Factors influence the housing price in Kuala Lumpur by using AHP

Gan Fui Yee¹, Suliadi Firdaus Sufahani¹, Mohd Helmy Abd Wahab² and Syed Zulkarnain Syed Idrus³

¹ Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, Pagoh Campus, 84600 Pagoh, Johor, Malaysia
² Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat Johor, Malaysia
³ Faculty of Applied and Human Sciences, Universiti Malaysia Perlis, 01000 Kangar, Perlis, Malaysia

Corresponding Author Email: fuiyee95@gmail.com, suliadi@uthm.edu.my

Abstract. The housing affordability issue was bothered the B40 and M40 buyers where the income level of the buyers cannot afford the higher housing price in Kuala Lumpur. To understand the factors that contribute to the housing price can improve the planning for the buyers. The planning for purchasing the residential property should be construct by the buyers to analyze the financial ability. Analytical Hierarchical Process can show the hierarchical diagram for the factors interested which have the higher priority is define as the important factor towards the housing price.

Keywords: Housing Affordability, Kuala Lumpur, Analytical Hierarchical Structure

1. Introduction

Residential property is a building which can functioned as a home or habitat for humans to live. House can describe as the essential needs to human beings [1],[2],[3],[4],[5],[6],[7],[8],[9]. Moreover, house also can illustrate as a shield or shelter for individuals or families which could accommodate with a harmonious and comfort place for individuals or families [4],[6],[7],[10]. Most of the Malaysian assigned the house as the heaven which represented that the house is one of the essential requirements to most of the Malaysian [2]. Besides that, the residential property is a fundamental for health, welfare and survival of individuals where it can be the indicator which use to measure the degree of a person’s wealth and life [1],[2],[4],[7].

Recently, residential property also been defined as an essential component in economic where house is one of a long-term profitable investment in Malaysia [2],[3],[4],[10],[11],[12]. Housing is a vital investment for individuals because housing have significant contribution to social interaction and socio-economics. Therefore, most of the households will enhance their quality of life and community to have a closer relationship with the neighborhoods [4].

Moreover, the investor and the policy maker will prefer to control and monitor the housing market due to the influence on global economy. The policy maker and investor prefer to maintain the
fluctuation of the housing market in economic [7]. Besides that, the housing market also be the vital factors on demographic factors where the income level of individuals will be directly influenced by the fluctuation of housing price [2], [4].

The price of construction materials is one of the factors that influence the housing price where the construction materials are the fundamental of the residential property [2]. The factor that affect the housing price also include the infrastructure and facility surround the residential property which may bring the convenient to the households [2], [3]. The location of the residential property will be the main factor that bring the significant contribution to the changes of housing price where this is the criterion will be considered by the buyers [4].

The housing price in Kuala Lumpur was 40% higher compare to other states in Malaysia [1]. Thus, the buyers in Kuala Lumpur may facing the housing affordability issue [2], [9], [10]. The housing unaffordability was a serious issue for low-income households and middle-income households [9]. The affordability issue was been noticed by the government and some solutions been proposed in order to assist the households [4]. However, the solutions did not perform well when the households facing the higher housing price that cannot be afford by their income [3].

Affordability can be defined by different concepts, but the consumer was preferred to describe the affordability as the housing price is 30% lower than the family’s income including the utilities and the monthly expenses [1], [9], [13]. The researchers stated that 66.7% of the population in Kuala Lumpur was been categorized as lower-income and middle-income group where they were facing the housing unaffordability issue [1].

There are 79.1% of the houses cannot be sold in year 2017 which due to the purchasing power of the households where the buyers were facing the unaffordable issue in housing market [14], [15]. The government of Malaysia was proposed five housing entities such as Perbadanan PR1MA Malaysia, 1 Malaysia Civil Servants Housing Programme (OOA1M), UDA Holdings Bhd, Syarikat Perumahan Negara (SPNB) and the Hardcore Poor Housing Programme (PPRT) [17]. PR1MA was corporate with some contractors and developers but most of houses did not been included. The writer mentioned that the government was trying to balance the increasing supply of mid-to-luxury house homes and low supply of affordable housing in urban areas where a chronic demand was continued to grow [14].

