 545-566. <https://doi.org/10.1108/JQME-06-2020-0056>
- [14] Martin, Hector, Fey Mohammed, Kevin Lal, and Shannon Ramoutar. "Maintenance strategy selection for optimum efficiency—application of AHP constant sum." *Facilities* 38, no. 5/6 (2020): 421-444. <https://doi.org/10.1108/F-05-2018-0060>
- [15] Erturan-Ogut, Esin Esra, and Ufuk Kula. "Selecting the right location for sports facilities using analytical hierarchy process." *Journal of Facilities Management* (2022). <https://doi.org/10.1108/JFM-09-2021-0103>
- [16] Emeç, Şeyma, and Gökay Akkaya. "Stochastic AHP and fuzzy VIKOR approach for warehouse location selection problem." *Journal of Enterprise Information Management* 31, no. 6 (2018): 950-962. <https://doi.org/10.1108/JEIM-12-2016-0195>



- [17] Khodamipour, Ahmad, Mahdi Askari Shahamabad, and Fateme Askari Shahamabad. "Fuzzy AHP-TOPSIS method for ranking the solutions of environmental taxes implementation to overcome its barriers under fuzzy environment." *Journal of Applied Accounting Research* 23, no. 3 (2022): 541-569. <https://doi.org/10.1108/JAAR-03-2021-0076>
- [18] Islam, Rafikul, and Fatima El Madkouri. "Assessing and ranking HALMAS parks in Malaysia: An application of importance-performance analysis and AHP." *Journal of Islamic Marketing* 9, no. 2 (2018): 240-261. <https://doi.org/10.1108/JIMA-03-2016-0027>
- [19] Saaty, Thomas L. *What is the analytic hierarchy process?*. Springer Berlin Heidelberg, 1988. <https://doi.org/10.13033/isahp.y1988.042>
- [20] Khaira, Ashish, and R. K. Dwivedi. "A state of the art review of analytical hierarchy process." *Materials Today: Proceedings* 5, no. 2 (2018): 4029-4035. <https://doi.org/10.1016/j.matpr.2017.11.663>
- [21] Miciuła, Ireneusz, and Joanna Nowakowska-Grunt. "Using the AHP method to select an energy supplier for household in Poland." *Procedia Computer Science* 159 (2019): 2324-2334. <https://doi.org/10.1016/j.procs.2019.09.407>
- [22] Loo, Kelly, and Norhaidah Mohd Asrah. "Survey on Customer Satisfaction Towards Courier Services in Johor." *Enhanced Knowledge in Sciences and Technology* 2, no. 2 (2022): 186-196.
- [23] Zhong, Shuya, Carl Lomas, and Tracey Worth. "Understanding customers' adoption of express delivery service for last-mile delivery in the UK." *International Journal of Logistics Research and Applications* 25, no. 12 (2022): 1491-1508. <https://doi.org/10.1080/13675567.2021.1914563>
- [24] Mordor Intelligence. "Malaysia courier, express, and parcel (CEP) market – growth, trends, COVID-19 impact, and forecasts (2023-2028)." (2022). <https://www.mordorintelligence.com/industry-reports/malaysia-courier-express-and-parcel-cep-market>.
- [25] Nazim, Mohd, Chaudhary Wali Mohammad, and Mohd Sadiq. "A comparison between fuzzy AHP and fuzzy TOPSIS methods to software requirements selection." *Alexandria Engineering Journal* 61, no. 12 (2022): 10851-10870. <https://doi.org/10.1016/j.aej.2022.04.005>
- [26] Baby, Saji. "AHP modeling for multicriteria decision-making and to optimise strategies for protecting coastal landscape resources." *International Journal of Innovation, Management and Technology* 4, no. 2 (2013): 218. <https://doi.org/10.7763/IJIMT.2013.V4.395>
- [27] Razi, P. Z., N. I. Ramli, M. I. Ali, and P. J. Ramadhansyah. "Selection of best consultant by using analytical hierarchy Process (AHP)." In *IOP Conference Series: Materials Science and Engineering*, vol. 712, no. 1, p. 012016. IOP Publishing, 2020. <https://doi.org/10.1088/1757-899X/712/1/012016>
- [28] Maracajá, Kettrin Farias Bem, Vanessa Batista Schramm, Fernando Schramm, and Vander Valduga. "A multicriteria model for evaluation of Brazilian wineries from a tourism destination perspective." *International Journal of Wine Business Research* 34, no. 1 (2022): 52-68. <https://doi.org/10.1108/IJWBR-12-2020-0057>
- [29] Sequeira, Movin, Per Hilletoft, and Anders Adlemo. "AHP-based support tools for initial screening of manufacturing reshoring decisions." *Journal of Global Operations and Strategic Sourcing* 14, no. 3 (2021): 502-527. <https://doi.org/10.1108/JGOSS-07-2020-0037>
- [30] Chiarini, Andrea. "Choosing action plans for strategic manufacturing objectives using AHP: Analysis of the path and pitfalls encountered—an exploratory case study." *Journal of Manufacturing Technology Management* 30, no. 1 (2019): 180-194. <https://doi.org/10.1108/JMTM-10-2017-0209>
