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An Evaluation of Online Food Delivery Application: Fuzzy Analytical Hierarchy Process

Nur Solihah Khadhiah Abdullah
College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu, 21080 Kuala Terengganu, Terengganu, Malaysia.
nsolihah@uitm.edu.my

Nurul Izzati Mohd Asri
College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu, 21080 Kuala Terengganu, Terengganu, Malaysia.
izzatiasri.1607@gmail.com

Ruhana Jaafar
College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu, 21080 Kuala Terengganu, Terengganu, Malaysia.
ruhana75@uitm.edu.my

Nor Aini Hassanuddin
College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu, 21080 Kuala Terengganu, Terengganu, Malaysia.
norai548@uitm.edu.my

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ABSTRACT

Food delivery is one of the businesses reporting growth rates after the COVID-19 pandemic. Due to social isolation and extensive lockdowns worldwide, individuals who once dined out now choose online food delivery. To keep up with the ever-changing market dynamics, the service provider must be aware of various measurements and aspects related to sustainable growth. Therefore, this study aims to determine the criteria for evaluating online food delivery applications, calculate the weight for criteria, and rank the online food delivery applications according to the most preferred by the customers. This study uses a multi-criteria decision-making (MCDM)-based framework which is the Fuzzy Analytic Hierarchy Process (FAHP). The FAHP is used to produce weights for criteria by applying fuzzy set theory to the linguistic evaluation statements of experts and ranking the online food delivery applications according to the customer's preference. The findings indicate that Foodpanda is the most preferred food delivery application, followed by GrabFood and McDelivery. The most crucial main criterion is economics, with delivery cost as the priority sub-criteria. The second most important criterion is technology, the third is service quality, and the last is social and environmental. This study is useful for the service provider in improving the criteria that will most affect the customer, as well as for the customer to wisely choose the e-service application that meets their demand.

Corresponding Author:
Nur Solihah Khadhiah Abdullah
College of Computing, Informatics and Mathematics, Univesiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu, 21080 Kuala Terengganu, Terengganu, Malaysia.
Email: nsolihah@uitm.edu.my

1. Introduction

The food industry delivery is one of the few that has seen growth rates since the COVID-19 Pandemic [1]. This growth can be recognized by the increasing use of online food delivery applications (OFDA), which has been stimulated by many countries regulating dining services. Online food delivery (OFD) has become a preferred option for individuals who previously dined out [2]. In

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Malaysia, as customers chose to use OFD services, online sales increased by 90% between February and March [3]. Other than the pandemic, the emergence of food delivery has been driven by several factors including changes in lifestyle, the rise of digital technologies, the growth of the middle class, increased competition, and a few others. The business operation landscape highly depends on online transactions, and internet usage has increased rapidly.

The traditional restaurant and catering industry, which was projected to reach US$ 899 billion in 2020 in the US, is estimated to have lost around US$ 240 billion by the end of 2020 [2]. This decline has led to increasing trends towards e-commerce, causing the online food delivery market to boom by up to 140% [4]. OFD services are experiencing accelerated growth and have become a new normal for a larger demographic [5]. The first multiple types of restaurant intermediary in Malaysia were Food Panda [6].

Ensuring customer satisfaction is an essential element in distinguishing the OFD services company from its competitors, paying attention to the criteria or factors that contribute to the selection of OFDAs by customers is incredibly significant to the OFDA provider. Customer decisions are influenced by many criteria, and these criteria need to be further analyzed, especially using the Multi-Criteria Decision Making (MCDM) approach to suggest which criteria are more important than others and which OFDA provides the best service. Therefore, this research was initiated in response to the criteria that influenced customer decisions, aiming to suggest the best OFDA that will benefit them the most using one of the MCDM methods, namely the Fuzzy Analytical Hierarchy Process (FAHP).

Despite the extensive growth in the OFD sector, there remains a lack of research focused on the multi-dimensional criteria influencing customer preferences and satisfaction. The rapid expansion of OFD services has led to a highly competitive environment where understanding and prioritizing customer needs is paramount for service providers. Existing studies have largely neglected the use of MCDM approaches to discern customer priorities in the selection of OFD applications. This research aims to fill this gap by applying the Fuzzy Analytical Hierarchy Process (FAHP) to evaluate and prioritize the criteria affecting customer decisions in OFD services. The study's contribution lies in providing OFD providers with strategic insights derived from an MCDM perspective, thereby enabling them to tailor their services to the nuanced preferences of their customer base, which could lead to enhanced customer loyalty and an augmented market share.