Nowadays, the government has offered some schemes to assist the buyers to purchase the residential property. One of the options offered is rent-to-own which supported by the banker and developer by allowing buyers to buy the property after 5 years rent [16]. Besides, Houzkey Program was launched by government too. The mentioned program will waive the legal fees and stamp duty during the purchasing of residential property, where allows those buyers enjoy the relatively lower cost [17].

Refers to the newspaper, Sin Chew, Minister of Finance has proposed a new scheme for the first times home buyer to enjoy stamp duty free if the property’s price is between RM300,000 to RM2,500,000 [18]. According NAPIC, the unsold residential property illustrated the increasing trend till the last quarter of year 2018. The government was collaborating with the developers to provide a 10% discount on the SPA price of the residential property under House Ownership Campaign (HOC).

However, these did not help much for the B40 and M40 buyers to buy their own house as there are issues of the supply-demand mismatch and low annual income growth [19]. Thus, the B40 and M40 buyers unable to afford the higher housing price as today.

Moreover, the decision-making process is the vital process where the decision making may influence to the outcome. The process involves the alternative and criteria selection. The alternative involves the different preference on each criterion and the criteria involve the different importance. The understanding about the method measurement and scale measurement is important during the best criteria and alternative selection. The scale measurement can evaluate the unit and the judgement where the judgement may include bias due to the view of the respondents. However, this issue can be solved when the respondents are the experts who contains the professional knowledge about the interested topic. Besides that, the main concepts of the Analytical Hierarchical Process (AHP) can also resolve the issue where AHP is a decision-making tool to deal with the complex, unstructured decision [20], [21].
The aims of this research are related to the factors that might affect the buyer group to consider to buy the residential property by using the decision tree and analytical hierarchical process.

2. Literature review

2.1 Housing affordability

In Malaysia, the property value is mainly seriously unaffordable for medium or lower income group. This research was carried out to identify the relationship between location of residential property and the affordability of low- and medium-income buyer. The researchers studied and realized that the Putra Heights is a place which suitable for the mentioned income group since the transportation and accessibility fulfill overall requirements [22].

According to the journal from Gopalan & Venkataraman, the affordable property was an issue that been concerned by the whole world. The researchers were giving a guidance of policies on the housing transaction and suggested solutions for the consumers. The researchers also highlighted the crucial issues related to the affordable housing sector which were limited supply of land, lack of market knowledge, tilting issues, increment of costs and the regulatory constraints. The researchers had suggested to increase the effectiveness in policy by having effective communications with politicians during the appropriate time [23].

Housing affordability was a key factor towards the households. As the housing price was rapidly increasing, the households were relatively unable to afford the price. Thus, this research was carried out to determine the factors that affect the housing price from the developers’ perspective and provide some constructive solutions to tackle this issue. As the result obtained from this research, the location, macroeconomics factor, demographic factor, land or zoning and industry factor were the main factors influence the price. Besides that, the researchers were suggested to conduct a survey with a huge sample size due to the limitation on small sample size [12].

The researchers carried out a research regards to the issue of housing affordability. This research was about the overview of challenges and problems in affordable housing provision to provide a rule of thumb on the housing affordability problem for housing development and government. The researchers pointed out on the factors of housing affordability issue were mainly about the income factors, the high population of urban centre, increasing of housing price, inadequate demand and supply of affordable land and the cost of construction materials and technologies. The recommendation given was about to increase the effectiveness of the construction technologies as the construction time and cost could be reduce and how the affordable house could be constructed [24].

According to the research, the issue housing affordability been reviewed and provide a set of solution to the serious issue that may influence the social relationship between the household. As per the outcome of this research, the researchers believed that the housing price, housing loan and housing scheme’s policy were the main factors that caused the middle-income group hard to afford the residential property. The researchers were recommended to resolve this issue soonest in order to enhance the living quality of the Malaysian [1].

As a conclusion, the housing affordability issue was occurred in global including Malaysia. The researchers conducted a lot of researchs to understand the root cause of this issue in order to reduce the cases happen to assist the consumer to buy a residential property affordability.

