



## A model to Estimate the Implicit Values of Housing Attributes by Applying the Hedonic Pricing Method

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### History:

Received: 5 March 2017

Accepted: 3 April 2017

Available Online: 30 May 2017

### Keywords:

Hedonic price model, implicit value, housing attributes.

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### DOI:

10.11113/ijbes.v4.n2.182

### ABSTRACT

Many scholars focused on the location based attributes rather than the non-location factors in decision making on land prices. Further, new research studies have identified the importance of the non-location attributes with the location factors. Many studies suggest that, many attributes exist which affects the housing price. Since the attributes involved and dominant for a particular case differs from one situation to the other, there cannot be an exact list of attributes. Yet, identification of factors that determine housing price and their relationships and the level of influence have poorly understood in planning and property development in the context of Sri Lanka. This study attempts to address what make householders to decide on housing price and application of hedonic pricing approach to estimate the implicit price of housing attributes in context of Sri Lanka. A sample study of selected fifty (50) single house transactions in Maharagama urban neighborhood area has been utilized to illustrate the applicability of the hedonic pricing model. As a methodology, correlation analysis has been carried out to study the degree of relationship between the housing price and the independent variables. The attributes which correlate with housing prices, the study identified the most significant attributes. A model was developed to estimate the future house price by applying the pricing model which is incorporated with these attributes. A hedonic house price model derived from multiple liner regression analysis was developed for the purpose. The findings reveal that six attributes as design type of the house, distance to the local road, quality of Infrastructure, garden size, number of the bed rooms and property age are contributed to estimate the implicit value of Housing property. The model developed would be used to identify implicit values of houses located in urban neighborhood area of Sri Lanka.

## 1. Introduction

The study is mainly focused to find applicability of HPM for estimation of implicit prices of the housing attributes in the context of Sri Lanka. Housing is one of the basic needs of people. It is unique and has specific characteristics when compared with other goods like durability, heterogeneity, and being spatial fixed. Each residential unit has a unique bundle of attributes, its accessibility to work, transport and amenities, structural characteristics, neighborhood and environment (Leong, 2003). Specially, in the real estate market, residential property is one of the main activities which have a high demand from people (Wheaton, 1999). Thus, deciding prices for the residential property is critically important. When a residential property is sold or purchased, it cannot be considered as a separate unit. It is implicitly combined with many qualities of the surroundings. When the price of a house is being decided, a bundle of inherent attributes such as location, structural, or neighborhood of the housing unit play a vital role, directly affecting the price (Yoo & Kyriakidis, 2009). Residential Property market is one of the main development activities which play a major role in the current development trend in Sri Lanka. But in the present market, housing price is determined only on the current market value. There are several implicit values of the housing attributes that are not taken into account normally (Yusof & Ismail, 2012). This has become a huge issue that many

people in general are not aware of, and can negatively impact on property developers, policy makers, real estate agents and property owners as well. Due to that reason, the implicit value of the housing attributes when deciding housing prices in the property market should also be addressed in order to identify its real value. The hedonic approach can be utilized to arrive for a better set of standards or measurements for residential property values to bridge this gap (Malpezzi, 2002). While theory is not much of a guide, experience from many studies suggests that, many attributes exist which affects the housing price. Since the attributes involved and dominant for a particular case differs from one situation to the other, there cannot be an exact list of attributes (O'Sullivan & Gibb, 2006). Therefore the aim of this research paper is to address what make householders to decide on housing price and whether hedonic approach can be used to estimate the implicit price of housing attributes in Sri Lankan context. This study will first identify the factors that affect the decision of housing price, and secondly, the research will examine the applicability of the hedonic approach to estimate the implicit price of the housing attributes in the property market in Sri Lanka. In Sri Lanka, a number of attributes can be affected on the residential property value. However this study is mainly focused only on selected attributes which influence Sri Lankan pricing market is mostly, based on perception of the officers who are engaged in property development, valuation and potential

buyers who lived in Colombo, Sri Lanka. And through this study, it is expected to consider the residential properties of which the transaction price can be conveniently found in the selected location in Sri Lanka within a limited time period.