2. Literature Review

In recent years, evaluating OFDAs has become increasingly important, leading researchers to explore various methods to evaluate their quality and performance. [7] focuses on evaluating prominent OFD companies in Vietnam using FAHP and Weighted Aggregated Sum Product Assessment (WASPAS). Factors like social and environmental impacts, financial aspects, service quality, and technology were included in their study. Their findings reveal that payment convenience and delivery speed were grouped as crucial factors.

In India, [4] conducted research on this domain by focusing on several characteristics, including financial standards, customer satisfaction, social and environmental impact, network strategy, tracking systems, and order satisfaction. FAHP and Fuzzy Technique for Order of Preference by Similarity Ideal Solutions (Fuzzy TOPSIS) were employed in this study.

While, in Bangladesh, [8] the researchers studied the factors influencing OFD services, dividing into direct factors (delivery time, service quality, price, and food conditions) and indirect factors (variety and delivery tracking). Additionally, a study on customer acceptance of online delivery platform was conducted in Brunei [9]. This study aimed to explore public responses towards digital platforms for delivering daily needs, especially food. The findings revealed that product quality is the critical factor chosen by respondents. Conversely, service quality, online habits and trust did not influence customer acceptance.

In Malaysia [10] investigated the factors influencing customers' intention to use OFDA via smartphone. The findings revealed that social influence, information quality, price-saving orientation, and time-saving orientation have a positive relationship and significant effect on attitude towards OFD services. Similarly, a quantitative study [11] in Malaysia accessed customer satisfaction with OFD services. The findings indicated that the service offered by Food Panda and Grab Food garnered the highest satisfaction among most respondents. This was attributed to the user-friendly system use and timely delivery.

Other researchers have also reported that gender plays a role in influencing loyalty towards purchasing local food through OFD services. In their study, [12] focuses on five measurement construct, with four grouped into significant factors: health, food quality, service quality and price value. Regarding the moderating effects of gender, females primarily emphasized service quality as the main contribution factors, while males tended to prioritize price value. This finding is consistent with [13], which observed similar pattern in fine dining, where female customers are more influenced by service quality compared to male customers.

The expansion of social media platforms has also led to the growth of OFD services in Malaysia. Customers use their social media accounts to review and express their opinions about any services that satisfy them the most. To address this trend, [14] designed a web application system that embeds the Twitter platform to categorize Twitter Sentiment Analysis (SA) on Malaysia's best OFD. Focuses on five SA (affordable price, promotion and discount, review rating, delivery time, and condition of food delivered), this research utilizes data extracted from 1st January 2022 to 31st December 2022. The findings from this research will help customers save time and effort in understanding the OFD services offered in Malaysia.

The use of quantitative studies to research on OFD services has received significant attention from researchers in Malaysia. However, limited studies utilize MCDM in their research. Given the existence of numerous criteria and factors that influence customer choices in OFDA, the implementation of MCDM deserves attention. Therefore, this study aims to apply the FAHP method to OFD services, which covers four main criteria and eleven sub-criteria. The weight for each criterion will be evaluated, and the ranking order will be proposed. Additionally, the best OFDA will be suggested.

3. Methodology

3.1 The identification of criteria, sub-criteria, and OFD applications

As the objectives are to evaluate the OFD applications, it is crucial to carefully select the criteria. Based on the literature, four criteria were chosen, along with eleven sub-criteria. Three OFD applications selected are Foodpanda, GrabFood, and McDelivery. The description of criteria is described in Table 1, while Figure 1 illustrates the hierarchical diagram for evaluating OFD applications.