2.2 Factors affect the housing affordability issue

Baquitayan conducted a research which used to determine the influenced the factors on the housing issue such as housing price, housing quality, transportation, schools, safety and security and economic development. This research was focused on the middle-income residents in Malaysia. Most of the residents were facing the housing affordability issue. The researcher suggested that the government should play good role to resolve these problems to provide a livable home standard for the citizens [1].

In the research that been conducted by Cheah, Almeid & Ho, the researchers stated that the three main factors that will influence the housing affordability which were the mismatch between supply
and demand, new launched skewed towards unaffordable range and growth in housing price not higher than the growth in household income. Besides that, the researchers also provided five policy solutions to tackle the housing affordability gap in Malaysia. First, centralization of affordable housing initiatives. Second, establishing an integrated housing database and an efficient applicant register. Third, reducing construction costs, followed by rehabilitating the balance of sheet of households and strengthening the rental market [19].

Based on the research of Hashim, the researcher stated that the housing price in Malaysia was influenced by population change, income, stock prices and cost of capital. As the result obtained, the health of housing market was played a vital role in the housing affordability issue in Malaysia which correlated to the purchasing power of the public. As a conclusion, the researcher enhanced that the supply and demand of housing should be concerned by the local and national market where the sustainable housing supply can reduce the market stress and make the residential property to be affordable for most buyers [25].

The housing affordability was been used as the key measure for a country’s socio-economy stability in the research. The researchers stated that the price income ratio could be applied to measure the housing affordability to understand the main factors that contribute to the fluctuation of housing price recently. The researchers concluded that this research should be able to suggest to the government to improve in the regulating effort to ensure that the medium-income group can afford the higher housing price in Malaysia [26].

In Malaysia, the government provided the low-cost housing scheme for the low-income earners to solve the accessibility and affordability problems. A research was conducted to understand the various factors by causing the shortage of low-cost housing in Malaysia. The researchers found out the root causes for this issue and provided some possible solutions on it. However, the researchers stated that the limitation of this study was the qualitative approach covered the seven states and one territory. The finding of the research was tough to generalize across the nationwide. Therefore, the researchers were giving a recommendation to use quantitative approach to conduct the research. The quantitative approach may obtain the finding which are easily to interpret [27].

Fallahi conducted a research to examine the implementation of housing policies in Malaysia for the low-income group. The research reviewed the housing policy which have been proposed by the government. The researcher realized that the private and public segments were corporate to make a long-term accommodation improvement strategic specifically for the low-income group. The recommendation given to the government by demonstrating the proportion of low-cost housing to be constructed [28].

The researchers investigated the relationship between the macroeconomics factors and the fluctuation of housing price in United stated from year 1999 to year 2013. The researchers found out that the real gross domestic product, the real interest rate and the unemployment rate were the contributed factors which will affect the differs of housing price. The limitation of this study was the data source. The data obtained from different sources and showed the discrepancies on the data. Thus, the researchers gave a recommendation about the data collection as collect the data from reliable source such as World Bank [7].

In year 2016, the researchers had conducted a study to understand about the relationship between the macroeconomics factors with the residential property price in Malaysia from year 1998 to year 2015. However, the researchers investigated the factors such as consumer price index, lending interest rate, population and gross domestic product which indicates that the different determinants used in both researches. Moreover, both researches had the same limitation with the data sources [28].

According to the researches that been conducted by the researchers, there were some factors that may influence the housing affordability issue. The housing price, transportation, population, economic development, macroeconomics factors, housing policy and the household income. These factors should be concerned and overcome with a proper planning and strategy from the buyers.

2.3 Analytical Hierarchical Process (AHP)
Analytical Hierarchical Process was widely used in solving decision-making issue in engineering application where there contain two evaluative criterions in a study. The analytical hierarchical process can be determined by using a software package. Expert Choice in year 1995 [29].

Moreover, the analytical hierarchical process also be applied in reconfiguration manufacturing systems. There contains two planning in this study which are long term planning and short-term planning. In year 2003, the Expert Choice software package also be used for analytical hierarchical process. However, the analytical hierarchical process also contains uncertainty in the analysis where the priorities scale is subjective judgement. Thus, the researchers suggest the backward hierarchy method to reduce the uncertainty [30].