## 2. Housing Attributes and Hedonic Pricing Method

Housing is one of the basic needs of humans. Many researchers and philosophers have defined this in different ways, in different eras. The United Nation's housing policy Guidelines for developing countries (1976) defines housing as a concept, since housing is more than a physical shelter. Housing encompasses all the auxiliary services and community facilities, which are necessary for the wellbeing of humans. The United Nation's Social program of housing in urban areas: refining the concepts in 1992 says that, "A house provides not only shelter for a family, but also serves as a center of its total residential environment, a force of economic activities, as a symbol of achievement, social acceptance and an element of urban growth and income distribution" (Ariyawansa, 2009). Based on the different research ideas and concepts, 'housing' basically means, not only the physical structure, rather a combination of many other amenities and facilities. As the time changes, housing fulfill not only the survival needs, but also other types of needs such as security, social esteem and even actualization of needs. Therefore housing has become a "Product" (Ariyawansa, 2009). With that change, there is a lot of literature emerged based on the housing market. From a purely economic perspective, housing represents the characteristics of a private property as it is not available in a noncompetitive manner and does not have the same characteristics of a public good (Bandara, 2011). However, housing economists have identified there are essential differences between housing and standard market commodities, since it is very heterogeneous, complex, highly durable and spatially fixed (Leong, 2003). One may purchase a house once in his or her lifetime. Therefore, purchasing a house is both an investment and a consumption decision (Yusof & Ismail, 2012). Thus people engaged in the housing area and interested in the particular subject area have identified the needs of the housing market. In the housing market, mainly there are a number of concerned parties namely, occupiers, realtors (estate agents), landlords, operators, developers, financial institutions and government institutes.

Today, housing demand shows an upward trend. Basically, housing demand is increased due to different factors such as the population growth, industrialization and urbanization. Housing demand is smaller than the housing need in real world situation because the demand is essentially determined by the ability and willingness of households to pay for a home. Several studies have been conducted on the housing price concept by many researchers. Common identification is that the housing prices are quite volatile relative to observable changes in fundamentals. According to the Malpezzi (1991) point of view, one of the basic methods is to model house prices and rent in a simple supply and demand framework, focusing on income, population changes, non-economic determinants and other supply conditions. But Kim & Renaud (2009) identified, in broad terms, house prices are determined by demand and supply. However time and technology changes have changed the old price paradigm. Many researchers and developers have identified that the price is better explained by the utility function possessed by each commodity. The higher the function is the higher is the price paid for it. Generally, there are two forms of prices: implicit and explicit. The combination of implicit prices sums up to explicit price (Yusof & Ismail, 2012). Based on that new price paradigm, many research studies have identified different housing attributes (i.e. implicit values) that affect the housing price.

Effective market demand determines the housing prices. Literature substantiates that two factors affect the effective demand namely affordability and willingness. The willingness to purchase a housing unit, dominates the housing attributes or determinants. Housing attributes are not explicitly traded in the market, but ultimately, these attributes more or less affect the final price (Yusof & Ismail, 2012). Therefore, many researchers have studied about the determinants of the housing price residential property value. The past urban economics studies have shown that residential property prices are largely determined by location factors such as distance from Central Business District (CBD) ignoring the non-location factors like neighborhood and structural (Raymond Y. C. Tse, 2002 and Yusof & Ismail, 2012). Therefore, most recent studies tried to identify the relative importance of the non- location factors too. Uju & Iyandaand, Yusof & Ismail (2012) concluded that the residential property value or price is largely determined by non – location factors. Many studies have shown different attributes based on their aim of the research. But generally, according to the studies it is commonly agreed that there are three major determinants that explain or model price variation as structural attributes, location attributes and neighbourhood attributes (Yusof & Ismail, 2012).

