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Location Selection Model for Low-rise Condominium Development in Bangkok*

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Abstract

Location is the most important factor for real estate project development. In this research, the researchers focused on the criteria and the factors for the selection of the location for developing condominiums with a height not more than 23 meters, which are low-rise buildings according to the law of Thailand, by interviewing experts. Then, the weights of all the factors were derived from a pair-wise comparison based on an Analytic Hierarchy Process. It was found that the price is the most important factor in the selection. Therefore, two decision making models were analyzed, i.e.,10,000-100,000 and more than 100,000 Baht/square wah (Thai units, equal to 70.60-706.02 and more than 706.02 US Dollars/square meter, respectively). The acquired models can help real estate developers select the land for low-rise condominium development in Bangkok effectively and systematically.

Keywords: Decision Making Model, Location Selection, Low-rise Condominium, Analytic Hierarchy Process

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1 Introduction

From the literature review, it was found that the most important factor for real estate development is location (Kamglin and Tochaiwat, 2014). In addion, research work performed in Phatumthanee Province by Thanyaluckpark (2014) and Bangkok by Homjumjung and Tochaiwat (2013) had identical results, in whichthe customers' points of view were that location was an important factor in making a decision to buy real estate. This finding is in accordance with research concerning the location selection for condominiums in the business area in Bangkok by Foongkiet (2015) that showed the location is the most important factor. Moreover, location is also important for other types of real estate projects, such as hotels (Likitanupak and Tochaiwat, 2016) and shopping malls (Maenthong and Tochaiwat, 2013).

In 2013, condominium demand was still high, as seen from the increasing number of transferred units, especially houses and condominiums (Government Housing Bank, 2013). The new Bangkok planning law in 2013 leads to changes in land use, such as where the original 2006 city plan allowed10,000 square meter buildings to be built in yellow-colored zones, while the new city plan allows only 2,000 square meter buildings. However, larger buildings are allowed under some conditions, i.e., in "ย.4" areas with a not-less-than 10 meter width road, whereas the previous city plan required only a 6-8 meter width road. The case shows that several real estate developers are interested in developing projects in alleys located close to train stations or main roads and where the land prices are not too high for developing low-rise condominiums (condominiums with a height not more than 23 meters, according to Thai laws). This shows why the number of low-rise condominiums is still increasing, even through they appear to be oversupplied in some locations (Real Estate Information Center, 2014).

Even though the number of this type of project is increasing, there has been no research that specifically studied the location selection criteria for low-rise projects in Bangkok. Therefore, the researchers focused on analyzing the criteria and the decision making model for location selection for low-rise condominiums in Bangkok, which is important basic information for project developers when effectively and objectively selecting land for low-rise condominium development in Bangkok.

2 Research Objectives

1) To study and analyze the important factors affecting location selection for the development of condominiums with a height not more than 23 meters in Bangkok.

2) To present a location selection model for condominiums with a height of not more than 23 meters in Bangkok.

3 Research Limitations

1) This research studied only considered condominiums with heights not more than 23 meters.

2) The weights of all the factors were derived from pair-wise comparisons based on the Analytic Hierarchy Process developed by Saaty (1995), as modified by Pivo (2009).

3) This research collected information from experts who have experience of selecting the location forcondominiums with a height not more than 23 meters on two or more occasions previously.

4 Methodology

The researchers reviewed the related literature to identify the factors affecting the selection of condominium locations. Then, the researchers interviewed experts to find the criteria for classifying the models to make the acquired models accurate. After that, the data from the condominiums in each category were analyzed and the weights of all factors were derived from a pair-wise comparison based on an Analytic Hierarchy Process, in which each factor shall be pair-wise compared with all the remaining factors using the criteria as shown in Table 1. Some examples of research work using modified methodologies based on AHP are (1) Kallas (2011) who used a Likert Scale instead of a pair-wise comparison in AHP and found that the weights of the factors acquired from both methods were not very different; (2) Tochaiwat and Likitanupak (2012) who used the same method to derive a model for facility contractor selection in a townhouse project in Thailand; and Pivo (2009) who used a pair-wise comparison based on AHP to find the weights of the social and environmental factors of US real estate projects. These research works showed that the AHP technique can be applied when doing research with appropriate modification.

Table 1 AHP Comparison Values.