In year 2008, the analytical hierarchical process also been used to resolve the traffic planning issue. The researchers were developed a computer application that can apply on the current market. The analytical hierarchical process can be applied in three software package which are Mathematica, Expert Choice and HIPRE 3+ [31].

Moreover, the analytical hierarchical process also been functioned in agriculture sector and landslide susceptibility [32], [33]. The analytical hierarchical process was useful in solving complex decision issue which can provide an accurate and applicable analysis in landslide. Although, the subjective judgement will provide the inaccurate findings, but, the decision metrics can reduce the bias which may occurred in analytical hierarchical process [33].

The public bus transport’s supply quality issue also can be solved by using analytical hierarchical process. The data used in this research was collecting by constructing a questionnaire. The respondents may bring the bias outcome when answering the questionnaire and the preference order was sensitive in the hierarchy structure [34].

In year 2014, the analytical hierarchical process also been used in healthcare technology and solid waste treatment system [35], [36]. In the solid waste treatment study was contain nine criterions and three alternatives which define as complex analysis. The sensitive analysis was been applied and the results showed that energy recovery was the best performing technology [36].

In year 2014, the analytical hierarchical process was been applied in road traffic safety issue where the researchers were determined the factors affect the road traffic safety issue. The factors can be evaluated and be rank based on the priority by using the analytical hierarchical process [37].

Besides that, the analytical hierarchical process also be used in the investigation which related with the customer behaviour in digital market. The prioritize of the criteria can be evaluated based on the data collection with the respondents by using the questionnaire and the face-to-face interview with the experts in particular area. Moreover, the researchers concluded the limitation for analytical hierarchical process was the determination of the interrelationship within the criteria and sub-criteria because the analytical hierarchical process can only determine the importance of the criteria [38].

As the summary, the analytical hierarchical process was widely used in various fields by solving the complex and unstructured problems such as operation management, budget allocation, benchmarking, win-win management, total quality management, site selection and education [38], [39], [40], [41]. Analytical hierarchical process was the combination of quantitative analysis techniques which include the linear programming, game theory, conjoint analysis, goal programming, SWOT analysis and data envelopment analysis [20].

3. Methodology

3.1 Analytical Hierarchical Structure

The construction of hierarchical structure in analytical hierarchical process involves the goal, alternatives and criteria. The performance or judgements were made according to the ratio scale and been synthesized through the hierarchical structure. The top of the structure is the goal and continue with the criteria which may involve various levels. The bottom of the structure was the alternative. The place for the criteria is mutually exclusive the importance for the criteria and the criterion was not depend on the present relationship between each criterion. The consistency of the judgement will be
influenced by the number of alternatives where the number of alternatives should be small and not greater than seven. If the number of alternatives greater than seven, the rating mode in analytical hierarchical process may apply in alternative level 2 [42].

The objectives for the construction of hierarchical structure in analytical hierarchical process is to provide an overall view for the complex relationship which can capture the spread of the influence for the criteria and can allow the decision makers to do the comparison in terms of the weight of impact [20], [21], [42].

Moreover, the preference matrix was been formed to do the comparison between the importance of the elements in each level from top to the bottom of the hierarchical structure where the preference matrix was showed in Equation [1]. The Pairwise comparison matrix, \( S = (s_{ij})_{p \times q} \), where \( p = q \).

\[
S = \begin{pmatrix}
s_{11} & s_{12} & \cdots & s_{1q} \\
s_{21} & s_{22} & \cdots & s_{2q} \\
\vdots & \vdots & \ddots & \vdots \\
s_{p1} & s_{p2} & \cdots & s_{pq}
\end{pmatrix}
\]  

(1)

with \( s_{ij} > 0 \) express the degree of preference of \( v_i \) to \( v_j \).

The preference of each element depends on the fundamental scale, which was developed by Saaty as showed in Table II. The fundamental scale is insensitive about the small change in the preference where could reduce the uncertainty influence in the evaluation [20], [43], [44].