**Locational Attributes:** Many researchers have mentioned that the location attribute generally means the accessibility to the CBD. No matter how accessibility can be defined, it is evident that it directly affects the housing price (Aluko, 2011 and Leong, 2003). Numerous studies have indicated that buyers prefer sites with good views such as sea, river or park view and are willing to pay for such sites. Leong (2003) noted that there are some special cases based on country, culture and many other things. Some location attributes impact positively while others have a negative impact on the housing price. For instance, the view of the cemetery can carry a negative effect and lucky number determined through Feng-Shui beliefs may result in increased price of the house. Many location attributes have been considered in different researches. They included location and access to markets, location of workplace, distance of the house to place of work, children's school, place of shopping, place of recreation and worship, amount paid to transport from home to area of activities, time spent to travel from home to area of activities (Aluko, 2011). The table1 illustrated the findings of different attributes identified through literature review.

**Structural Attributes:** Prices of properties are frequently related to their structural attributes. Numerous studies reveal that the number of rooms and bedrooms, the number of bathrooms and the floor area are positively related to the sales price of the house. This is because buyers are willing to pay more for space, especially functional space (Aluko, 2011 and Leong, 2003). Researchers also have summarized that building age is negatively related to property prices. The lot size, existence of a basement, garage, and portico, water heating system, one or more fireplaces and air heating system are significantly related to the price of the dwelling (Leong, 2003). The table 2 summarized the structural attributes identified through literature review.

**Neighbourhood Attributes:** Raymond Y. C. Tse (2002) and Mihaescu & Hofe (2012) identify the importance of the neighborhood attributes in the HPM. A good hedonic study has to include neighborhood quality measures, at as disaggregated level as possible. In previous researches, neighbourhood attributes have been variously classified as, socioeconomic variables (social class and the occupation), Quality of Local government or Municipal services (schools, hospitals and places and worship) and Externalities such as crime rate, traffic noise, airport

**Table 1** Location attributes from the literature review

Different Attributes	Authors/source
Distance to the CBD	Leong (2003), Ismail & Macgregor (2006), Leung et al. (2007), Visser, Van Dam, & Hooimeijer (2008), Bhattacharjee, & De Castro (2011), Mihaescu & Hofe (2012), Uju & Iyanda (2012), Yusof & Ismail (2012)
Distance to the railway station	Ismail & Macgregor (2006), Choy, Mak, & Ho (2007), Leung et al. (2007), Visser, Van Dam, & Hooimeijer (2008), Jim & Chen (2009), Bhattacharjee, & De Castro (2011)
Distance to the bus stop	Chang & Lee (1999), Ismail & Macgregor (2006), Choy et al. (2007), Visser, Van Dam, & Hooimeijer (2008), Jim & Chen (2009)
Distance to the work place	Leong (2003), Visser, Van Dam, & Hooimeijer (2008)
Distance to the park / playground	Ismail & Macgregor (2006), Visser, Van Dam, & Hooimeijer (2008), Bhattacharjee, & De Castro (2011)
Distance to the shopping center	Leong (2003), Ismail & Macgregor (2006), Visser, Van Dam, & Hooimeijer (2008)
Distance to the nearest school	Ismail & Macgregor (2006), Visser, Van Dam, & Hooimeijer (2008), Bhattacharjee, & De Castro (2011)
Tenure type of land	Leong (2003), Ismail & Macgregor, 2006)
View of natural quality	Raymond Y.C.Tse (2002), Leong (2003), Choy et al. (2007), Visser, Van Dam, & Hooimeijer (2008), Jim & Chen (2009), Bhattacharjee, & De Castro (2011)
Distance to the market	Leong (2003), Visser, Van Dam, & Hooimeijer (2008), Bello & Moruf (2010)
Access to quality of infrastructure	Leung et al. (2007), Mihaescu & Hofe (2012)
Access to the health facilities	Raymond Y.C.Tse (2002), Leong (2003), Choy et al. (2007), Visser, Van Dam, & Hooimeijer (2008)
Other facilities (pool, gym, tennis court)	Leong (2003), Jim & Chen (2009), Yusof & Ismail (2012)
Disaster prone area	Bhattacharjee, & De Castro (2011), Mihaescu & Hofe (2012), Uju & Iyanda (2012), Yusof & Ismail (2012)
Proximity to nearest A road	Ismail & Macgregor (2006), Ge & Du (2007), Uju & Iyanda (2012)
Proximity to nearest B road	Ismail & Macgregor (2006)