Value	Intensity of Importance
1	A is equal important with B
2	A is weakly or slightly more important than B
3	A is moderately more important than B
4	A is moderately-plus more important than B
5	A is strongly more important than B
6	A is strongly-plus more important than B
7	A is very strongly more important than B
8	A is very-very strongly more important than B
9	A is extremely more important than B
Reciprocals of Above	If activity A has one of the above non-zero numbers assigned to it when compared with activity B, then B has the reciprocal value when compared with A.

Note: Adjusted from Saaty (2008)

The acquired models are in the form of regression models as shown in Equation 1, butthe researchers also present the results as tables that show the coefficients of the factors to enhance the users' convenience.

$$Y = a_1X_1 + a_2X_2 + a_3X_3+...+a_nX_n \quad [1]$$

While Y = location score of analyzed land

a_n = coefficient of n^{th} factor

X_n = score (1-5) of n^{th} factor according to Likert Scale; where, 1 means very poor and 5 means very good.

5 Literature Review

5.1 Factors affecting condominium location selection

The researchers reviewed 14 related research works, i.e., Noble Development Public Company Limited (2011) [1], Land and Houses Public Company Limited (2013) [2], Prinsiri Public Company Limited (2010) [3], Ninlanon (2011) [4], Punthawornnawin and Vanichkobchinda (2010) [5], Yoopakdee (2010) [6], Wangbenmad, Sangkapan & Parnrat (2013) [7], Yooyued (2010) [8],

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Hiranlakana (2010) [9], Panacheunwongsakul (2007) [10], Laophairoj (2012) [11], Klinphan (2009) [12], Inkaew (2013) [13], CMMU Condominium Magazine (2013) [14], and summarized the 14 factors affecting condominium location selection, as shown in Table 2.

6. Results

6.1 Criteria for classifying the models

To make the models accurate, the researchers asked 10 experts which criterion affects the model's accuracy the most when selecting the locations for condominiums with a height not more than 23 meters. The result showed that the experts give opinions that the price of the land is the most important criterion, followed by location, price level of condominium, area of land and project size, respectively, as shown in Table 3.

Table 2 Summary of Factors Affecting Condominium Location Selection.

Factors	Literature													
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Location	✓													✓
Land Size	✓									✓				
Close to Transportation	✓			✓	✓			✓	✓					✓
Utilities		✓		✓					✓					
Resident Demand		✓												
Geological and Population Properties		✓								✓				
Public Assistance					✓		✓							
Land Price							✓						✓	✓
Close to Electrical Train											✓	✓		✓
Close to Shopping Mall in CBD							✓	✓		✓				
City Plan and Legal Restrictions			✓											
Future Growth									✓					✓

Factors	Literature													
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Competitors			✓											
Transportation to Workplace				✓				✓						
Development of Location													✓	

Table 3 Effect of Criteria for Classifying Models.

Criteria	Average Value (of 5.00)
1. Land Price (Baht/Square Wah)	4.78
2. Location	4.67
3. Price Level of Condominium	4.00
4. Area of Land	4.00
5. Project Size (Number of Rooms)	3.89

From Table 3, the researchers analyzed the models with the data from 32 experts. There were two models: (1) for condominiums with a 10,000-100,000 Baht/square wah land price (70.60-706.02 US Dollars/square meter) and (2) for condominiums developed with more than a 100,000 Baht/square wah land price (more than 706.02 US Dollars/square meter). It should be noted that the price ranges were calculated from the exchange rate of the Bank of Thailand (2016), which equaled 1 US Dollar = 35.41 Baht, and 1 square wah = 4 square meters.

6.2 Priority of Location Selection Factors

From the weights of all the factors derived from pair-wise comparisons based on the Analytic Hierarchy Process developed by Saaty (1995), as modified by Pivo (2009), it was found that both models have transportation as the highest weight factor, followed by facilities, location near workplace and utilities. The results for the model for land price between 10,000 – 100,000 Baht/square wah show that (1) for transportation, a location near the urban high-speed train (i.e., BTS, MRT and Airport Link for Bangkok) is the most important factor, followed by main road and highway; (2) As to facilities, it was found that entrepreneurs always choose locations near shopping malls; (3) For utilities, entrepreneurs choose locations nearby hospitals;

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(4) And for workplace, a location near an academic institute is more important than an office zone or government office.

