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Hybrid Optimization for Distribution Channel Management: A Case of Retail Location Selection

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Abstract

Purpose: This study aims to introduce a hybrid MCDM model to support the selection of retail store location**. Research design, data, and methodology:** The hybrid approach of ANP and TOPSIS was used to address the location selection problem. The ANP technique was employed to compute the weights of the selection criteria, whilst the TOPSIS was used to rank alternatives. The proposed approach was then applied into a fashion company in Vietnam to select the best alternatives to be the retail store. **Results:** The results showed that Candidate 1 – Hai Ba Trung street is the most appropriate selection for locating retail stores. **Conclusions:** The proposed approach provides the decision makers with more useful methods than traditional ones. Therefore, the model can be applied to the location selection in all industries. In terms of academic contribution, the selection criteria proposed in the research can devote to the literature in the selection of location along with the concept of distribution channels. Additionally, the research also provides insight and guidelines for firms in making decision on retail store location based on limited resources to avoid the waste of funds. However, the results only answer to the context of Vietnam - a developing country. Thus, future research may be extended to developed countries where have better conditions.

Keywords: ANP, Distribution, Distribution Channel, Location, Retail Store, TOPSIS

JEL Classification Code: C44, L67, M11, M31

1. Introduction

The speedily growing markets and the complication of distribution have increased the demand for distribution channels, which have a crucial role in shortening the gap between production point and consumption point. Distribution channel management, therefore, has long been a critical task of firms to improve their operation efficiency and profitability. One of the intermediaries that compromise the distribution channel is retailers. Retailing has been a dynamic sector with high growth rate. Despite the recent popularity of online retail stores, the physically traditional ones are still preferred because here are the places for people to come, shop, and relax.

There are lots of determinants of a successful retail store. Amongst them, the retail location performs a pivotal role as it provides uniquely competitive advantage to retailers (Karande & Lombard, 2005). Therefore, choosing an appropriate retail location is a dominant strategic decision which has a great impact on the overall success and sustainable profitability of the firm (Erbıyık, Özcan, & Karaboğa, 2012; Tolga, Tuysuz, & Kahraman, 2013). A

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wrong decision in retail store location may not be overcome easily as it is a long-term and substantial investment (Erbıyık et al., 2012). Given the significance of this issue, the selection decision of retail location has long become the major concern of practitioners and researchers. Four theories have been developed for the selection of retail location named central place theory, spatial interaction theory, land value theory, and the principle minimum differentiation (Christaller, 1933; Reilly, 1931; Brown, 1993; Clarkson, Clarke-Hill, & Robinson, 1996; Yıldız, & Tüysüz, 2019; Baviera-Puig, Buitrago-Vera, & Escriba-Perez, 2016; Suárez-Vega, Gutiérrez-Acuna, & Rodríguez-Díaz, 2015; Reigadinha, Godinho, & Dias, 2017). Under the central place theory, the supply point and transportation cost are the two most crucial factors decrease their demand for goods or services. Accordingly, consumers prefer the nearest retail store. On the contrary, the spatial interaction theory argues that consumers focus much on the allurement of the shopping places than their distances. With the principle minimum differentiation, it is of importance that the retail store should be located near their rivals because a cluster of retailers in the same industry will show their outstanding performances. Besides, it is also easier for consumers to compare prices in this case. The last mentioned theory is the land value one. This theory indicates that retailers have a tendency to pay higher rents to have high profile customers as high rent is a reliable indicator of good performance and competitiveness. Through these theories, it can be said that the selection decision of retail location is a complex process as it involves too many quantitative and qualitative criteria. Especially, in the age of technology 4.0, decision-making needs to be made robust and efficient to keep pace with the rapid growing pace and uncertainty of retailing sector. Thus, to solve the location selection problem easily and quickly, a variety of methods and models have been proposed recently such as mathematical methods, multi-criteria decision making (MCDM) approaches, fuzzy logic, heuristic-meta-heuristic methods, and qualitative methods (Okatan, Peker, & Birdogan, 2019). However, as mentioned, the selection problems refer a wide range of quantitative and qualitative criteria, so a practical approach to this problem is the utilization of MCDM methods. There are numerous MCDM techniques to help decision-makers select the best location such as Order Preference Similarity to the Ideal Solution (TOPSIS), Analytical Hierarchy Process (AHP), Analytical Network Process (ANP), Weighted Aggregates Sum Product Assessment (WASPAS), Multicriteria Optimization and Compromise Solution (VIKOR), the preference ranking organization method for enrichment evaluation (PROMETHEE), ÉLimination et Choix Traduisant la Realité (ELECTRE), etc. However, to the knowledge of the authors, there is a dearth of research on proposing an all-inclusive retail location selection model with appropriate methods for the case of Vietnam – a developing country with rapid growth rate in the retail sector. Statistics show that, in the period 2010-2020, the number of supermarkets and trade centers increased rapidly from 567 supermarkets, 95 trade centers in 2010 to 1,163 supermarkets and 250 trade centers in 2020. Since integrating into the world economy, foreign direct investment and franchising activities in Vietnam have begun to appear and develop. According to the Ministry of Planning and Investment, in the first quarter of 2021, the total amount of newly registered FDI in the wholesale, retail and engine repair sectors is 22.1 million USD, from 42 projects and accounting for 0.3% of the total capital of the country. Investment projects in the retail sector mainly form a chain of supermarkets, convenience stores, and foreign retail businesses that operate quite effectively. For that reason, in this research, an attempt to propose an integrated MCDM model has been made to support the selection of retail location. The author proposed a model of ANP and TOPSIS methods to define the weights of selection criteria and select the most appropriate retail location, respectively. This approach was suggested because there is no evidence of combining ANP and TOPSIS methods in the field of retail location selection. The proposed model was then applied into an empirical case of selecting a retail location to demonstrate its effectiveness and feasibility.