**Table 2** Structural Attributes from the literature review

Different Attributes	Authors/source
Total floor area/net floor area ratio	Chang & Lee (1999), Raymond Y.C.Tse (2002), Leong (2003), Kestens, The'riault, & Rosiers (2006), Choy, Mak, & Ho (2007), Visser, Van Dam, & Hooimeijer (2008), Xu (2008), Jim & Chen (2009), Yusof & Ismail (2012)
Number of living rooms	Ismail & D. Macgregor (2006), Xu (2008)
Number of bedrooms	Leong (2003), Ismail & Macgregor (2006), Visser, Van Dam, & Hooimeijer (2008), Xu (2008), Jim & Chen (2009), Bhattacharjee, & De Castro (2011), Mihaescu & Hofe (2012), Uju & Iyanda (2012), Yusof & Ismail (2012)
Number of storeyed	Ismail & Macgregor (2006), Leung, Wong, & Cheung (2007), Xu (2008), Jim & Chen (2009)
Number of bathrooms	Raymond Y.C.Tse (2002), Leong (2003), Mihaescu & Hofe (2012)
Basement, garage and portico	Leong (2003), Ismail & D. Macgregor (2006), Visser, Van Dam, & Hooimeijer (2008), Mihaescu & Hofe (2012)
Age of the property	Chang & Lee (1999), Leong (2003), Choy, Mak, & Ho (2007), Xu (2008), Bhattacharjee, & De Castro (2011), Uju & Iyanda, (2012), Yusof & Ismail (2012)
Design type	Kestens, The'riault, & Rosiers (2006), Ariyawansa (2009)
Quality of materials which used	Leong (2003), Kestens, The'riault, & Rosiers (2006), Ariyawansa (2009), Uju & Iyanda (2012)
Presence of common decoration	Xu (2008), Uju & Iyanda (2012)
Presence of luxury decoration	Xu (2008), Uju & Iyanda (2012)
Air heating/cooling system	Jim & Chen (2009), Mihaescu & Hofe (2012), Yusof & Ismail (2012),
Garden size	Ismail & D. Macgregor (2006), Ge & Du (2007)

**Table 3** Neighbourhood attributes from the literature review

Different Attributes	Authors/source
Availability of religious places	Mihaescu & Hofe (2012), Uju & Iyanda (2012)
Crime rate	Leong (2003), Bello & Moruf (2010)
Pollution level	Leong (2003), Bello & Moruf (2010), Uju & Iyanda (2012)
Quality of school	Ge & Du (2007), Uju & Iyanda (2012)
Socioeconomic status of people (The type of people living in that area)	Kestens, The'riault, & Rosiers (2006), Mihaescu & Hofe (2012)
Behaviour type of the earlier people	Uju & Iyanda (2012)
Norms and customs	Choy et al. (2007), Leung et al. (2007)

noise and pollution level. The table 3 summarized the neighbourhood attributes identified through literature.

**Hedonic Pricing Method:** The hedonic approach is basically used to estimate the implicit values of the environmental amenities. It is an environmental valuation method. But many researchers study hedonic approach, for the real estate or housing based on above mentioned main three attributes (Yusuf & Ismail, 2012). The basic hedonic equation states that the market prices (P) of a property can be expressed as a function of attributes like structural variables (S), neighbourhood characteristics (N) and property Location attributes (L).  