Table 1. Criteria and Sub-criteria of OFD Applications

Criteria		**Sub-criteria**		**Description**
Economic	C1	Delivery cost	C11	Transportation cost, labor cost, administrative cost
		Discounts & offers	C12	Initiative given to the customers
Service Quality	C2	Order fulfillment	C21	Time savings of order processing, order pick-up time, cleanliness of packaged food
		Delivery speed	C22	Timeliness of order arrival
		Convenience of payment	C23	Diversity of payment methods
		Customers feedback	C24	Online reviews, online rating, customer behavioral intention
Technology	C3	Application design	C31	Update-to-date platform, page visual effects, user-friendly
		Real-time tracking system	C32	Online tracking, smart technology for tracking and tracing
		Marketing techniques	C33	Digital marketing, digital technologies for product advertising efforts
Social and Environmental	C4	Health and safety	C41	Food hygiene, contactless delivery, health, and safety guidelines
		Information security	C42	Customer's data protection, security of online payment

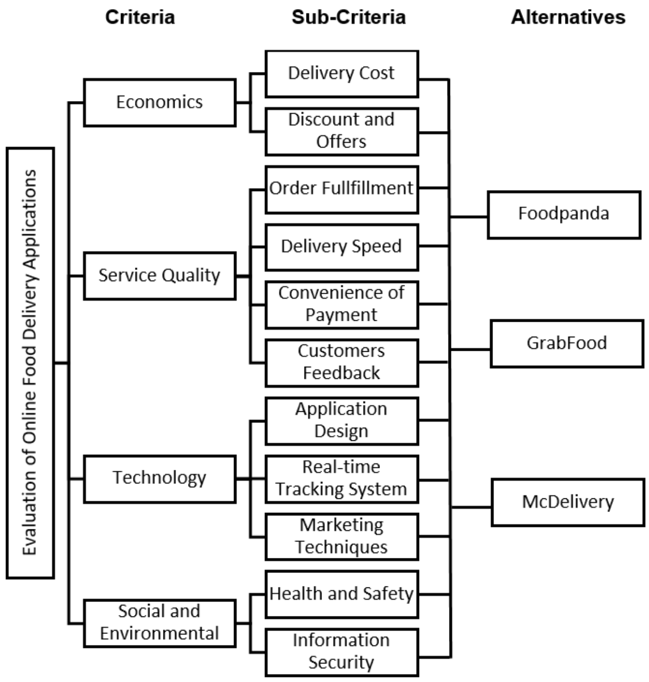

Figure 1. Hierarchical Diagram of OFD Applications

3.2 The collection of data

Experts' opinions were utilized as the sources of data. Three experts were interviewed to gather their views on the criteria and sub-criteria that impact the OFD applications. Based on the literature [15], a sample size of 2-100 experts is commonly used in AHP. Additionally, a questionnaire was prepared and administered via Google Forms to the experts beforehand to ensure the smoothness of the interview sessions. The questionnaires comprise several criteria and sub-criteria to access OFD applications as described in Table 1. The experts used linguistic scale terms and the corresponding scale outlined in Table 2 as reported in [4].

Table 2. The Linguistic Scales and the Corresponding Triangular Fuzzy Number

Scale	Definition	Triangular Fuzzy Number
1	Equally important	(1,1,1)
2	Weakly important	(1,2,3)
3	Not bad	(2,3,4)
4	Preferable	(3,4,5)
5	Important	(4,5,6)
6	Fairly important	(5,6,7)
7	Very important	(6,7,8)
8	Absolute important	(7,8,9)
9	Perfect	(8,9,10)

3.3 The implementation of FAHP

There are six essential steps involved in FAHP as described in the literature [4], [7]. These steps include (1) constructing the pair-wise comparison matrix, (2) developing an aggregated fuzzy comparison matrix, (3) calculating fuzzy geometric mean, (4) calculating fuzzy weight, and (5) de-fuzzifying and normalizing the fuzzy weights, and (6) ranking the alternatives. Further details are presented below.

Step 1: Construct the pairwise comparison matrix.

Constructing a judgment matrix is an indispensable part of hierarchical analysis, as it aids in determining the consistency of experts' logic. The final weights derived from the matrix may lack scientific validity if it is not rational. Construct a matrix for pairwise comparison using acquired data. If there are *n* number of decision criteria or decision alternatives, then formulating pairwise comparisons for decision alternatives or criteria requires (0.5) n (n-1) [16].