The empirical case was conducted for a fashion company. The Covid-19 pandemic broke out in the world and especially seriously affected the fashion market. Noted, the pandemic has pushed a series of major fashion brands in the world to the brink of bankruptcy. However, it is estimated that fashion in Vietnam has a growth rate of more than 37% in 2020 compared to 2019. This is the second highest growth rate in terms of percentage, only after the food and health care industries. As a result, a wave of brands moving to new markets from the end of 2020 took place strongly, and Vietnam is a priority destination with effective pandemic prevention and control, along with the economy positive growth in the region. For these reasons, it can be said that studying the retail store location problem for a fashion company is practically and theoretically significant.

The rest of this research is organized as follows: Section 2 presents literature review on related works. Research design and methodology are proposed in Section 3. In Section 4, an empirical case applies the proposed model into the retail store location selection of an apparel company. Conclusion is then drawn in Section 5.

2. Literature Review

This section copes with the detailed literature review on two aspects: retail store location problems and MCDM methods, and retail store location selection criteria.

2.1. Retail Store Location Problems and MCDM Methods

Lots of methods and models have been introduced for the selection of retail location to catch up with the rapid growing rate of the retail sector. Many conventional MCDM approaches have been applied to solve the location selection problem. For example, Cheng, Li, and Yu (2005) applied ANP for shopping mall location selection, then compared the results with AHP method. The authors concluded that ANP is a useful method to solve the selection problem when there are interdependent relationships among selection criteria. Therefore, ANP has attracted numerous researchers and practitioners in making location selection decision. Tolga et al. (2013) proposed to use fuzzy ANP with fuzzy Real Options Valuation in the field of location selection science. Tuzkaya, Yilmazer, and Tuzkaya (2015) combined DEMATEL with ANP to determine the relationships of criteria and rank the alternative locations. Some years later, Okatan et al. (2019) also applied DEMATAL and ANP methods in solving the distribution center location selection problem. However, the authors only used DEMATAL and ANP to define the relationships among criteria and to derive the criteria weights. VIKOR was then utilized to rank the alternatives. Peker, Baki, Tanyas, and Ar (2016) proposed a methodology named ANP-BOCR (Benefits, Opportunities, Costs and Risk) to solve the location problem in Trabzon.

In addition to ANP method, AHP is also one of the most common MCDM methods because of its easy-to-use characteristics and exactness (Mulliner, Malys, & Maliene, 2016; Harwati & Utami, 2018; Yap, Ho, & Ting, 2018; Nguyen, 2021). Single AHP technique is utilized by many researchers such as Eryuruk, Kalaoglu, and Baskak (2011), Erbıyık et al. (2012), and Hartati and Islamiati (2019) to choose the most appropriate location for retail stores. In complex situations, researchers tend to integrate AHP with other MCDM methods to meet different purposes of the case. Durak, Yildiz, Akar, and Yemeniící (2017) and Yerlikaya, Tabak, and Yıldız (2019) combined AHP with VIKOR to define the weights and rank the alternatives, respectively. Mihajlović (2019) suggested to apply AHP with Weighted Aggregates Sum Product Assessment (WASPAS) to select the distribution center location. Goceri (2020) combined AHP with TOPSIS to select the best retail store in Turkey. AHP was used to derive the weights of selection criteria whilst TOPSIS was applied to rank the best alternative which was nearest to the ideal solution. Under fuzzy environment, Kuo, Chi, and Kao (1999) utilized AHP to support 7-SEVEN managers in locating a new convenience store. The research results depicted that fuzzy AHP is a very good method in accuracy and speed for the managers. Yıldız and Tüysüz (2019) combined fuzzy AHP with Grey Relational Analysis (GRA) to obtain the weights of criteria and rank the alternative location, respectively. Ghorui, Ghosh, Algehyne, Mondal, and Saha (2020) applied fuzzy AHP and fuzzy TOPSIS for shopping mall site selection. Singh, Tyagi, Kumar, and Agrawal (2020) proposed to combine fuzzy AHP with fuzzy TOPSIS and GRA to choose the most optimal convenience store location. Fuzzy AHP was used to weigh each criterion and a combination of fuzzy TOPSIS and GRA was conducted to rank the alternatives. Kieu, Nguyen, Nguyen, and Ho (2021) integrated fuzzy AHP with Combined Compromise Solution (CoCoSo) to select an appropriate location for the distribution center of perishable agricultural products in Vietnam. In addition, fuzzy AHP is also combined with other methods such as ELECTRE (Ka, 2011), PROMETHEE (Kabir & Sumi, 2014)

AHP aside, TOPSIS has also been another common MCDM method (Erkayman, Gundogar, Akkaya, & Ipek, 2011; Tuan & Hien, 2017; Quynh, Thu, Huong, Van, Van, & Van, 2020). Chang and Hsieh (2014) proposed to use TOPSIS method to solve the retail chain location selection problem. Under fuzzy environment, TOPSIS is also popularly used (Yong, 2006; Hu, Wu, & Cai, 2009; Awasthi, Chauhan, & Goyal, 2011; Mokhtarian & Hadi-Venchehb, 2012) or integrated with many other methods such as AHP (Li, Liu, & Chen, 2011; Ak & Derya, 2021), VIKOR (Yavuz & Deveci, 2014), and Geographic information systems (GIS) (Erdin & Akbaş, 2019) to handle the location problem.