For the land with prices more than 100,000 Baht/square wah, it was also found that the locations near an urban high-speed train are the highest-weight factors, followed by main road and highway. In addition, for facilities it was also found that entrepreneurs always choose locations near shopping malls. As to utilities, entrepreneurs choose locations near hospitals. Finally, for workplace, locations near an office zone or government office are more preferable than an academic institute.

The weights of all the factors and sub-factors for each model are shown in Table 4 and Table 5, respectively. It should be noted that the Consistency Ratio (CR) of the factors and sub-factors of the 10,000 to 100,000 Baht/square wah model are 0.08, 0.09, 0.06, 0.00 and 0.03 while they are 0.09, 0.07, 0.09, 0.00 and 0.09 for the model with a price higher than 100,000 Baht/square wah. All the ratios are less than 0.10 that shows that the acquired eigenvectors can be used as the weights or local weights, as the case may be.

Table 4 Weights of Factors and Sub-factors for Land with Price Between 10,000 to 100,000 Baht/Square Wah

Factor [1]	Weight [2]	Sub-factor [3]	Local Weight [4]	Weight [5] =[2]x[4]
1.Transportation	0.578	1.1 Urban High-speed Train	0.537	0.310
		1.2 Highway	0.199	0.115
		1.3 Main Road	0.048	0.028
		1.4 Sub-road	0.138	0.080
		1.5 Bus Stop	0.078	0.045
2.Facilities	0.135	2.1Shopping Mall	0.659	0.089
		2.2 Convenience Store	0.163	0.022
		2.3 Fresh Market	0.111	0.015
		2.4 Public Park	0.067	0.009
3.Utilities	0.047	3.1 Police Station	0.106	0.005
		3.2 Hospital	0.894	0.042

Table 4 Weights of Factors and Sub-factors for Land with Price Between 10,000 to 100,000 Baht/Square Wah (Cont.)

Factor [1]	Weight [2]	Sub-factor [3]	Local Weight [4]	Weight [5] =[2]x[4]
4.Workplace	0.240	4.1 Academic Institute	0.479	0.115
		4.2 Office Zone	0.242	0.058
		4.3 Government Office	0.163	0.039
		4.4 Industry Zone	0.058	0.014
		4.5 Airport	0.058	0.014
Total	1.000			1.000

Table 5 Weights of Factors and Sub-factors for Land with Price Higher than 100,000 Baht/Square Wah.

Factor [1]	Weight [2]	Sub-factor [3]	Local Weight [4]	Weight [5] =[2]x[4]
1.Transportation	0.623	1.1 Urban High-speed Train	0.586	0.365
		1.2 Highway	0.178	0.111
		1.3 Main Road	0.100	0.062
		1.4 Sub-road	0.093	0.058
		1.5 Bus Stop	0.043	0.027
2.Facilities	0.130	2.1Shopping Mall	0.669	0.087
		2.2 Convenience Store	0.162	0.021
		2.3 Fresh Market	0.100	0.013
		2.4 Public Park	0.069	0.009
3.Utilities	0.040	3.1 Police Station	0.500	0.020
		3.2 Hospital	0.500	0.020

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Table 5 Weights of Factors and Sub-factors for Land with Price Higher than 100,000 Baht/Square Wah (Cont.)

Factor [1]	Weight [2]	Sub-factor [3]	Local Weight [4]	Weight [5] =[2]x[4]
4.Workplace	0.207	4.1 Academic Institute	0.348	0.072
		4.2 Office Zone	0.386	0.080
		4.3 Government Office	0.145	0.030
		4.4 Industry Zone	0.082	0.017
		4.5 Airport	0.039	0.008
Total	1.000			1.000

Tables 4 and 5 show the weights of the location selection factors as rated by the experts using a pair-wise comparison based on the Analytic Hierarchy Process, where the summations of all the weights equal 1. They also show the weights of the sub-factors of each factor, which are derived from multiplying the local weight of each sub-factor (column [4]) by the weight of its main factor (column [2]). For example, the local weight of the sub-factor "urban high-speed train" for the model for the land with a price between 10,000-100,000 Baht/square wah is 0.054. Therefore, the weight of this sub-factor equals 0.578 x 0.537 = 0.310. It should be noted that the summation of the weights of all the sub-factors in each factor equals the weight of the factor, while the summation of all sub-factors equals 1.