$$P = f(S, N, L)$$

The term “hedonics” is derived from the Greek word ‘hedonikos’, meaning pleasure. In the economic context, it refers to the utility or satisfaction one derives through the consumption of goods and services. The HPM, derived mostly from Lancaster’s (1966) consumer theory and Rosen’s (1974) model, posits that a good possesses a myriad of attributes that combine to form bundles of utility-affecting attributes that the consumer values (Malpezzi, 2002, Leong, 2003 and Ismail & Macgregor, 2006). Hedonic pricing model currently is a universally applied method, and according to the literature from past years it is frequently used in the United State of America, as well as many other countries. Switzerland, Malaysia and Hong Kong have used HPM on many occasions. The application of HPM is based on some key assumptions as market operates under the perfect competition, there are many buyers and sellers and buyers have perfect concerning housing attributes and price (Leong, 2003). HPM have been used for many of different purposes. Many studies have used hedonic pricing to identify the determinants of the housing price (people’s willingness to pay) for the different type of houses in the relevant housing market. It is very essential need for real estate development. Therefore, this study is to examine the applicability of the HPM for estimation of implicit values of the housing attributes in Sri Lankan context.

### 3. Research Methodology

In this study, the first objective is to identify the factors that affect the decision of housing price. Thirty six (36) housing attributes could be

**Table 4** Description of the relationship between price and housing attribute

Code	Pearson's coefficient of correlation	Significant value	Strength of the relationship
Minimum distance to the CBD	0.130	0.366	Positive weak
Minimum distance to the nearest railway station	0.188	0.192	Positive weak
Minimum distance to the nearest bus stop	0.023	0.908	None
Minimum distance to the nearest park	0.114	0.431	Positive weak
Distance to work place from home	0.117	0.419	Positive weak
Minimum distance to the nearest shopping Centre	-0.007	0.960	None
Minimum distance to the nearest school	0.100	0.489	None
Minimum distance to the nearest market	0.086	0.553	None
Minimum distance to the hospital	0.157	0.276	Positive weak
Minimum distance to the main road	-0.091	0.528	Negative weak
Minimum distance to the local road	-0.545	0.000	Negative strong
Total floor area	0.562	0.000	Positive strong
Number of bed rooms	0.534	0.000	Positive strong
Number of bath rooms	0.562	0.000	Positive strong
Number of storeyed	0.525	0.000	Positive strong
Age of the property	-0.330	0.019	Negative weak
Size of the garden	0.343	0.015	Positive weak

recognized through the literature scan mentioned by the majority of researchers as main determinants under three different headings. However all these attributes are not compatible with the Sri Lankan context while there are some other additional attributes affecting the Sri Lankan housing price, have not been mentioned. The Delphi technique was used to ascertain the validity and consistency of the selection of attributes. The experts were from both public and private sectors including valuers in the department of valuation, valuation officers in local authorities and private property developers. In addition, an interview with the public was adapted as a data collection technique, to get the ideas regarding housing price determinants through preliminary sampling inquiry. The potential buyers were selected from the city of Colombo, the people who are permanently working residing in temporary residences (private, public, non-government organization). As a result, finally six attributes which were not compatible to the Sri Lankan context could be ignored. Their views also helped to change some attribute titles so that they would be more familiar to local people (i.e. Distance to A and B road were changed as distance to the main road and local road). The data regarding selected 36 factors of housing attributes were collected conducting questionnaire survey, direct interviews and field observation survey.

To apply the HPM for the selected attributes, neighbourhood areas were selected from the Maharagama Urban Council (UC), a suburb of the Colombo district. It is located about 16 km away from the city center. Under the Western Province mega polis Development Plan, Maharagama UC area is located between the city of Colombo and the city of Homagama which are identified as two main growth centers. Due to the impacts of these two growth centers located one in the west and other in the east, Maharagama UC area could be developed as a main residential city. The study focuses on housing units of which the owners who moved to the Maharagama UC area purchasing new or

