

A decision making model for selection of café location: An ANP approach

Y Y Wibisono^{1*}, S Marella¹

¹ Department of Industrial Engineering, Parahyangan Catholic University, Jalan Ciumbuleuit 94, Bandung, Indonesia.

*yogi@unpar.ac.id

Abstract. Decision-making in business location selection is a challenging task for companies because it involves multiple alternatives and criteria. Previous studies have investigated this problem using various approaches, and AHP/ANP-based decision-making approach is the most used one due to its capabilities in dealing with the complex problem. Although numerous studies have adopted AHP/ANP approach in determining the business location, but most of them were conducted in the large-scale enterprises and not in the context of culinary business such as cafe. This study is intended for selecting the best business location alternative in the context of small enterprise of culinary industry. We developed a decision-making model based on theories and experiences of the culinary expert to choose the best café location. A total of five major criteria we identified namely location characteristics, demography, competition, physical features, and cost. Each major criterion consists of elements that range from two to five elements. Because there are relationships among elements, therefore we develop a network model, which depicts the criteria, sub criteria, alternatives, and their interactions. We apply ANP by using expert opinion to analyse the importance of each criterion and the rank of each alternative. The final result displays that the competitor strength is the highest importance for small enterprises in selecting the best business location.

1. Introduction

The selection of business location is a strategic decision problem because it has a long-term impact on a company. The accurate choice of location could give competitive advantages to company. Decision-making in business location selection is a challenging task for companies because it involves multiple alternatives and criteria. Although the decision of location selection is a complex problem, most small companies simplify the decision process by stressing much on the cost factor and ignoring other important factors. As a result of the decision process simplification, they earn dissatisfied result. This typical problem occurs in a small company in Bandung, which runs culinary business. The study is conducted to aid in making location selection decision particularly for a small company that engages in café business.

Most previous studies have investigated the location selection decision problem, but they focused their research on the large companies; meanwhile location selection problems in the small companies are still under-investigated. The large and small companies have different characteristics that have impact on the decision model. The study of Wang et al. display that small firms and large firms have different emphasis on the considered criteria for selecting the business location [1]. From the perspective of problem domain, most studies investigated the site selection problem in the energy



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

generation and logistic site location and problem domain in retail facilities such as restaurant is the least investigated problem [2]. Each domain problem has unique criteria such as environmental impact for the energy generation, geographical distance for logistics, population density for public services, and demographics for retail facilities [2]. Because there are limited studies on a business location selection problem in the small companies and in the domain of retail facilities, therefore it becomes important to develop the knowledge of site location selection for small enterprises in the retail facilities problem domain.

2. Literature Review

Many researchers have explored the study of location selection in the various businesses. Wang et al. classified the streams of location selection studies into two groups: studies that focused on location determinant, and studies that focused on practice and implementation of specific technique [1]. Our study focuses on the second stream namely applying certain technique for selecting business location. Various approaches for analyzing the problem of business location selection have been used in numerous studies to find the best location for a business such as analytic hierarchy process (AHP), analytic network process (ANP), TOPSIS, ELECTRE, PROMETHE [3]. Among those multi-criteria decision-making methods in site selection problems, the AHP/ANP-based approach is the most-used method in dealing with determining business location [2].

The study of [3] implemented AHP technique to determine Carglass store location by considering multi criteria either qualitative or quantitative criteria. The criteria that involved in the study consists of five main criteria, namely sectorial factors, environmental factors, investment cost, labor potential, and regional potential.

Wang et al. developed decision model for selecting a high-tech manufacturing firm location based on internal and external factors framework [1]. Their decision model embraces three main criteria i.e. the cost, community, and regulation criteria. The cost embraces labor, transportation, and material cost; the community is related to infrastructure, innovation cluster, manufacturing concentration, industrial linkage, and market; regulation encompasses tax reduction, FDI incentive, finance provider.

In the context of dry port location selection, Abdoukarim et al. [4] involved three major criteria in choosing the location i.e. cost, demand, and proximity. The criterion of cost is related to the energy, labor, and land cost; the demand criterion consists of export and import sub-criteria; and the proximity encompasses sub-criteria of highway/railway, logistics platforms, and market centers. The study implemented ANP to model and analyze the interdependency among criteria and sub-criteria.