7 Conclusion and Discussion

The results show that there are four factors affecting location selection when developing condominiums with a height not more than 23 meters in Bangkok, i.e., transportation (Tran), facilities (Fac), utilities (Uti) and workplace (Wor), and the models derived for ranking the land are as follows:

1)For the land with a price between 10,000-100,00 Baht/square wah, the model is:

Y = 0.578(Tran) + 0.135(Fac) + 0.047(Uti) + 0.240(Wor)

2) For the land with a price more than 100,000 Baht/square wah, the model is:

$$Y = 0.623(Tran) + 0.130(Fac) + 0.047(Uti) + 0.207(Wor)$$

Where, Y = land location score
Tran = score of transportation
Fac = score of facilities
Uti = score of utilities
Wor = score of workplace

To find the land location score for each piece of land, the scores of the transportation (Tran), facilities (Fac), utilities (Uti) and workplace (Wor) of the responsive models (equation [2] or [3]) shall be calculated by assessing each sub-factor using a Likert Scale (1 to 5, where 1 is least competitive and 5 is most competitive).

From the models, the most important factors for location selection for the low-rise condominiums are transportation, workplace, facilities, and utilities, respectively which are in accordance with some related works of the other residential types such as single-detached houses and townhouses (Chandrasugree and Vesdapunt, 2014; Phongsawat, 2013).

Moreover, to facilitate the calculation process, tabular forms of the models are suggested, as shown in Table 6. The example table shows all factors and sub-factors as well as their weights for the model of the land with a price between 10,000 to 100,000 Baht/square wah. Users can use this table by assessing all 16 alternative land sub-factors with the Likert Scale scores in columns D_1, D_2, D_3, ... , D_n for land Number 1, Number 2, Number 3, ... , Number n, respectively. The weighted scores (E_1, E_2, E_3, ..., E_n) can be calculated by multiplying the weight in column C with the scores in column D for all land. The total score for each land shall be the summation of the weighted scores for the land, as shown in the following matrix-form equation:

$$[\text{Total Score}_i]_{1x1} = [C]^t_{1x16} \times [D_i]_{16x1}$$

Where, i = 1, 2, 3, ..., n
$[\text{Total Score}_i]_{1x1}$ = Matrix of Land Number i Score
$[C]^t_{16x1}$ = Transposed Matrix of Sub-factor Weights
$[D_i]_{16x1}$ = Matrix of Scores for Land Number i

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For the land with a price higher than 100,000 Baht/square wah, users can use a similar table, where the weights in column C shall be replaced with the local weights (column [4]) from Table 5.

Finally, some important recommendations and limitations should be addressed.

1. The models can help real estate developers select land more effectively and systematically for low-rise condominium development in Bangkok.

2. The users can either quickly use the models by directly assessing the main factors or use the models more slowly by assessing detailed sub-factors, as described above. However, to make the results comparable, the same approach should be used for all land to be compared.

3. The models have two limitations: first, the scores of the factors and sub-factors input to the models using a Likert Scale are subjective, and a more objective scoring method is recommended for further study. Second, the land location score acquired from the proposed models is relative, which means it can specify the best choice among only the selected land; it cannot specify the land's absolute potential. To do that, the criteria for translating the scores acquired from the models need to be further study. This will help with correctly locating condominium developments.

Table 6. Tabular Form of Model for Land with a Price Between 10,000 to 100,000 Baht/Square Wah

Factor [A]	Sub-factor [B]	Weight (%) [C]	Land No.1		Land No.2		Land No.3	
			Score (1-5) [D_1]	Weighted Score [E_1]	Score (1-5) [D_2]	Weighted Score [E_2]	Score (1-5) [D_3]	Weighted Score [E_3]
1.Transportation (57.8%)	1.1 Urban High-speed Train	31.0						
	1.2 Highway	11.5						
	1.3 Main Road	2.8						
	1.4 Sub-road	8.0						
	1.5 Bus Stop	4.5						
2.Facilities (13.5%)	2.1Shopping Mall	8.9						
	2.2 Convenience Store	2.2						
	2.3 Fresh Market	1.5						
	2.4 Public Park	0.9						
3.Utilities (4.7%)	3.1 Police Station	0.5						
	3.2 Hospital	4.2						
4.Workplace (24.0%)		11.5						
	4.2 Office Zone	5.8						
	4.3 Government Office	3.9						
	4.4 Industry Zone	1.4						
	4.5 Airport	1.4						
Total Score		100.0						

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