Along with the above methods, many other techniques are able to be considered for the retail location selection as well. Zolfani, Aghdaie, Derakhti, Zavadskas, and Varzandeh (2013) proposed to use Stepwise Weight Assessment Ratio Analysis (SWARA) to calculate the importance of selection criteria and Weighted Aggregated Sum Product Assessment (WASPAS) method to evaluate potential locations for a shopping mall. Agrebi, Abed, and Omri (2017) applied ELECTRE I in selecting an appropriate location for a distribution center. In 2018, Chen, Wang, Baležentis, Zagurskaitė, Streimikiene, and Makutėnienė applied the Evaluation Based On Distance From Average Solution (EDAS) and the Weighted Aggregated Sum Product Assessment with Normalization method (WASPAS-N) towards the sustainable selection of a teahouse location. Ulutaş, Karakuş, and Topal (2020) proposed to apply fuzzy SWARA and Combined Compromise Solution (CoCoSo) for the location selection of Sivas province in Turkey. In 2021, Agrebi and Abed considered to utilize a fuzzy multi-attribute and multi-actor decision-making (FMAADM) to solve the location selection problems.

To conclude, there have been a variety of literatures on the proposition and application of MCDM techniques to the retail location selection. Out of them, AHP and TOPSIS are the most common ones for decision makers. There is no evidence of combining ANP and TOPSIS methods in the field of retail location selection. Thus, in this research, the

authors propose to use ANP and TOPSIS methods for the retail location selection. This research approach contributes to the literature of retail store location selection using the hybrid ANP and TOPSIS for a developing country.

2.2. Retail Store Location Selection Criteria

As mentioned, retailers are intermediaries that compromise the distribution channel. Managing retailers well may help firms improve their distribution system, from then increase their firms' operation. Among a series of factors affecting a successful retailer, the retail location plays an extremely significant role (Karande & Lombard, 2005). Thus, it is of much importance to define a strategic site for a retail store.

Identifying retail location selection criteria is one of the crucial steps in the location selection decision-making process (Tzeng & Huang, 2011). The conflicting interests of different stakeholders, and economic, cultural, psychographic, and social factors need to be considered (Singh et al., 2020; Kim, Chung, Jun, & Kim, 2013; Gonzlez-Benito & Gonzlez-Benito, 2005). Some of these factors were mentioned by Erbıyık et al. (2012) in their research that considered cost, competition conditions, traffic density, physical features, and retail site location as criteria for the location selection. In their language, cost will cover rental value, retail store furnishing cost, contracting time and condition. In terms of competition conditions, competition power, number of competitors, and distance to competitors need to be focused. In addition, to evaluate traffic density, vehicle traffic and passenger traffic are the two sub-factors that decision-makers need to pay attention to. With regard to physical features, store size, parking facilities, and visibility need to be considered. The last factor – retail site location – refers to the position of the location, whether it is on the main street, near business centers, settlement area, and social residence area or not. Furthermore, Chang and Hsieh (2014) proposed to consider the site features, store spaces, store cluster, crowd and rent costs as criteria to investigate the best store location. Chang, Hsieh, and Yang (2015) evaluated an optimal store site by basing on some measures such as stream of people, group of store, location characteristics, store space, and rent proportional to sales. Chen and Tsai (2016) also preferred store site criterion in their study on choosing a retail store location; however, they examined some more selection criteria such as availability of parking areas, store visibility, and population growth rate of the vicinity area. Chen, Wang, Baležentis, Zagurskaitė, Streimikiene, and Makutėnienė (2018), in their research on the selection of a teahouse location in the context of Lithuania, investigated 11 selection criteria named rent cost, property area, distance to scenery, public transportation, pedestrian flow, parking capacity, number of competitors, number of crimes in the surrounding area, distance to public facilities, outdoor advertisement, and distance to garbage containers. In another research of Harwati and Utami in 2018, the authors reused the criteria investigated by previous authors comprising distance, competition level, potential customers, and cost to locate a marketing store.

Many of the mentioned criteria were then replicated and improved by Yap et al. (2018). The new set of location selection criteria of these authors involve establishment, location, population density, and conveniences. According the study's explanation, establishment refers parking spaces, number of counters, access to entrace; location mentions visibility, traffic density, accessibility by public transporation; and conveniences covers availability of conveniences, average distance from conveniences. Basing on the literature review and Delphi method, Yıldız and Tüysüz (2019) provided an all-inclusive set of food retail store location selection criteria including numbers of competitors in the city, rent levels in the city, per capita GDP of the city, food retailing consumption amount in the city, number of enterprises in the city, age distribution of the population in the city, urbanization level of the population in the city, population density of the city, average saving account amount per person, and unemployment rate of the city. Another research in 2019 by Erdin and Akbaş also applied several criteria of previous researchers such as transportation, population density, economy, and regional development into their study about locating a shopping mall in Turkey. Nevertheless, they suggested two new criteria including tourism and cultural structure. Goceri (2020) determined a list of location selection criteria by carrying a survey of 224 participants involving price, advertising, cleanliness of market, quality of workers, customer support, market layout design, promotions, brand image and time spending during shopping for his selection of the best retail store in Turkey. Singh et al. (2020) explored eight criteria for the selection of an appropriate convenience store on the basis of their review of literature and indepth interview with experts. These criteria encompass population characteristics, economic criteria, competition, consumer accessibility, store size, total cost, site attractiveness and security. Last but not the least, Ghorui et al. (2020) presented a list of criteria affecting optimal location selecton including population density, transportation, regional growth, cost, building structure, provision of nearby parking, and environmental health. According to the authors, to assess the population density, population growth rate, socioeconomic state, and current population density need to be cared. In order to estimate the regional growth, administrative offices, business hub, school and college are of importance. For the cost, it must cover land cost and construction cost. The authors put their focus on external design, internal design,

and parking to evaluate the building structure. In terms of the provision of nearby parking and environmental health, capacity of parking space and parking rate per hour will be used to weigh the former, noise and air pollution will be applied for the assessment of the latter.