If there are *a* decision criteria and *b* decision alternatives, then *(a × a)* matrix is needed for comparing decision criteria, and *(b × b)* matrix for comparing decision alternatives concerning the *a* decision criteria. The construction of the comparison matrix is outlined below, where C_{ij} represents the degree of preference of element *i* to the *j.*

$$A = \begin{bmatrix} c_{11} & c_{12} & \cdots & \cdots & c_{1a} \\ 1/c_{12} & c_{22} & & & c_{2a} \\ \vdots & & \ddots & & \vdots \\ \vdots & & & \ddots & \vdots \\ 1/c_{1a} & 1/c_{2a} & \cdots & \cdots & c_{aa} \end{bmatrix} \quad (1)$$

Step 2: Develop an aggregated fuzzy comparison matrix (AFCM).

A distinct fuzzy comparison matrix (FCM) is created for each hierarchy level using expert judgments. The FCM captures the expert's pairwise comparisons in fuzzy form, with elements consisting of fuzzy numbers indicating the degree of preference or importance. The subsequent step is to merge the individual FCMs into a unified AFCM, achieved by combining judgments from various experts or decision-makers. Several aggregation methods such as arithmetic mean, geometric mean, or the ordered weighted averaging operator (OWA) can be utilized. The objective is to reach a consensus on AFCM that reflects the opinions of all experts. The arithmetic mean formula is shown below:

$$(a_{ij}, b_{ij}, c_{ij}) = \frac{1}{n}\sum_{i=1}^{n}(a_{ij}, b_{ij}, c_{ij}) = \frac{(a_{ij} + b_{ij} + c_{ij})}{n} \quad (2)$$

where (a_{ij}, b_{ij}, c_{ij}) is the fuzzy number of criteria in the comparison matrix, and n is the number of decision-makers.

Step 3: Calculate the fuzzy geometric mean.

To apply the fuzzy geometrical mean technique and calculate the fuzzy geometrical mean of each criterion, the following equations were applied.

$$\tilde{r}_i = \left(\prod_{j=1}^{n} \tilde{l}_{ij}\right)^{\frac{1}{n}},\ i = 1, 2, \ldots n \quad (3)$$

$$\tilde{r}_i = (a_{i1} \otimes \ldots \otimes a_{ij} \otimes \ldots \otimes a_{in})^{\frac{1}{n}} \quad (4)$$

where a_{ij} represents the fuzzy comparison value of dimension i to criterion j, n is the total number of criteria, and $\tilde{r}_i$ is the geometric mean of each criterion's fuzzy comparison value.

Step 4: Calculate the fuzzy weights.

To find the fuzzy weight, the values of the total vector of each geometric mean need to be found first. Then, the (-1) power of the summation is calculated, and the fuzzy triangular numbers are replaced to ensure they are in increasing order. Subsequently, the fuzzy weight can be determined using the equation below.

$$\widetilde{w}_i = \tilde{r}_i \otimes (\tilde{r}_1 \oplus \ldots \oplus \tilde{r}_i \oplus \ldots \oplus \tilde{r}_n)^{-1} \quad (5)$$

where $\widetilde{w}_i$ is the ambiguous importance of the i-th criterion, which is represented by a triangular fuzzy number, $\widetilde{w}_i = (lw_i, mw_i, uw_i)$.

Step 5: De-fuzzify and normalize the fuzzy weights.

This study utilizes the centre of area defuzzification to de-fuzzify the fuzzy weight, $\widetilde{w}_i$, as there are in the form of fuzzy triangular numbers, employing Equation (6). Subsequently, normalization is carried out using Equation (7).a

$$M_i = \frac{lw_i + mw_i + uw_i}{3} \quad (6)$$

$$N_i = \frac{M_i}{\sum_{i=1}^{n} M_i} \quad (7)$$

Step 6: Ranking the alternatives.

The ranking is determined by multiplying the weight of each criterion by the weight of each alternative to the criterion.

4. Results and Discussion

The initial steps in the implementation of FAHP generated the following pairwise comparison matrix for each criterion. The focus is on four main criteria (C1, C2, C3, and C4) and involves three decision-makers (DM1, DM2 and DM3). Further, the data in Table 3 were associated with corresponding fuzzy number, to produce a fuzzy pairwise comparison matrix as presented in Table 4.