The previous studies have their own unique model for location selection due to different businesses. In the study of [3] we discover the unique criteria for the auto glass business namely number of cars in the region and regional automobile insurance rate. The criteria for dry port selection involve unique criteria that are only fit for port selection such as export and import demand.

Besides various and unique criteria that be considered by previous studies, we also find that previous studies have different importance on the criteria. The difference of criteria importance among previous studies is caused by the size of company and the characteristic of business. The study of [3] displays that the number of cars and automobile insurance rate have the most important criteria in the auto glass store location selection. The criterion of export and import demand is the most important in choosing the dry port location [4].

3. Methodology and Results

3.1. Model of Café Location Selection

Previous literatures have identified various criteria for selecting the best business location. We synthesize criteria for choosing a café location from various studies that consist of location characteristics, demography, cost, physical features, and competition. The following table displays the criteria and sub criteria of café location selection.

Table 1. Criteria and sub criteria for selecting café location

Criteria	Sub criteria	Definition	Sources
Location characteristics	Traffic density	The number of vehicles pass through the café location	[5]
	Easiness for car access	The extent of customers to reach the location easily	[6], [7], [8]
	Infrastructure	The availability of comprehensive underlying features	[7], [5]
	Environmental atmosphere	The suitability of café location with market target	New sub-criteria
	Closeness to market	The distance of café location to potential customers	[8], [5]
Demography	Market size	The number of potential customers in business area	[5], [6], [7]
	Income	The wealth level of business area	[5]
	Growth	The economy development of business area	[6]
	Market stability	The stability of potential customer number for year-round	New sub-criteria
Cost	Rental cost	The annual charge of rented store	[5], [8]
	Design cost	The extent of investment for designing interior and exterior	[8]
Physical features	Store size	The broadness of café building	[5]
	Parking area	The spacious area for vehicle parking	[6], [5]
	Visibility	The easiness of customers to see the store	[5], [6]
Competition	Competitor strength	The power of competitors in attracting customers	[5], [6]
	Competitor number	The quantity of competitors which operate in the same area	[5], [6], [7]

Further, we develop the model by adopting the holarchy model as a base model. The holarchy model is generated from a hierarchy by increasing the hierarchy's connections gradually so that pairs of components are connected as desired [9]. The top level consists of the main criteria that are location characteristics, demography, cost, physical features, and competition. The second level consists of sub-criteria of main criteria. The sub-criteria of locations characteristics include traffic density, easiness for car access, infrastructure, environmental atmosphere, closeness to market; demography consists of market size, income, growth, and market stability; cost criteria comprehend rental cost and design cost; physical feature embraces store size, parking area, visibility; and competition comprises competitor strength and the number of competitor. A number of alternative locations that will be evaluated are placed at the lowest level. We consider three alternative locations namely Ciumbuleuit, Mahmud, and Setrasari. Because we use the holarchy model, then at the end the alternatives loop back to the main criteria. Figure 1 depicts the holarchy model for location selection.

3.2. Data Collection

We collect data from expert opinion by using mixed method that is questionnaire and interview. The criteria of expert in the study are having experiences in the culinary business more than 5 years, having culinary business in Bandung, having successful experiences in relocating his business location. Expert was asked to fill the pairwise comparison questionnaires related to location characteristics, demography, cost, physical features, competition, and alternatives. We also interviewed the expert to obtain the comprehensive information about his response to the questionnaires.