To conclude, a great many studies have addressed a variety of criteria for the selection of retail store location. Most applicable criteria take in the store size, demographics of the site, the site features, and rental costs of the site. Nonetheless, the determinants may be customized to fit well the features of each industry; for example, fashion sector where pop-up stores exemplify the need for short-term retail formats which are deemed as a strategic selection at both entry and expansion phases. For that reason, in the study of Alexander, Nobbs and Varley (2018), it is concluded that the location selection depends on the business approach of retailers. Fashion retailers may be opportunistic or strategic when choosing pop-up locations. In case of opportunistic approach, fashion retailers may not focus much on the space; and the location should be primary (commerical). However, with the proactive (strategic) feature, the space must fit the brand; the location may be secondary and near other retailers; and customers may be typical.

3. Research Design and Methodology

3.1. Research Design

As stated earlier, to develop a retail location selection model, MCDM approaches have to be considered. Therefore, in this research, a hybrid model of ANP and TOPSIS is proposed to use. ANP method is applied to define the weights of the location selection criteria whilst TOPSIS method is utilized to rank the alternative locations.

ANP is chosen because it is considered as the most appropriate method due to the existence of trade-offs among criteria and sub-criteria in decision making under the fashion industry (Nong & Ho, 2019). Further, ANP can solve the problem of interrelationships among criteria under the fashion retail industry. Additionally, it is also the best choice as it complies with the human way of thinking (Saaty, 2005). According to Zak (2005), the decision-making models should be effortless to understand, amiable to use and in line with the human thinking.

In terms of TOPSIS, it tackles multi-criteria decision-making problems starting from its power in determining priorities among alternatives, simplicity, and formation of both outside and inside, unemotional and emotional criteria, qualitative and quantitative criteria, which are all covered in the fashion retail industry (Nong & Ha, 2021).

The flowchart for the proposed methodology is illustrated in Figure 1. Steps in the methodology are presented in the subsections.

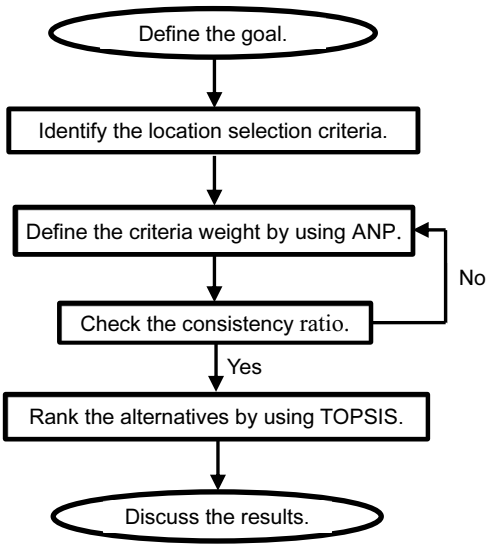


Figure 1: Research framework

3.2. Research Methodology

3.2.1. Methodology for the determination of location selection criteria

The authors use qualitative approach in which literature review and in-depth interview with experts were conducted to determine the criteria for location selection.

Sampling and data collection: purposeful sampling was applied in this research. Participants were selected based on an initial set of criteria on positions and experiences (Patton, 2002). They were responsible for the location selection and held managerial positions. The informants who were well-informed about location selection would make the obtained information valuable and reliable (Dorussen, Lenz, & Blavoukos, 2005). Further, participants must have at least three-year experience in location selection as it was noted that ten thousand hours of practice (about three years with eight hours of practice per day) in a field would make a person an expert (Ericsson, Krampe, & Tesch-Römer, 1993).

Interviews were conducted face-to-face through telephone because of the serious Covid-19 pandemic situation. Interviews were performed in Vietnamese and then translated into English and reviewed by two readers fluent in Vietnamese and English.

Data analysis: The interviews were split into words and phrases. The repeated words or phrases were grouped into themes which then were placed in a category code. To present the data, the interviews were searched for statements that could be appropriate for any of the categories. At the last phase of analysis, the authors searched for explanations, antonyms, and synonyms to make conclusions for the research.

3.2.2. Analytic Network Process – ANP

This method, proposed by Saaty in 1996, demonstrates the inner and outer dependence. In case the elements (sub-criteria) within a cluster (criterion) have mutual effects, the inner dependence exists. When a cluster with elements affects another cluster, there exists the outer dependence. ANP can tackle the interdependence among clusters by computing the compound weight via supermatrix.