Table 3. Pairwise Comparison Matrix of main criteria

Decision Maker 1					**Decision Maker 2**					**Decision Maker 3**				
	C1	**C2**	**C3**	**C4**		**C1**	**C2**	**C3**	**C4**		**C1**	**C2**	**C3**	**C4**
C1	1	5	5	5	**C1**	1	1	1	3	**C1**	1	7	7	7
C2	1/5	1	1	3	**C2**	1	1	1	4	**C2**	1/7	1	1	4
C3	1/5	1	1	3	**C3**	1	1	1	8	**C3**	1/7	1	1	1
C4	1/5	1/3	1/3	1	**C4**	1/3	1/4	1/8	1	**C4**	1/7	1/4	1	1

Table 4. Fuzzy Pairwise Comparison matrix of main criteria

DM	1			
Criteria	**C1**	**C2**	**C3**	**C4**
C1	(1.0000, 1.0000, 1.0000)	(4.000, 5.0000, 6.000)	(4.0000, 5.0000, 6.0000)	(4.0000, 5.0000, 6.0000)
C2	(0.1667, 0.2000, 0.2500)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(2.0000, 3.0000, 4.0000)
C3	(0.1667, 0.2000, 0.2500)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(2.0000, 3.0000, 4.0000)
C4	(0.1667, 0.2000, 0.2500)	(0.2500, 0.3333, 0.5000)	(0.2500, 0.3333, 0.5000)	(1.0000, 1.0000, 1.0000)
DM	**2**			
Criteria	**C1**	**C2**	**C3**	**C4**
C1	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(2.0000, 3.0000, 4.0000)
C2	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(3.0000, 4.0000, 5.0000)
C3	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(7.0000, 8.0000, 9.0000)
C4	(0.2500, 0.3333, 0.5000)	(0.2000, 0.2500, 0.3333)	(0.1111, 0.1250, 0.1429)	(1.0000, 1.0000, 1.0000)
DM	**3**			
Criteria	**C1**	**C2**	**C3**	**C4**
C1	(1.0000, 1.0000, 1.0000)	(6.0000, 7.0000, 8.0000)	(6.0000, 7.0000, 8.0000)	(6.0000, 7.0000, 8.0000)
C2	(0.1250, 0.1429, 0.1667)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(3.0000, 4.0000, 5.0000)
C3	(0.1250, 0.1429, 0.1667)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)
C4	(0.1250, 0.1429, 0.1667)	(0.2000, 0.2500, 0.3333)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)

Using Equation (2), the aggregated Fuzzy Comparison Matrix is computed. The calculations below demonstrate the steps of determining the aggregated fuzzy number of C1 with respect to (w.r.t) C2 for the three experts.

$$\frac{(0.1667 + 1.0000 + 0.1250)}{3} = 0.4306$$
$$\frac{(0.2000 + 1.0000 + 0.1429)}{3} = 0.4476$$
$$\frac{(0.2500 + 1.0000 + 0.1667)}{3} = 0.4722$$

Therefore, the aggregated fuzzy number for C1 w.r.t C2 is (0.4306, 0.4476, 0.4722). Similar calculations were repeated to obtain the aggregated fuzzy number for all other criteria. The value is summarized in Table 5 below.

Table 5. Aggregated Fuzzy Comparison Matrix for the main criteria

Criteria	C1	C2	C3	C4
C1	(1.0000, 1.0000, 1.0000)	(3.6667, 4.3333, 5.0000)	(3.6667, 4.3333, 5.0000)	(4.0000, 5.0000, 6.0000)
C2	(0.4306, 0.4476, 0.4722)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(2.6667, 3.6667, 4.6667)
C3	(0.4306, 0.4476, 0.4722)	(1.0000, 1.0000, 1.0000)	(1.0000, 1.0000, 1.0000)	(3.3333, 4.0000, 4.6667)

C4	(0.1806, 0.2254, 0.3056)	(0.2167, 0.2778, 0.3889)	(0.4537, 0.4861, 0.5476)	(1.0000, 1.0000, 1.0000)

Continuing with steps (3)-(5) as elaborated in Section 3, the criterion with the highest score is proposed as the most essential criterion. Table 6 shows the result of the fuzzy geometric mean, while Table 7 presents the relative fuzzy weight value for all main criteria.

