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A TOPSIS Model For Chain Store Location Selection

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ABSTRACT

Store location selection has become the most important decision for many retailers. The selection of store location can be assessed by five criteria: Crowds, Store Cluster, Site Features, Store site acreages and the proportion of rent expenses against annual sales, respectively. This study uses the TOPSIS (Technique for order preference by similarity to ideal solution) method to obtain the optimal spot of site selection. Finally, an empirical case reveals the feasibility of the primary results developed in this paper.

Keywords: Retail Chains, Site-selection, TOPSIS, Chain store

1. Introduction. Choosing the appropriate channel operating locations is becoming a top priority issue due to location greatly influencing the firm's future performance. Numerous computing methods, such like Yang and Lee's the Analytical Hierarchy Process (AHP) approach (J. Yang, & H. Lee 1997), have been used. Furthermore, the existing literatures often mentions that the importance of location selection, for example, large warehouses (T. Demirel, N.C. Demirel, & C. Kahraman 2010), hospitals (C.T. Lin, C.R. Wu, & H.C. Chen 2008), and high tech corporations (H.C. Chen, & Y.W. Yu 2008). These studies, in fact, were seldom discussed channel development of retail store location selection in the expansion stage.

This article, therefore, presents the case focusing on selection of store location and selection of the market segment in the China market. In this case, the processes of selecting the store location will be related to an online store desiring to choose the optimal operation place for a store in the greater Shanghai area. The selection of store location has become the most critical decision for many retailers.

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Nowadays, both the franchisor and franchisee are facing two essential problems. They are facing not only selection of store location, but also ‘where’ to make profit. The ‘value for money’ location is hard to find due to most of these kinds of locations already being rented. Under inflationary pressures in China, rent expenses have increased the difficulty of finding relevant locations in downtown or newly developed areas, which is bound to increase the fixed cost of transportation.

The commercial zone tends to be changed all the time due to public construction. Public construction projects often block out the crowds. Moreover, the cost of good locations is also extremely high. The rent expense eliminates the profit. The optimal store location varies due to the different industries. Thus, there are various business entities desiring store location assessment skills. Assessment skills can predict monthly sales and profit accurately. The optimal store location may provide the maximum rate of return. The franchisor must establish precise assessment criteria. Successful assessment accelerates the expansion of stores within a certain period to reach an economical scale. Expansion of the chain stores will create greater visibility and higher operating profits. It will be also reduce unnecessary wastage of resources. Therefore, a geographic expansion plan is an important issue for a chain system. This study reveals a strategic location selection solution by one Multiple Criteria Decision Making (MCDM) method, which is called the technique for order preference by similarity to ideal solution (TOPSIS).

The rest of this paper is organized as follows. The next section defines the judgment criterions of store site selection. The following section uses the TOPSIS method and preliminary analysis and the survey illustrates and describes the results. The final section offers a conclusion and suggestions.

2. Decisions of store site selection. Store site selection is often composed of geographic, demographic, and location analysis. In this study, a group of alternative store locations within the designated area was examined using “multiple-attribute value functions". An approach that is often suggested for certain condition obtains the data from each alternative. An approach would be suggested when certain conditions, such as costly feasibility study or several non-tangible attributes, were satisfied. Economic theory treats the latter as the archetypical decision makers, while there are still over the million stores of this type. It has become increasingly irrelevant to

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consumers and the distribution system (K. Jones, & J. Simmons 1995).

For assessment evaluation of a commercial zone, the success of franchise stores is based on steady income. Steady income will protect the entrepreneur from investment loss. Assessment evaluation is critical before establishing franchise stores. Each attribute and definition is shown in Table 1. The five criterions are Crowd, Store Cluster, Site Features, Store Space, and the Proportion of rent expenses.

TABLE 1. Store selection of Index

Index	Definition	Attributes
1. Crowds	The features of the locations and the quantity of the crowds	Generation of consumption power is caused by crowd flow, population, households, and workforce.
2. Store cluster	Stores surrounding the area increase purchasing power	The effect is caused by the store cluster bringing people into the commercial zone.
3. Site features	Easy to access in this location	Location is convenient and accessible for customers
4. Store spaces	The spaces contained in this location	The spaces provide the customers easy access by different floors or different points
5. Proportion of Rent expenses	Rental expense to be paid	Several locations or floors generate different proportions of rent expenses against annual sales.

3. The TOPSIS method. The technique for order preference by similarity to ideal solution (TOPSIS) method was presented in Chen and Hwang (S.J. Chen, & C.L. Hwang 1992), and extended by Hwang and Yoon (C.L. Hwang, & K. Yoon 1981). The basic principle is that the chosen alternative should have the shortest distance from the ideal solution and the farthest distance from the negative-ideal solution. This approach has been successfully applied in environmental quality improvement strategies (G.H. Tzeng, S.H. Tsaur, Y.D. Laiw 2002), car retrieval systems (T. Samatsu, K. Tachikawa, & Y. Shi 2008), and long distance highway bus company development (H. Chang, K. Wang, & S. Lin, Expressway 2011). The TOPSIS

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procedure consists of the following six steps:

3.1 Calculate the normalized decision matrix. The normalized value r_{ij} is calculated as

$$r_{ij} = f_{ij} / \sqrt{\sum_{j=1}^{J} f_{ij}^2} \qquad j = 1,...,J; i = 1,..,n.$$

3.2 Calculate the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as

$$v_{ij} = w_i r_{ij} \qquad j = 1,...,J; i = 1,..,n \tag{1}$$

where w_i is the weight of the *i*th attribute or criterion and $\sum_{i=1}^{n} w_i = 1$.