The ANP is performed through a series of steps (Saaty, 2005):

Step 1: Decision makers perform paired comparisons on all elements within the clusters with the elements of other clusters (outer dependence) or in their own clusters (inner dependence) to form supermatrix (Figure 3) by utilizing a scale from 1 to 9 for denoting equal importance to extreme importance.

$$W = \begin{array}{c} \\ e_{11} \\ e_{12} \\ \vdots \\ e_{1n_1} \\ e_{21} \\ e_{22} \\ \vdots \\ e_{2n_2} \\ \vdots \\ e_{m1} \\ e_{m2} \\ \vdots \\ e_{mn_m} \end{array} \begin{array}{c} \begin{array}{cccccccc} C_1 & & & C_2 & & \cdots & C_m & \\ e_{11} & \cdots & e_{1n_1} & e_{21} & \cdots & e_{2n_2} & \cdots & e_{m1} \quad \cdots \quad e_{mn_m} \end{array} \\ \begin{bmatrix} W_{11} & W_{12} & \cdots & W_{1m} \\ & & & \\ W_{21} & W_{22} & \cdots & W_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ W_{m1} & W_{m2} & \cdots & W_{mm} \end{bmatrix} \end{array} \begin{array}{l} \\ C_1 \\ \\ \\ \\ \\ W = C_2 \\ \\ \vdots \\ \\ \\ C_m \\ \\ \end{array}$$

Figure 2: General form of supermatrix

Where, C_m stands for the m^{th} cluster, e_{mn} stands for the n^{th} element in the m^{th} cluster, and ***Wij*** is the main eigenvector of the impact of the elements compared in the j^{th} cluster to the i^{th} cluster. Additionally, if the j^{th} cluster has no impact on the ith cluster, then ***Wij*** = 0.

Step 2: Compute the impact (i.e., compute the main eigenvector) of the elements in each matrix.

Step 3: Make the supermatrix via the mentioned eigenvectors and structure.

Step 4: Obtain the weighted supermatrix by converting all column sums to unity.

Step 5: Obtain the global priority vectors by raising the weighted supermatrix to limiting powers following the below equation.

$$\lim_{\kappa \to \infty} w^k$$

If the supermatrix has cyclicity, the Cesaro sum will be applied to get the priority. The formula of Cesaro sum is as follows to compute the average impact of the limiting supermatrix where W_r stands for the r^{th} limiting supermatrix. Or else, the supermatrix will be raised to large powers to get the priority vectors

$$\lim_{k \to \infty} \left(\frac{1}{N}\right) \sum_{r=1}^{N} W_r^k$$

All above mathematical issues can be handled by Super Decision Software designed by Saaty in 2004, in which the methodology can be condensed into following steps:

(1) form the paired comparison matrices to compare among clusters.
(2) check the inconsistency ratio.
(3) calculate the priorities of criteria.

3.2.3. The Technique for Order Preference by Similarity to The Ideal Solution – TOPSIS

The TOPSIS method defines the best alternative by applying the trade-off solution, whereby the closest distance from the ideal solution and the farthest distance from the negative ideal solution will be selected (Tzeng & Huang, 2011). Below are steps to perform the TOPSIS method:

Step 1: Form normalized decision matrix.
Normalize scores or data as follows:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_i^m x_{ij}^2}} \text{ for i=1, …, m; j=1, …, n} \quad (1)$$

Step 2: Form the weighted normalized decision matrix.

- Firstly, define the weight values for each criterion.

$$\sum_{j=1}^{n} w_j = 1 \quad (2)$$

- Secondly, multiply each column of the normalized decision matrix by its correlative weight value. Below is the new matrix:

$$v_{ij} = w_j \, r_{ij} \quad (3)$$

Step 3: Determine the ideal (A^+) and negative ideal (A^-) solutions.

- Positive ideal solution.

$$A^+ = \{ v_1^+, \ldots, v_n^+ \} \text{ (maximum values)} \quad (4)$$

- Negative ideal solution.

$$A^- = \{ v_1^-, \ldots, v_n^- \} \text{ (minimum values)} \quad (5)$$

Step 4: Compute the separation measures for each alternative.

- The separation from the positive ideal alternative is:

$$S_i^+ = \sqrt{\sum_{j=1}^{n} \left(v_j^+ - v_{ij}\right)^2} \qquad i = 1, \ldots, m \qquad (6)$$

- Similarly, the separation from the negative ideal alternative is:

$$S_i^- = \sqrt{\sum_{j=1}^{n} \left(v_j^- - v_{ij}\right)^2} \qquad i = 1, \ldots, m \qquad (7)$$

Step 5: Compute the relative proximity to the ideal solution C_i^+

$$C_i^+ = S^-_i / (S_i^+ + S^-_i), \; 0 < C_i^+ < 1 \qquad (8)$$

Select the alternative with C_i^+ nearest to 1.

4. Empirical Case for Retail Store Location Selection

To verify the feasibility of the proposed model for the retail store location selection, the authors applied it into a fashion company. The selection and evaluation of qualified location is as presented in the preceding part corresponding to detailed steps in the research framework: (1) determining the goal/requirement, (2) identifying the location selection criteria, (3) defining the criteria weights by using the ANP technique and simultaneously checking the consistency ratio, (4) ranking the alternatives by applying the TOPSIS technique.

4.1. Defining the Goal/Requirement

The goal of this case is to select an appropriate retail location for a fashion company in Hochiminh city, Vietnam named ABC. This is ABC's strategic decision as it has to face fierce competition from brandy fashion retailers like H&M, Juno, Ivy Moda, Ninomaxx, etc. For ABC, retail stores are not only distribution centers to bring its products to end consumers but also part of a multi-channel retail marketing strategy and brand communication.

Five alternatives are determined based on experts' opinion including one on Hai Ba Trung street, one on Nguyen Trai street, one on Le Van Sy street, another on Phan Dang Luu street, and the other on Nguyen Dinh Chieu street. All these locations are in Hochiminh city - one of the most dynamic fashion centers in Vietnam. Therefore, the research findings may be applied into all fashion retail stores in Vietnam.