existing house within recent five years (2008-2013). Firstly the resource profile of Maharagama UC was taken as reference and neighborhoods were identified having higher number of residential units and residential demand in the Maharagama UC area. Then, other sources were used especially from the Divisional Secretary, Grama Niladani officers and property developers for identifying the recently transacted housing units by conducting unstructured discussion. Snowball non probability sampling technique was applied in the process since there is no recorded data regarding the transactions housing units of the study. The householders included in this sample were fifty (50). In this empirical study, correlation analysis was used to identify the degree of relationship between transaction housing price and each housing attribute for the continuous variables only. The Chi square test was used to find the relationship between the price and other dummy variables (categorical factors) as quality of infrastructure, vicinity view, design type and etc according to specific hypothesis ( $H_0 =$  Two categories of data are independent). Further to analyze the significant level of each attribute to house sales considering house sale price as the dependent variable and selected attributes as independent variables. Finally Stepwise Multiple Regression Analysis was used to develop a model to assess the selling price of a house considering implicit values of above significant housing attributes in Maharagama Area.

#### 4. Analysis and Discussion of Results

Mainly, eighteen continuous variables were considered including the housing price to calculate the correlation coefficient. Based on the results of the calculation, the relationship between dependent variable and independent variables was mapped. The result shows eight location attributes were not up to the expected sign. It means these attributes are not related with price at all. Five attributes were indicated relatively strong relationship with selling price. The table 4 illustrates the summary of the correlation analysis. Chi square test was used to analyze the thirteen categorical variables such as tenure type, vicinity view, quality of infrastructure facilities, vulnerability to disasters, followed architectural design, availability of religious places, crime rate, pollution level and availability of common decoration etc. Out of thirteen variables, only three were related to the housing price at 0.05 significant levels. They are architectural design of the house, vicinity view of the paddy field or park and quality of infrastructure.

The table 5 illustrates the summary of the Chi-square analysis. Multiple Regression Analysis indicates that six attributes are significantly contributed to decide the housing price in Maharagama UC area being "followed architectural design is the most influential factor at 0.05 significant level. Other factors which were significant are minimum distance to the local road, quality of infrastructure facilities, number of bed rooms, size of the garden and age of the property. The table 6 illustrated the significant level of all attributes on deciding housing price. The result of the study is discusses under main three categories as location, structural and neighbourhood. Rank values were given considering the magnitude of significant values. Hedonic pricing model was developed applying step wise regression analysis for significantly correlated factors. Table7 shows the six models derived from the stepwise regression.

According to the Eckert (1990), validity of the regression model is tested based on the completeness and accuracy of data, sample representativeness, linearity of continuous variables, normally distributed errors and co-efficient of determination ( $R^2$ ). Model 6 is recorded 86.8% of determination of co-efficient correlation ( $R^2$ ) value

**Table 5** Summary of the Chi-square analysis

Code	Pearson's Chi-square	Significant value	Direction of relationship
Tenure type of the house	0.397	0.820	H0 is accepted
Located within the vicinity of river/ paddy field/park	15.278	0.000	H0 is rejected
Quality of infrastructure			
Occurred disaster at current residence within one year	5.093	0.078	H0 is accepted
Special architectural design followed	13.756	0.010	H0 is rejected
Availability of common decoration	3.704	0.157	H0 is accepted
Availability of religious places	0.810	0.667	H0 is accepted
Number of crimes happen in last year	1.241	0.538	H0 is accepted
Availability of pollution generate sources	1.682	0.431	H0 is accepted
Availability of quality schools	2.482	0.289	H0 is accepted
Type people live in surrounding	2.813	0.245	H0 is accepted
The behavior type of earlier residence good	0.174	0.917	H0 is accepted
House built based on the astrological factors	2.641	0.267	H0 is accepted

and comparatively low standard error value that model is very much fit in to the context. Beta values indicate the relative influence of the attributes for deciding housing price in comparable units by emphasizing the magnitude and direction of the relationship.