Table 6. Fuzzy Geometric Mean Comparison Values

Criteria	**Geometric Mean, *ri***		
C1	2.70801	3.11282	3.49964
C2	1.03514	1.13187	1.2184
C3	1.09453	1.15676	1.2184
C4	0.365	0.41768	0.50507
TOTAL	5.2027	5.8191	6.4415
P (-1)	0.1922	0.1718	0.1552
INCR	0.1552	0.1718	0.1922

Table 7. Fuzzy Weights of the Main Criteria

	Fuzzy weight, *Wi*		
C1	0.42028	0.53478	0.67263
C2	0.16065	0.19445	0.23418
C3	0.16987	0.19873	0.23418
C4	0.05665	0.07176	0.09707

Finally, the normalized weight for all criteria was computed. The values of de-fuzzified and normalized fuzzy weight are presented in Table 8. The same steps were repeated to the sub-criteria, and the results are shown in Table 9.

Table 8. Normalized Weights of Criteria

Criteria	**Defuzzification, *Mi***	**Normalized, *Ni***
C1: Economic	0.54257	0.53451
C2: Service Quality	0.19643	0.19351
C3: Technology	0.20093	0.19794
C4: Social and Environmental	0.07516	0.07404
Total	1.01508	1.00000

Table 9. Normalized Weights of Sub-criteria

Criteria	**Sub-Criteria**	**Normalized Weight**
C1: Economic	C11: Delivery Cost	0.86188
	C12: Discounts & offers	0.13812
C2: Service Quality	C21: Order Fulfillment	0.49467
	C22: Delivery Speed	0.25559
	C23: Convenience of payment	0.15754
	C24: Customers Feedback	0.10965
C3: Technology	C31: Application Design	0.56759
	C32: Real-Time Tracking Systems	0.28697
	C33: Marketing Techniques	0.14545
C4: Social and Environmental	C41: Health & Safety	0.85112
	C42: Information Security	0.14888

This normalized weight for the main criteria is further multiplied by the weight of alternatives produce the ranking order for each alternative as presented in Table 10. The weight for alternatives is calculated in the same way as the weight for criteria.

Table 10. The Ranking of Alternatives

Criteria	Foodpanda (A1)	GrabFood (A2)	McDelivery (A3)
Economic (C1)	0.26334	0.17190	0.09927
Service Quality (C2)	0.11398	0.05674	0.02280
Technology (C3)	0.11223	0.06130	0.02441
Social and Environmental (C4)	0.03478	0.02595	0.01331
Total	0.52432	0.31589	0.15979
Ranking	1	2	3

According to findings in Table 8, economics criteria have the highest relative normalized weight, indicating that it is an essential criterion for selecting OFD companies. The weight value of this factor is 0.53451, higher than the weight value of the other criteria. This discovery is consistent with the findings in [17]. Technology is the second most crucial factor, with a weight of 0.19794, followed by service quality and social and environmental factors. These results align with [4], indicating that the use of technology is the second most important aspect. The use of technology is a significant predictor of when managers should replenish stocks in the e-commerce business. Thus, it is crucial to include it in the development of an inventory strategy.

Regarding the sub-criteria, the delivery cost carries the highest weight value in the economic criteria, as well as the highest weight value overall among the sub-criteria. The delivery cost sub-criteria carries the weight of 0.86188, while the discount and offers scored 0.13812. Based on the result, it is evident that the community covered tends to be more influenced by the delivery cost, compared to discount and offered might be because of the current roles played by the service provider that promote “free delivery” which attracts more customers. While, for the service quality criteria, the top priority sub-criteria is order fulfillment (0.49467), followed by delivery speed (0.25559), convenience of payment (0.15754), and with less priority, customer feedback with a score of 0.10965.