4.2. Identifying The Selection Criteria

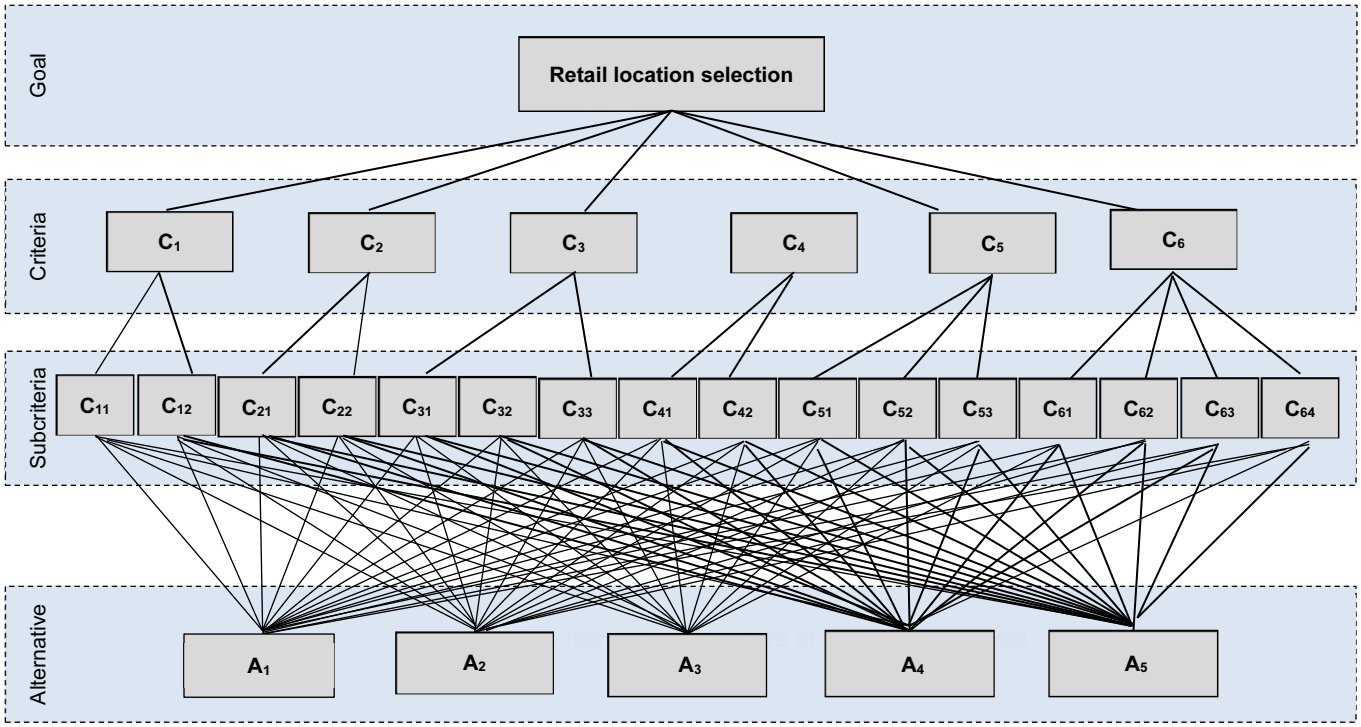
After conducting in-depth interviews with four experts of ABC company, the list of retail location selection criteria is summarized in Table 1.

Table 1: Retail location selection criteria

Criteria	Sub-criteria	References
Population density (C_1)	Population growth rate (C_{11})	Ghorui (2020), Singh et al. (2020), Erdin and Akbaş (2019), Yap et al. (2018), Yildiz and Tüysüz (2019), Chen and Tsai (2016)
	Current population density (C_{12})	Ghorui (2020)
Economic factor (C_2)	Average household income (C_{21})	Singh et al. (2020), Erdin (2019)
	Purchasing power of the population (C_{22})	Singh et al. (2020), Erdin (2019)
Competition (C_3)	Competition power (C_{31})	Erbıyık et al. (2012)
	Numbers of competitors (C_{32})	Erbıyık et al. (2012)
	Distance to competitors (C_{33})	Erbıyık et al. (2012)
Cost (C_4)	Rent cost (C_{41})	Yildiz and Tüysüz (2019), Chen et al. (2018), Chang (2014), Erbıyık et al. (2012)
	Furnishing cost (C_{42})	Erbıyık et al. (2012)
Location (C_5)	Visibility (C_{51})	Yap et al. (2018), Chen et al. (2018), Chen and Tsai (2016), Erbıyık et al. (2012)
	Traffic density (C_{52})	Yap et al. (2018), Erbıyık et al. (2012)
	Accessibility by public transportation (C_{53})	Yap et al. (2018)
Physical features (C_6)	Parking space (C_{61})	Ghorui (2020), Chen et al. (2018), Yap et al. (2018), Erbıyık et al. (2012)
	Store size (C_{62})	Singh et al. (2020), Chen et al. (2018), Chen and Tsai (2016), Chang (2014), Erbıyık et al. (2012)
	Architecture (C_{63})	Ghorui (2020), Goceri (2020)
	Infrastructure (C_{64})	Ghorui (2020)

4.3. Defining the Criteria Weights by Applying the ANP Method

Figure 3 and 4 present the structure of the research model and the interdependence of criteria. Basing on the mentioned model, a meeting between the authors and four experts was conducted through telephone. They were required to define the inner and outer interdependence among criteria and sub-criteria and then respond a series of pairwise comparisons between criteria. Superdecision software was utilized simultaneously to compute the inconsistency ratio which can ensure the consistent value for the entries. The inconsistency ratio should be less than 0.1 (Demirtas & Üstün, 2008).