- [31] do Carmo Silva, Marcela, Helder Gomes Costa, and Carlos Francisco Simões Gomes. "Multicriteria decision choices for investment in innovative upper-middle income countries." *Innovation & Management Review* 17, no. 3 (2020): 321-347. <https://doi.org/10.1108/INMR-02-2019-0016>
- [32] Shamsuzzoha, Ahm, Michael Ehlers, Richard Addo-Tengkorang, and Petri Helo. "Tracking and Tracing of Global Supply Chain Network: Case Study from a Finnish Company." In *ICEIS (1)*, pp. 118-125. 2021. <https://doi.org/10.5220/0010515401180125>
- [33] Restuputri, Dian Palupi, Ilyas Masudin, and Citra Permata Sari. "Customers perception on logistics service quality using Kansei engineering: Empirical evidence from Indonesian logistics providers." *Cogent Business & Management* 7, no. 1 (2020): 1751021. <https://doi.org/10.1080/23311975.2020.1751021>
- [34] Akter, Shahriar, and Samuel Fosso Wamba. "Big data analytics in E-commerce: a systematic review and agenda for future research." *Electronic Markets* 26 (2016): 173-194. <https://doi.org/10.1007/s12525-016-0219-0>
- [35] Kawa, Arkadiusz, and Justyna Światowiec-Szczepańska. "Logistics as a value in e-commerce and its influence on satisfaction in industries: a multilevel analysis." *Journal of Business & Industrial Marketing* 36, no. 13 (2021): 220-235. <https://doi.org/10.1108/JBIM-09-2020-0429>
- [36] Muljono, Wiryanta, and Sri Setiyawati. "Exploring the effects of service quality, shipping cost, brand and attitude on consumer's intention to choose express courier services in e-commerce." *Journal of Marketing and Consumer Behaviour in Emerging Markets* 1, no. 9 (2019). <https://doi.org/10.7172/2449-6634.jmcbem.2019.1.4>

- [37] Pandey, Rudresh, Varsha Ganatra, Harsh Sonawane, Fahada Nur Binti Mohd Fauzi, Daisy Mui Hung Kee, Nur Hafizah Binti Mohd Yasir, Nur Fatini Farisya Binti Suhairi, and Nur Afeza Azila Binti Md Zamri. "The impact of global trend on courier service and consumer satisfaction: A study of DHL." *International journal of Tourism and hospitality in Asia Pasific (IJTHAP)* 4, no. 1 (2021): 64-72. <https://doi.org/10.32535/ijthap.v4i1.1022>
- [38] Marcysiak, Adam. "Customer service quality management on the courier services market." *Entrepreneurship and Sustainability Issues* 9, no. 1 (2021): 190. [https://doi.org/10.9770/jesi.2021.9.1\(11\)](https://doi.org/10.9770/jesi.2021.9.1(11))
- [39] Tsai, Cheng-An, and Che-Wei Chang. "Development of a partial shipping fees pricing model to influence consumers' purchase intention under the COVID-19 pandemic." *Energies* 15, no. 5 (2022): 1846. <https://doi.org/10.3390/en15051846>
- [40] Ouyang, Zhiyuan, Eric KH Leung, and George Q. Huang. "Community logistics and dynamic community partitioning: A new approach for solving e-commerce last mile delivery." *European Journal of Operational Research* 307, no. 1 (2023): 140-156. <https://doi.org/10.1016/j.ejor.2022.08.029>
- [41] Jintana, J., A. Sopadang, and S. Ramingwong. "Idea selection of new service for courier business: The opportunity of data analytics." *International Journal of Engineering Business Management* 13 (2021): 18479790211042191. <https://doi.org/10.1177/18479790211042191>
- [42] Rajendran, Suchithra. "Improving the performance of global courier & delivery services industry by analyzing the voice of customers and employees using text analytics." *International Journal of Logistics Research and Applications* 24, no. 5 (2021): 473-493. <https://doi.org/10.1080/13675567.2020.1769042>
- [43] Yuan, Yuehua, and Pengliang Qiao. "A research review on E-commerce Logistics delay." In *2018 International Conference on Management, Economics, Education and Social Sciences (MEESS 2018)*, pp. 272-275. Atlantis Press, 2018. <https://doi.org/10.2991/meess-18.2018.51>
- [44] Pfohl, Hans-Christian, Pascal Wolff, and Johannes Kern. "Transshipment hub automation in China's courier/express/parcel sector." In *Urban Freight Transportation Systems*, pp. 163-180. Elsevier, 2020. <https://doi.org/10.1016/B978-0-12-817362-6.00009-4>
- [45] Gulc, Aleksandra. "Multi-stakeholder perspective of courier service quality in B2C e-commerce." *PloS one* 16, no. 5 (2021): e0251728. <https://doi.org/10.1371/journal.pone.0251728>
- [46] Jain, Nikunj Kumar, Hasmukh Gajjar, and Bhavin J. Shah. "Electronic logistics service quality and repurchase intention in e-tailing: Catalytic role of shopping satisfaction, payment options, gender and returning experience." *Journal of Retailing and Consumer Services* 59 (2021): 102360. <https://doi.org/10.1016/j.jretconser.2020.102360>
- [47] NST Business. "GDEX to focus on boosting digital, technology capabilities." (2022).