Followed architectural design and distance to the local road are moderately impacted to the price showing higher values. Further, followed architectural design, quality of infrastructure, number of bed rooms and garden size positively impact to have higher implicit housing value. Distance to the local road and age of the property negatively impact to decide housing selling price. Finally, following hedonic pricing model was developed based on coefficients of those attributes.

$$\text{Log (PRICE)} = 6.467 + (0.240 * \text{Design type}) - (0.003 * \text{Local road}) + (0.186 * \text{Quality of infrastructure}) + (0.00005 * \text{Garden size}) + (0.078 * \text{Bed rooms}) - (0.003 * \text{Property age})$$

Where,

Log (PRICE) is natural log of transaction price in Sri Lankan rupees

Design type is dummy variable which equal one if followed or considered architecture regarding the design, otherwise zero

Local road is minimum distance to the local type of road in m

Quality Infrastructure is a dummy variable which is equal one if there is collection of quality water, electricity facility, good road condition and good waste disposal system, otherwise zero

Garden size is actual size of the land area in sq.ft (excluding the housing area)

Bed rooms are number of the bed rooms

Property age is age of the property in years

There is a less difference between the predicted transaction price by this HP model and the actual transaction price since the mean value of regression standardized residuals on log values of transaction price is very close to the zero (5.5x10-16). The main limitation of this study is consideration of small sample size since the data on housing transaction price are not readily available in Maharagama UC area. This HPM shows age of the property negatively impact on the price. There can be

**Table 6** Significant level of all attributes on the housing price

	Dependent Variables	Sig.	Rank
Location	Minimum distance to the CBD	.485	19
	Minimum distance to the nearest railway station	.335	13
	Minimum distance to the nearest bus stop	.325	27
	Minimum distance to the nearest park / playground	.977	30
	Distance to work place from home	.166	8
	Minimum distance to the nearest shopping Centre	.282	11
	Minimum distance to the nearest school	.831	26
	Tenure type of the house	.958	29
	Located within the vicinity of river/ paddy field/park	.428	15
	Minimum distance to the nearest market	.564	21
	Minimum distance to the hospital	.764	24
	Quality of infrastructure	.000	3
	Occurred disaster at current residence within one year	.615	22
	Minimum distance to the main road	.779	25
Structural	Minimum distance to the local road	.000	2
	Total floor area	.441	17
	Number of bed rooms	.004	4
	Number of bath rooms	.296	12
	Number of storeyed	.719	23
	Age of the property	.021	6
	Special architectural design followed	.000	1
	Availability of common decoration	.265	10
	Size of the garden	.007	5
	Availability of religious places	.238	9
Neighborhood	Number of crimes happen in last year	.450	18
	Availability of pollution generate sources	.944	28
	Availability of quality schools	.367	14
	Type people live in surrounding	.193	7
	The behavior type of earlier residence good	.437	16
	House built based on the astrological factors	.562	20

some exceptional cases, age of the property positively impact on the housing prices (i.e. historically valuable residence- "Walawwa").

From the Location Attributes, Previous similar studies identified that distance to the CBD is positively correlated with selling price. This study reveals that distance to CBD is not significantly important to decide selling price since people who live in Maharagama area prefer to purchase a house located away from the CBD. Six railway stations are located parallel to the high level road or near to the CBD in Maharagama area and people have enough public and private transport facilities. Distance to the schools, hospital facilities and distance to the park and playground were not significantly impact to selling price since available facilities are not enough for catering all population. Maharagama area is very poor in vicinity view so implicit value gained from this attribute is comparatively low. According to this case study, if a residential area consist with enough infrastructure facilities such as water supply, proper waste disposal system, good road condition and electricity facilities, it add implicit value to the housing price. Many studies identified that distance to main road affects to decide high value, but this case was differed from earlier results and located nearest to the local road is the attribute that strongly contributes to the housing price. It was more particularly concerned on the design type rather than the common structural attributes such as the total floor area, common decorations and etc as structural attributes. People who live in Maharagama area commonly expressed much willingness to pay for the structural attributes such as followed an architectural design, more bed