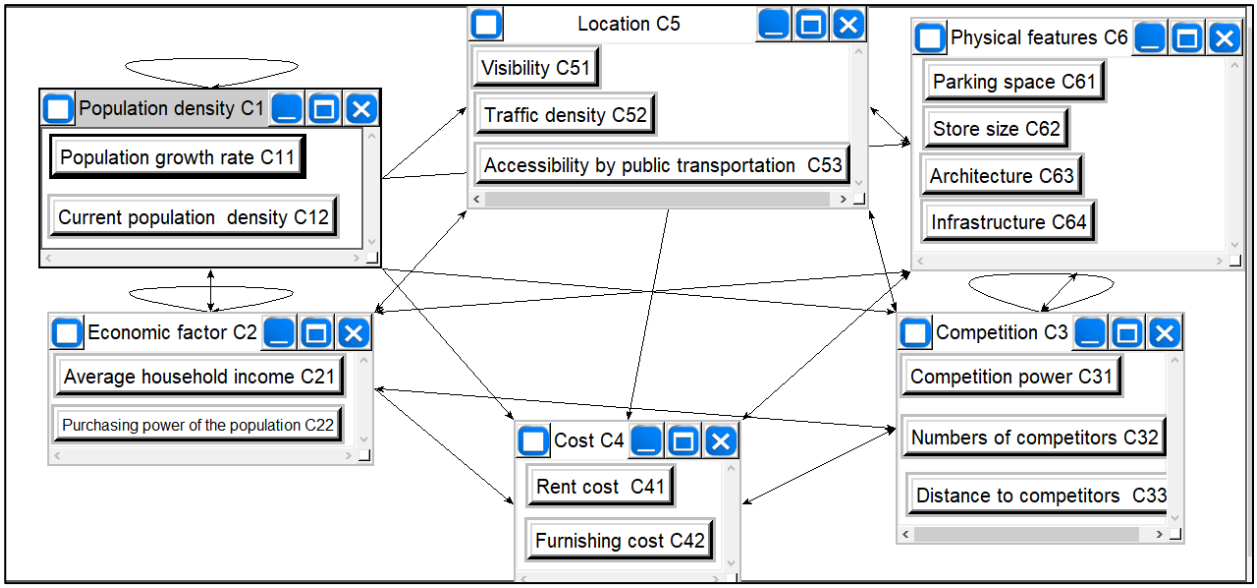


Figure 4: Inner and outer relationships of criteria

The priorities of these criteria are presented in Table 2. It is noted that visibility is the most important criterion and population growth rate is the least one.

4.4. Ranking The Alternatives by Using The TOPSIS Method

The results of this step are presented in Table 4 to Table 7. Table 3 illustrates the ratings of each alternative. Table 4 depicts the normalization of the above ratings. The weighted normalization is presented in Table 5. Table 6 shows the results of computing the separation from the positive ideal alternative S^+_i and the negative ideal alternative S^-_i and the relative proximity to the ideal solution C_i^+

Table 2: The weights of retail store location selection criteria

Criteria	Normalized By Cluster	Limiting	Ranking
Population growth rate C_{11}	0.00386	0.000104	16
Current population density C_{12}	0.99614	0.026871	14
Average household income C_{21}	0.01536	0.002019	15
Purchasing power of the population C_{22}	0.98464	0.129386	2
Competition power C_{31}	0.49631	0.105137	4
Numbers of competitors C_{32}	0.21931	0.046458	10
Distance to competitors C_{33}	0.28439	0.060244	8
Rent cost C_{41}	0.67321	0.098754	5
Furnishing cost C_{42}	0.32679	0.047938	9
Visibility C_{51}	0.60396	0.144896	1
Traffic density C_{52}	0.27107	0.065033	7
Accessibility by public transportation C_{53}	0.12496	0.029979	12
Parking space C_{61}	0.27008	0.065678	6
Store size C_{62}	0.43613	0.106059	3
Architecture C_{63}	0.18122	0.04407	11
Infrastructure C_{64}	0.11256	0.027373	13

Table 3: The decision matrix for the retail location selection

	C11	C12	C21	C22	C31	C32	C33	C41	C42	C51	C52	C53	C61	C62	C63	C64
Hai Ba Trung	8	8	10	10	10	10	10	7	7	10	10	10	8	9	9	9
Nguyen Trai	8	8	10	10	10	10	10	7	7	10	10	10	8	8	9	9
Le Van Sy	10	10	8	9	9	9	9	8	8	8	10	10	8	9	8	8
Phan Dang Luu	8	8	8	8	9	8	7	9	9	8	8	9	9	9	9	8
Nguyen Dinh Chieu	8	8	8	8	9	9	8	8	8	9	9	9	8	8	9	8

Table 4: The normalized decision matrix for the retail location selection

	C11	C12	C21	C22	C31	C32	C33	C41	C42	C51	C52	C53	C61	C62	C63	C64
Hai Ba Trung	0.424	0.424	0.505	0.494	0.475	0.485	0.504	0.400	0.400	0.494	0.474	0.465	0.436	0.467	0.457	0.457
Nguyen Trai	0.424	0.424	0.505	0.494	0.475	0.485	0.504	0.400	0.400	0.494	0.474	0.465	0.436	0.415	0.457	0.457
Le Van Sy	0.530	0.530	0.404	0.445	0.428	0.436	0.453	0.457	0.457	0.396	0.474	0.465	0.436	0.467	0.406	0.406
Phan Dang Luu	0.424	0.424	0.404	0.396	0.428	0.388	0.353	0.514	0.514	0.396	0.379	0.419	0.490	0.467	0.457	0.406
Nguyen Dinh Chieu	0.424	0.424	0.404	0.396	0.428	0.436	0.403	0.457	0.457	0.445	0.427	0.419	0.436	0.415	0.457	0.406