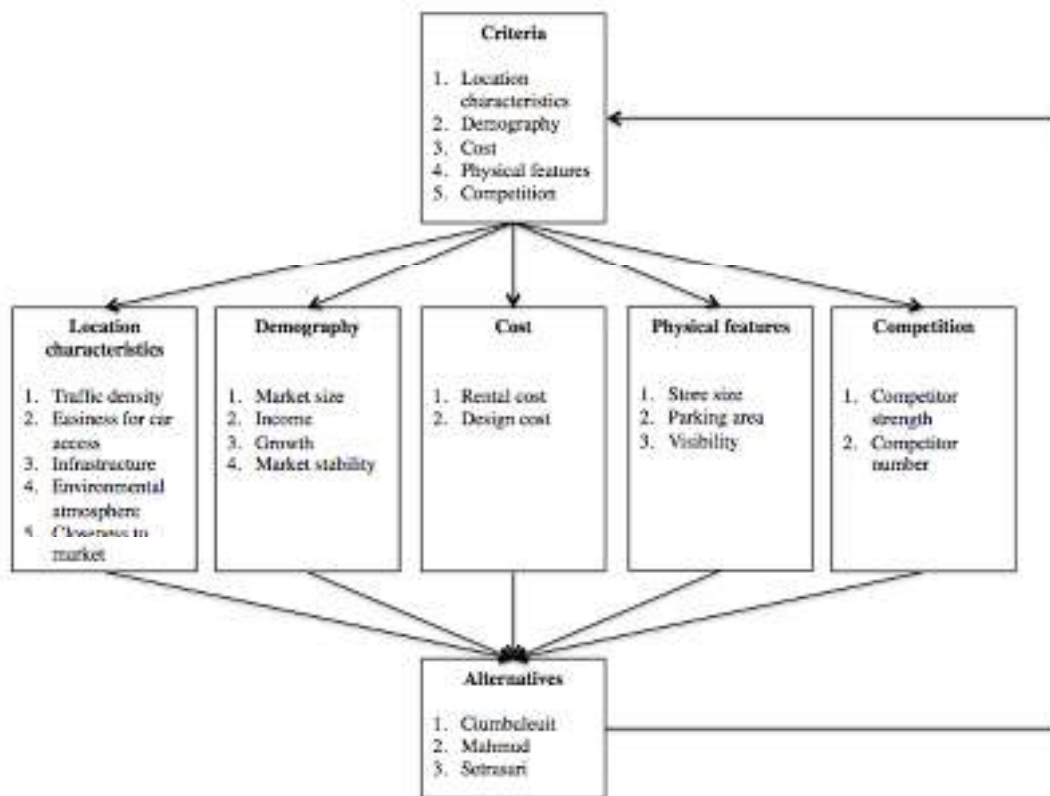


Figure 1. A holarchy model for café location selection

The feedback from the expert was examined to ensure his consistency by conducting a consistency test. Saaty develops the measure of consistency ratio (CR) by forming the ratio of consistency index (CI) and the random consistency index [10]. A value of CR less than or equal to 0.1 is acceptable. We have CR value of all matrices of comparison less than 0.1, therefore we conclude that the expert is consistent in making the pairwise comparisons.

3.3. Results

We conducted the priorities analysis through developing cluster matrix, unweighted matrix, weighted matrix, and limiting matrix. The cluster matrix contains Eigen value of cluster criteria, location characteristics, demography, cost, physical features, competition, and alternatives. The unweighted matrix includes Eigen value of each sub-criteria of main criteria. The weighted matrix is the product of cluster matrix and unweighted matrix. The limiting matrix that is derived through powering the weighted matrix contains a stable value of each column and row of matrix. We obtain priority ranks of primary criteria, sub-criteria, and location alternatives from the limiting matrix. Table 2 and 3 display the priority ranks.

4. Discussions

The selection of café location involves multi criteria that consist of four main criteria of location characteristics, demography, cost, physical features, and competition. We identify 16 sub-criteria and two of them are new sub-criteria that have been considered in the previous studies namely environmental atmosphere and market stability. The cities in Indonesia included Bandung have various environments from slum areas to elite areas that give a different atmosphere. A company should consider the environment of café location. If market target of company is an upper-class customer, it should consider selecting the upscale location. Each location has a unique market that influences the stability of demand.

The café location in a campus area with students as a main customer target will have the risk of low demand in certain months.

Table 2. The weight of criteria and sub-criteria

Primary criteria	Weight	Rank	Sub-criteria	Local weight	Local rank	Overall weight	Overall rank
Location characteristics	0.221	3	Traffic density	0.05	5	0.011	16
			Easiness for car access	0.275	2	0.061	7
			Infrastructure	0.083	4	0.018	14
			Environmental atmosphere	0.43	1	0.095	4
			Closeness to market	0.162	3	0.036	10
Demography	0.228	1	Market size	0.289	2	0.066	6
			Income	0.059	4	0.013	15
			Growth	0.176	3	0.040	9
			Market stability	0.476	1	0.109	3
Cost	0.124	5	Rental cost	0.25	2	0.031	11
			Design cost	0.75	1	0.093	5
Physical features	0.228	2	Store size	0.243	2	0.055	8
			Parking area	0.088	3	0.020	13
			Visibility	0.669	1	0.153	2
Competition	0.199	4	Competitor strength	0.875	1	0.174	1
			Competitor number	0.125	2	0.025	12