For the technology criteria, experts agree that application design has more influence on customer satisfaction compared to real-time tracking and marketing techniques. According to [7], online food sellers must strive to make their platforms easy to use, navigate, reliable, and secure. This is why the application design becomes the top priority sub-criteria for the technology criteria. Additionally, health and safety (0.851112) are more important compared to information security (0.14888) in the social and environmental criteria. OFD services must ensure information security to protect confidential data, while health and safety demands are still at the top priority of sub-criteria might due to the contribution to the work balance and quality of life. To guarantee the assured OFD experience for consumers, it is important to address both health and safety and information security comprehensively.

The chosen criteria in OFDA and their respective weight value were discussed. The final aim of this study is to propose the best OFDA to customers that will be significant enough in every aspect of the criteria. The findings show that A1 was ranked first with a weight of 0.52433, A2 was ranked second with 0.31589, followed by A3 (0.15979). Therefore, A1 and A2 turned out to be the most widely accepted delivery application in Kuala Terengganu, consistent with [11].

5. Conclusion

The criteria influencing the evaluation of online food delivery applications have been thoroughly explored and evaluated in this study. The implementation of the Fuzzy Analytical Hierarchy Process (FAHP) has successfully revealed the significant criteria to OFDAs, calculating the weight for each criterion, and finally suggesting which application will benefit the customer most. The research findings provide valuable insights to regular customers and service providers. Knowing which criteria will influence the customer the most will provide a good opportunity for service providers to improve. Additionally, it is believed that the results will benefit the delivery riders in choosing the company that will provide the highest return on salary.

Future research can build on these findings by exploring additional criteria and alternatives that contribute to OFD services. Overall, this study emphasizes the importance of analyzing and selecting the best OFDA, thus contributing to customer satisfaction, and maximizing the profit of both riders and service providers.

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Conflict of Interest

The authors declare no conflict of interest in the subject matter or materials discussed in this manuscript.

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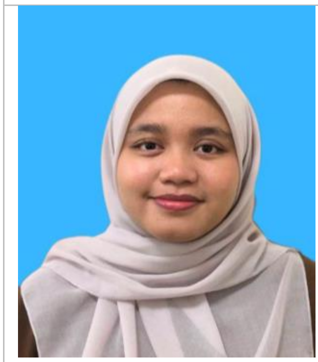
Biography of all authors

Picture	**Biography**	**Authorship contribution**
	Ms. Nur Solihah Khadhiah Abdullah obtained her first degree in Bachelor of Science (Computational Mathematics) (Hons) from Universiti Malaysia Terengganu in 2008. She received a master's degree from Universiti Malaysia Terengganu in Mathematical Sciences (Fuzzy Mathematics). Currently, she is a lecturer at Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu. Her research interest is related to Fuzzy Multi-Criteria Decision Making. She can be contacted at email: nsolihah@uitm.edu.my.	Introduction, literature review, methodology, discussion, and final checking of the article
	Ms. Nurul Izzati Mohd Asri is a graduate Student of BSC. (Hons). Mathematical Modelling and Analytics at Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu. Currently employed under MyStep programme at the Department of Statistics Malaysia. She can be contacted at email: izzatiasri.1607@gmail.com.	Introduction, literature review, data collection, methodology, and analysis
	Mrs. Ruhana Jaafar obtained her first degree in Bachelor Science (Hons) in Education from Universiti Sains Malaysia in 1999. She has received a master's degree from Universiti Malaysia Terengganu in Mathematical Sciences (Optimization). Currently, she is a lecturer at Universiti Teknologi MARA Cawangan Terengganu Kampus Kuala Terengganu. Her research interests are Optimization, Applied Mathematics, and Mathematical Modelling. She can be contacted at email: ruhana75@uitm.edu.my	Interpretation and final checking of the article

	Mrs. Nor Aini Hassanuddin obtained her first degree in Bachelor of Statistics (Hons) from Universiti Teknologi MARA in 2003. She received a master's degree from Universiti Sains Malaysia in Statistics. Currently she is a lecturer at Universiti Teknologi MARA Cawangan Terengganu Kampus Dungun. Her research interests are related to Statistical Modelling, Applied Statistics, Social Science, and Education. She can be contacted at email: norai548@uitm.edu.my	Interpretation and final checking of the article