3.3 Determine the ideal and negative-ideal solution. Here we given 'ideal' and 'negative-ideal' solution is relatively better (or worst) conditions in each attributes, thus we can defined as Eq. (2) and (3) as following terms.

$$A^* = \{v_1^*,......,v_n^*\} = \{(\max_j v_{ij} | i \in I'), (\min_j v_{ij} | i \in I'') | j = 1,2,...,J\} \tag{2}$$

$$A^- = \{v_1^-,......,v_n^-\} = \{(\min_j v_{ij} | i \in I'), (\max_j v_{ij} | i \in I'') | j = 1,2,...,J\} \tag{3}$$

where I' is associated with benefit criteria and I'' is associated with cost criteria.

3.4 Calculate the separation measures using the *n*-dimensional Euclidean distance. The separation of each alternative from the ideal solution is given as

$$D_j^* = \sqrt{\sum_{i=1}^{n} \left(v_{ij} - v_i^*\right)^2}, j = 1,...,J. \tag{4}$$

Similarly, the separation from the negative-ideal solution is given as

$$D_j^- = \sqrt{\sum_{i=1}^{n} \left(v_{ij} - v_i^-\right)^2}, j = 1,...,J. \tag{5}$$

3.5 Calculate the relative closeness to the ideal solution. The relative closeness of the alternative a_j with respect to A^* is defined as

$$C^- = D_j^- / (D_j^* + D_j^-), j = 1,...,J, 0 \le C^- \le 1. \tag{6}$$

3.6 Finally, rank the preference order.

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4. An example. Firm A has over four decades of retailing channel business operating experience in Taiwan. They are engaged in expanding their business in Mainland China. Following intense discussion, the management decided to focus on Greater Shanghai as their first channel in China. For saving time and cost, the management of Firm A selected four experts from marketing, public relations, and real estate to search for a potential channel operation place and estimate their expected performance. The subsequent process is shown in the intergraded index: A survey has been prepared with five assessment criteria of site-selection listed in Table 2. The normalized site-selection is listed in Table 3.The weights of each attribute are listed in Table 4. Construction of the weighted normalized decision matrix is listed in Table 5.

TABLE 2. The raw data of each store site

Place\Criteria	Crowds	Store cluster	Site features	Store spaces	Rent costs	Total
A	60	30	35	40	5	170
B	41	25	25	30	10	131
C	41	20	10	25	15	111
D	29	15	10	20	20	94
E	36	20	20	15	15	106

TABLE 3. Normalized site-selection

Place\Criteria	Crowds	Store cluster	Site features	Store spaces	Rent costs
A	0.290	0.273	0.350	0.308	0.077
B	0.198	0.228	0.250	0.231	0.154
C	0.198	0.182	0.100	0.192	0.231
D	0.140	0.137	0.100	0.154	0.308
E	0.174	0.182	0.200	0.115	0.231

TABLE 4. weights of each attribute

Criteria	Crowds	Store cluster	Site features	Store spaces	Rent costs
Proportions (%)	25	15	15	10	35

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TABLE 5. Construct the weighted normalized decision matrix

Place\Criteria	Crowds	Store cluster	Site features	Store spaces	Rent costs
A	0.0720	0.0410	0.0525	0.0308	0.0270
B	0.0500	0.0341	0.0375	0.0231	0.0540
C	0.0500	0.0273	0.0150	0.0192	0.0810
D	0.0350	0.0205	0.0150	0.0154	0.1080
E	0.0430	0.0273	0.0300	0.0115	0.0810

According to equation (4), (5) and (6), the ideal solution and the negative ideal solution A^{-} are

$$A^{+} = \{0.0720, 0.0410, 0.0525, 0.0308, 0.0270\}$$

$$A^{-} = \{0.0350, 0.0205, 0.0150, 0.0115, 0.0108\}$$

The relative closeness degree of each site-selection according to the solution of A^{+} and A^{-}. The result is listed in table 6. Place A has the best conditions of the five potential store site places.

TABLE 6. The result list

Place	S_i^{+}	S_i^{-}	c^{-}	Ranking
A	0.081	0.115	0.5866	1
B	0.106	0.089	0.4560	2
C	0.113	0.083	0.4240	5
D	0.111	0.085	0.4330	3
E	0.111	0.084	0.4305	4

5. Conclusions. Compared to many unnecessary and time-consuming discussions in the enterprise’s internal decision-making process, TOPSIS offers a consequence-based perspective on searching for a ‘relatively optimal’ solution. TOPSIS delves deeply into decision participants’ intentions through among the each thoughtful program while the firm facing a completely strange business environment. According to each criterion definition in TOPSIS, the result revealed Place A had the best potential for the firm operating in Shanghai. Actually, The performance of this store has achieved the annual target within two year. Future study can attempt to test numerous cities in Mainland China, leading to results with high practical value.

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