Table 3. The alternative priority

Alternative	Weight	Rank
Ciumbuleuit	0.322	2
Mahmud	0.257	3
Setrasari	0.421	1

We obtain the importance of each location selection decision criterion with top five most important criteria embrace competitor strength, visibility, market stability, environmental atmosphere, and design cost. The small company must be aware of the existence of competitors in the targeted location. The big competitor will have advantages such as reputation, capital, human resources that is hard to be challenged. The selected location must have high visibility that enables potential customers to be aware of the existence of café. Their awareness can increase the possibility of their coming to café. The market stability determines the stability of demand that has impact on the revenue. The company must have knowledge the fluctuation of market size in the considered location. The environmental atmosphere has impact on the customer intention to come to café. Customers tend to visit a café with a nice and unique environmental atmosphere. The attractiveness of café is determined by the attractive café design especially in the social media era, in which people always search a unique place for taking a picture. The café will expend significant amount of money to make its design as attractive as possible. The cost of design depends on the condition of initial building.

Based upon criteria and sub-criteria for selecting the best café location, we recommend to the company, which is considering three alternatives for its café location namely Ciumbuleuit, Mahmud, and Setrasari. Setrasari is the most suitable location for café among three alternatives with some advantages such as competitor strength, market stability, and design cost. The company can exploit these advantages to develop its business in Setrasari.

5. Conclusions

Selecting the best location for a business of café is one of the complicated decision problems that involve multi criteria. In this study, we can conclude that there are five main criteria for selecting café location namely location characteristics, demography, cost, physical features, and competition. Each main criterion embraces two sub-criteria until five sub-criteria. ANP mode was used to calculate the weights of the criteria and sub-criteria. Demography that relates to market is the most important main criterion, and competitor strength is the most important sub-criterion for a small company in choosing a café location.

The study finds new factors that must be considered by a company in selecting a café location namely environmental atmosphere and market stability. These findings enrich the result of previous studies that mostly investigated the location selection decision problem in a large company and in logistic site location domain.

The study has some limitations. As the study was conducted in a particular business line, the criteria were specific for the business sector of café. In developing the model, we rely on one expert to validate the criteria and their interdependence.

References

- [1] Wang K J, Lestari Y D and Tran V N B 2017 Location selection of high-tech manufacturing firms by a fuzzy Analytic Network Process: A case study of Taiwan high-tech industry *International Journal of Fuzzy Systems* **19** 1560-84
- [2] Yap J Y L, Ho C C and Ting C Y 2019 A systematic review of the applications of multi-criteria decision-making methods in site selection problems *Built Environment Project and Asset Management* **9** 548-63
- [3] Koc E and Burhan H A 2015 An application of Analytic Hierarchy Process (AHP) in a real world problem of store location selection *Advances in Management & Applied Economics* **5** 41-50
- [4] Abdoukarim H T, Fatouma S H and Kalgora B 2019 The selection of dry port location by Analytic Network Process model: A case study of Dosso-Niger *Journal of Transportation Technologies* **9** 146-55
- [5] Erbiyik H, Ozcan S and Karaboga K 2012 Retail store location selection problem with multiple analytical hierarchy process of decision making an application in Turkey *8th International Strategic Management Conference, Procedia - Social and Behavioral Sciences* **58** 1405-14
- [6] Roig-Tierno N, Baviera-Puig A, Buitrago-Vera J and Mas-Verdu F 2013 The retail site location decision process using GIS and the analytical hierarchy process *Applied Geography* **40** 191-98
- [7] Gurbuz T, Ank H and Albayrak Y E 2014 Cash and carry store location selection using Analytic Network Process: An Application in Turkey *International Symposium of The Analytic Hierarchy Process*
- [8] Kundakci N, Adali E A and Isik A T 2016 Tourist hotel location selection with analytic hierarchy process *Journal of Life Economics* 47-58
- [9] Saaty T L and Vargas L G 2006 *Decision Making With The Analytic Network Process: Economic, Political, Social and Technological Applications with Benefit, Opportunities, Costs and Risks* (Pittsburgh, PA, USA: Springer)
- [10] Saaty T L 1994 *Fundamentals of Decision Making and Priority Theory with The Analytic Hierarchy Process Vol. VI* (Pittsburgh, PA, USA: RWS Publications)