After that, the weight for the elements can be determine by normalized the eigenvector in the preference matrix which been named as the synthesizing process. The weight can be calculated by using the formula stated in Equation (2), where the entry in pairwise comparison matric is approximate the ratio between two weights [20], [21], [43], [44].

\[
s_{ij} \approx \frac{\omega_i}{\omega_j}
\]

(2)

where \( \omega \) represent the weights for each entry in matrix \( S \). Therefore, matrix \( S \) can be expressed as Equation (3).

\[
S = \frac{\omega_i}{\omega_j} \cdot (s_{ij})_{p \times q} = \begin{pmatrix}
\frac{\omega_1}{\omega_1} & \frac{\omega_1}{\omega_2} & \cdots & \frac{\omega_1}{\omega_q} \\
\frac{\omega_2}{\omega_1} & \frac{\omega_2}{\omega_2} & \cdots & \frac{\omega_2}{\omega_q} \\
\vdots & \vdots & \ddots & \vdots \\
\frac{\omega_p}{\omega_1} & \frac{\omega_p}{\omega_2} & \cdots & \frac{\omega_p}{\omega_q}
\end{pmatrix}
\]

(3)

A condition of multiplicative reciprocity \( s_{ij} = \frac{1}{s_{ji}} \), matrix \( S \) can simplify as the Equation (4) [43], [44].

\[
S = \begin{pmatrix}
1 & \frac{1}{s_{12}} & \cdots & \frac{1}{s_{1q}} \\
\frac{1}{s_{12}} & 1 & \cdots & \frac{1}{s_{2q}} \\
\vdots & \vdots & \ddots & \vdots \\
\frac{1}{s_{1q}} & \frac{1}{s_{2q}} & \cdots & 1
\end{pmatrix}
\]

(4)

The final score of the alternative is to sum the product of the weight for each criterion times the scaled weight with respect to the criterion, where the sum includes all the criteria. There contain two synthesis modes which are distributive and ideal mode.

Distributive mode is the model that normalizes an alternatives’ score under each criterion and sum into one. This mode depends on the performance of the alternative where the rank may reversal. The ideal mode is different compare with distributive mode where the score of each alternative will divide by the score of the best alternative under the criterion. This mode will preserve the rank if the unimportant alternatives are deleted or added [20], [21]. There contains a rule of thumb for decision maker to use the correct mode based on certain condition. The distributive mode could use to estimate
the extent to which alternative that dominate all alternative under the criterion. The ideal mode could use to determine the performance of alternative that relate with a fixed benchmark [45].

Moreover, the sensitivity analysis can be applied to understand how the changes weight affect the findings [21]. The decision maker can check and improve the consistency by using the eigenvalue. The inconsistency was been defined as 10% of total concern with the consistency measurement or one order of magnitude less important than consistency [20]. The consistency index for matrix S can calculated by using Equation (5).

\[ CI(S) = \frac{\lambda_{max} - p}{p - 1} \]  \hspace{1cm} (5)

where \( \lambda_{max} \) is the maximum eigenvalue for matrix S and \( p \) is the number of rows of matrix S [46].

The consistency ratio also can calculate by using the formula stated in Equation (6).

\[ CR(S) = \frac{CI(S)}{R_{ln}} \]  \hspace{1cm} (6)

where \( R_{ln} \) is the random index.

When the value of CR is smaller than 0.1, the matrix S will be accepted. However, the value of CR is greater than 0.1, the matrix S will be rejected. If the value of CR is equal to one which indicates that the judgement is 10% consistent [47], [48],[49],[50],[51].

Analytical hierarchical process can be conducted by using the program named Microsoft Excel. In Microsoft Excel, the tables and matrices used can construct the analytical hierarchical process easily and clearly. This can simplify the complicated process.

4. Expected result

The study is focus on the determination of factors which contribute towards the housing price in Kuala Lumpur. The hierarchical diagram constructed by using techniques analytical hierarchical process which display the factors which will influence the housing price directly. The importance for each criterion will be evaluated and ranked. Furthermore, the analytical hierarchical process will provide the best alternative for the goal.

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