Table 5: The weighted standard decision matrix

	C11	C12	C21	C22	C31	C32	C33	C41	C42	C51	C52	C53	C61	C62	C63	C64
Hai Ba Trung	0.000	0.011	0.001	0.064	0.050	0.023	0.030	0.039	0.019	0.072	0.031	0.014	0.029	0.050	0.020	0.013
Nguyen Trai	0.000	0.011	0.001	0.064	0.050	0.023	0.030	0.039	0.019	0.072	0.031	0.014	0.029	0.044	0.020	0.013
Le Van Sy	0.000	0.014	0.001	0.058	0.045	0.020	0.027	0.045	0.022	0.057	0.031	0.014	0.029	0.050	0.018	0.011
Phan Dang Luu	0.000	0.011	0.001	0.051	0.045	0.018	0.021	0.051	0.025	0.057	0.025	0.013	0.032	0.050	0.020	0.011
Nguyen Dinh Chieu	0.000	0.011	0.001	0.051	0.045	0.020	0.024	0.045	0.022	0.064	0.028	0.013	0.029	0.044	0.020	0.011

Table 6: The relative closeness to the ideal solution C_i^* and ranking

	S^+_i	S^-_i	C_i^+	Ranking
Hai Ba Trung	0.0133	0.0494	0.7873	1
Nguyen Trai	0.0144	0.0491	0.7727	2
Le Van Sy	0.0186	0.0454	0.7099	3
Phan Dang Luu	0.0491	0.0143	0.2259	5
Nguyen Dinh Chieu	0.0292	0.0242	0.4532	4

Based on the experts' evaluation, the results depict that among the alternatives, Hai Ba Trung street was the best place for retail stores, followed by Nguyen Trai, Le Van Sy, Nguyen Dinh Chieu, and Phan Dang Luu in that order. Hai Ba Trung was superior to other places in average household income, purchasing power of the population, competition power, number of competitors, distance to competitors, visibility, traffic density, and accessibility by public transportation. The detrimental criteria of Hai Ba Trung street were rather high rent cost and furnishing cost, and less parking space than those of other alternatives. However, these two kinds of costs belong to the least critical factors evaluated by the experts. Hai Ba Trung is, therefore, the most appropriate selection for locating retail stores. This result was in good line with the practical state of Hai Ba Trung, which has been one of the dynamic and crowded places locating numerous fashion stores like PT2000, Wink Perry, Giordano, Mattana, NEM, etc. In addition, this result is also compatible with the research results of Singh et al. (2020), Erdin (2019), and Erbıyık et al. (2012) who paid their much attention on economic factor, competition, and location. Besides,

The second alternative, Nguyen Trai street, had a little bit lower assessment result than the first position did. This street also has the same superior as well as inferior criteria as of Hai Ba Trung. Nonetheless, the store size on this street is less spacious. It can be seen from this result that the store size plays a significant role in the set of location selection criteria (Alexander et al., 2018).

The third priority was of Le Van Sy street. Although Le Van Sy has the advantages of population growth rate and current population density, traffic density, and accessibility by public transportation, it lacks the most highly preferred criterion in the benchmark criteria that is visibility (Yap et al., 2018; Chen et al., 2018; Chen & Tsai, 2016; Erbıyık et al., 2012). Additionally, Le Van Sy also has disadvantages in a wide range of criteria such as lower average household income, high costs, mini parking space, and unattractive internal and external design (architecture and infrastructure). It, therefore, does not meet the aim of retail stores.

The fourth and fifth alternatives, Nguyen Dinh Chieu street and Phan Dang Luu street, were evaluated moderately in all factors. Therefore, it ranked fourth and fifth in the list of alternatives, respectively.

5. Conclusion

The choice of an optimum location has long been a major question of both private and public sectors (Notteboom & Rodrigue, 2009). A well-chosen retail store may help attract customers, increase profits and optimize distribution channels. Thus, this research proposed a benchmarking model for the choice of retail store location with the empirical case in a fashion company in Vietnam. A hybrid ANP – TOPSIS model was utilized to examine the criteria and rank the alternatives. It can be noted that visibility, purchasing power of the population, and store size are considered as the three highest priority factors in the choice of retail store location. Besides, in this research, among the five alternatives for location selection, Hai Ba Trung street was ranked first, followed by Nguyen Trai street, Le Van Sy street, Nguyen Dinh Chieu street, and Phan Dang Luu street.

The contribution of this research focuses on the proposition of an integrated ANP and TOPSIS techniques to deal with the dependence and independence of multi-criteria and select the optimum site for retail stores. Further, the criteria proposed in the research can devote to the literature in the selection of location along with the concept of distribution channel. Besides, the research may also be guidelines for firms in making decision on retail location based on limited resources to avoid the waste of funds.

The proposed model may be applied to the selection science of retail location in all industries. However, the results only answer to the context of Vietnam - a developing country. Thus, future research may be extended to developed countries where have better conditions. Besides, the other future step to this research may be the application of other MCDM methods in solving the location selection problem.

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