**Table 7 Model co-efficient values**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	6.535	.043		150.434	.000
	Special architectural design followed	.454	.065	.707	6.933	.000
2	(Constant)	6.818	.064		107.333	.000
	Special architectural design followed	.365	.055	.568	6.634	.000
	Minimum distance to the local road	-.005	.001	-.455	-5.315	.000
3	(Constant)	6.661	.061		109.024	.000
	Special architectural design followed	.333	.045	.519	7.334	.000
	Minimum distance to the local road	-.004	.001	-.368	-5.089	.000
	Quality of infrastructure	.222	.045	.346	4.907	.000
4	(Constant)	6.595	.061		108.158	.000
	Special architectural design followed	.362	.043	.564	8.368	.000
	Minimum distance to the local road	-.003	.001	-.323	-4.689	.000
	Quality of infrastructure	.185	.044	.289	4.234	.000
	Size of the garden	0.00005	.000	.198	2.921	.005
5	(Constant)	6.414	.092		70.063	.000
	Special architectural design followed	.301	.047	.469	6.362	.000
	Minimum distance to the local road	-.003	.001	-.309	-4.747	.000
	Quality of infrastructure	.188	.041	.292	4.534	.000
	Size of the garden	0.00004	.000	.168	2.582	.013
	Number of bed rooms	.067	.026	.180	2.550	.014
6	(Constant)	6.467	.090		71.979	.000
	Special architectural design followed	.240	.052	.373	4.624	.000
	Minimum distance to the local road	-.003	.001	-.332	-5.301	.000
	Quality of infrastructure	.186	.039	.290	4.734	.000
	Size of the garden	0.00005	.000	.174	2.809	.007
	Number of bed rooms	.078	.025	.212	3.090	.004
	Age of the property	-.003	.001	-.156	-2.390	.021

**Table 8 Summary of the models**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.707	.500	.490	.22988
2	.829	.688	.675	.18361
3	.892	.795	.782	.15037
4	.910	.828	.812	.13939
5	.922	.850	.833	.13158
6	.931	.868	.849	.12505

rooms, quality of infrastructure and large garden size. Equal to the other places in the world, price of the house is inversely related to the age of the property. From Neighborhood Attributes, Previous studies revealed that traditional views, norms and customs are significant to decide in housing price. In Sri Lanka, some people followed astrological factors, considered earlier people’s behaviour pattern and socio economic environment when purchasing a house. People who live in Maharagama area totally ignored those attributes when purchasing a house.

## 5. Conclusion

First, the housing attributes which were more related to the local context, were identified from the three major headings of location, structural and neighborhood attributes. The outcome of the case study led to the final finding, that people were willing to pay for structural attributes rather than for the other two major attributes. Sri Lanka is an Asian country with a diversity of people following different norms and customs. This variety of culture was expected to play a dominating role when purchasing a house. But research findings indicated that, although norms and customs which fall under neighborhood attributes impacted the purchase decisions to a certain extent, it did not have strong significance which directly affected the housing price. The study findings revealed that structural attributes of a housing property were the primary consideration when making a purchase decision.

This study has employed empirical findings to show that the contribution of each price determinant related to the transaction price of a house can be determined with the application of hedonic regression. In the property or housing development sector, there is no better understanding of the housing attributes and the people willingness to pay. Therefore, this analysis aids the decision making process. The study has identified main six attributes that determines the

housing price. This HPM can be applied to estimate the implicit value in Sri Lankan housing market as a good mathematical model for aid analysis in housing sector in the similar urban context. This analysis will help property developers, potential buyers and developers to identify important factors for which people would willingly to invest based on a particular location. In a planner's point of view, they can make location decisions of where a suitable location for a neighborhood or a housing development, commercial buildings, schools or other facilities are located based on the identified prime attributes. Thus this analysis and approach will help to create quality of housing units for people, as they can better predict the buyer's preferences. The effectiveness of HPM in the Sri Lankan real estate field should be tested in a few more areas which has a considerable number of transacted houses. The findings (significant attributes and developed model) are not valid for the entire country. It will be different from location to location. Therefore further studies may be focused upon different locations along the same process. Attributes can be different based on income groups. Therefore further studies can address different income groups.

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