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A Conjoint Analysis of Buyers' Preferences for Residential Property

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This study evaluates the preferences of middle-high income earners for newly designed high-cost residential property attributes in their purchase decision, by using the conjoint method, whereby the buyers' 'trade-offs' of different product attributes are measured. The fractional factorial design is used to create eighteen sets of product profiles based on a combination of the six most important attributes that determine the purchase decision of buyers. The preference rating of the respondents is then decomposed to yield part-worth utility for each attribute level. A regression analysis shows that the most pertinent attributes of high-cost residential properties trade-off by the respondents, are type of property, design and features, price, built-up

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area, location, and reputation of the developer. Together, these attribute explain about 74% of the buyers' expressed utility of the product purchased. By using a hold-out sample of respondents, a conjoint analysis has predicted the buyers' expressed utility with a reasonable level of accuracy.

Keywords

Conjoint method; Residential, Consumer behaviour; Preference; Utility

1. Introduction

Property purchase is a complex decision-making process as evidenced by costly acquisition, infrequent purchase, riskiness, high self-expressiveness, and awareness among buyers of significant differences among product alternatives (Iman, 2002; Daly et al., 2003; Livette, 2006). Buyers are very particular about the property attributes that they are contemplating, thus, giving rise to differences in attribute preferences among them. In this context, property marketing can be problematic if developers do not have a sufficiently complete picture of buyers' preferences for such attributes. The gap between what the buyers expect or have at their disposal and what the developers provide in terms of product attributes partly gives rise to mismatched property supply and demand, especially in an expanding market (Molin et al., 1999; Volk and Zimmerman, 2000; Tawil et al., 2011). Many reasons have been given for the poor sale performance of residential properties, such as non-strategic location and unreasonably high price. To increase sale performance, various incentives have been given by developers to buyers, including reduced prices, although it is costly and risky. However, to build devoid of the buyer's requirements means to result in marketing failure. As such, to effectively market, a vendor must fully understand consumer needs and perceptions (Levy, 1995). Among other things, these are the needs of buyers and selection criteria.

Developers in Malaysia have adopted various methods to understand the evaluation of property attributes by buyers in their purchase decision making process. Some use gut feelings while others resort to professional advice of property consultants. Many others tend to follow their market competitors albeit that the strategy might be myopic and have a reactive nature. Direct queries on prospective buyers also tend to be a popular approach in property marketing. Glowa (2001) has identified three weaknesses in the last approach. First, buyers might regard all the attributes as important since they are utility-

maximisers. Secondly, the buyers might not know the real reasons for their purchase (March, 1978). Finally, even if they can identify the reasons for the purchase, they may not be able to rank the importance of their selection. The market-test approach is also popular among developers. However, it is constrained by high risks and costs.

This study uses a conjoint analysis to assess buyer's preference in residential property attributes - an important tool in product development, pricing and positioning (Natter and Feurstein, 2002). It recognises that buyers face a 'trade-off' between different attributes that a product may yield. The process of making a selection among different attributes of a product would reveal their real value (Orme, 1996). The value given to a product by buyers will help a marketer identify the product quality that buyers desire (Green and Wind, 1975). In the property context, conjoint analyses have been widely used in residential design and pricing (Fiedler, 1972), assessment of pricing and pre-construction configuration of condominium units (Johnson, 1974), site evaluation (Knight and Menchik, 1974; Lerman and Louviere, 1978), individual preference of housing model (Louviere, 1982; Findikaki-Tsamaourtzi, 1982), selection of homes for the elderly, selection of manufacturer's factory relocation (Levy, 1995), and assessment of damage of real property (McLean and Mundy, 1998).

The paper is organised as follows. Section 2 discusses the conjoint analysis literature in order to identify the framework of the study. Section 3 presents the data and methodology. Section 4 analyses the outcome of the survey data. The conclusions and implications of the study are presented in Section 5.

2. Conjoint Analysis Theory

2.1 Background

Behavioural real estate research has been accepted as a valid and relevant aspect of market analysis (Gallimore, 1999). In this context, conjoint analysis (Luce and Tukey, 1964; Green and Rao, 1971) is one of the many techniques for dealing with situations in which a decision-maker has to choose among alternatives that simultaneously vary across two or more attributes (Green et al., 1999). Attributes are known as characteristics, factors, or quality in property (Kinnard and Boyce, 1984; Lancaster, 1996). Conjoint analysis is a scientific strategy for studying trade-offs among independent variables that maintain a dependent attribute constant (Luce, 1996). It is a qualitative multivariate technique that is used to measure trade-offs made by a person when choosing from a number of alternative product profiles (Kruskal, 1965; Green and Wind, 1975; Green and Srivinasan, 1978).

The basic attributes of conjoint analysis are succinctly described by Orme (2006, p. 25): "…respondents evaluate product profiles composed of multiple conjoined elements (attributes or features). Based on how respondents evaluate the combined elements (product concepts), we deduce the preference scores that they might have assigned to individual components of the product that would have resulted in those overall evaluations".

Conjoint analysis is a concept based on the integration of information whereby users will integrate the information on a set of determinant attributes, which will form an overall opinion on the product profiles (Louviere, 1998). The overall utility for a good can be decomposed into separate utilities for its constituent attributes (Louviere 1994). There are two basic assumptions in a conjoint analysis (Gill and Sanchez, 1997). First, a product is a synthesis that combines various levels of a set of attributes. In this context, home attributes are inter-linked, whereby by using the conjoint method, the inter-linked attributes are 'jointly' evaluated in a consumer's general expression of utility for a given product profile. Second, attribute levels determine the overall user opinion of the product. The objective of a conjoint analysis is to identify the combination of attributes that gives the highest utility to users and to determine the relatively more important attributes in the form of their contribution to the total utility derived. In general, the outcome from a conjoint analysis assists in marketing by resolving problems such as identifying the favourite shares, and carrying out competitor analyses, product design, advertising strategies, elasticity analyses, and creating marketing maps.

The literature suggests that conjoint analysis originates from the economic theory of utility. The utility function of individual users can be determined by using a structural valuation method of priority. The users will determine the level of utility for each attribute of a product and then make a selection based on the rule of compensation (Mowen, 1990). The general assumption is that the decision to purchase a product follows the utility maximisation rule. The rule assumes that every user will select a product with the highest utility or part-worth between alternative products offered in the market as users are known to be wealth-maximisers (Samuelson, 1938). The total worth of a particular product is then determined by the different part-worth of each attribute level (Sayadi et al., 2005). In the process of comparing the utility of different attributes and making selections to maximise utility, a 'trade-off' between the attributes will occur. Similarly, in the process of selecting and buying properties, one will have to evaluate and select different attributes that make up the property in order to maximise his or her utility.

2.2 Real Estate Purchase and Conjoint Analysis

A buyer will consider a number of factors when purchasing a residential property (Ratchatakulpat et al., 2009). The major factors are location, building

size, type of unit, number of bedrooms, design and layout, amenities, facilities, view, density, developer reputation, promotional efforts, security, and convenience (Chua, 1988; Wong, 2001; Chau et al., 2002; Chau et al., 2004). Other attributes that may contribute to dwelling choices are workplace accessibility (Quiqley, 1985) and environmental quality (Bendre et al., 2000). These factors form the market value of a property. In an experiment on the determinants of buyer aspirations and reservation prices of properties, Kristensen and Garling (1996) disclose that they were both similarly affected by the estimated market price. The advantages and disadvantages in these factors create buyer's motivation or demotivation in selecting a property.

Real estate purchase is a complex decision-making process which requires a buyer to pass through a number of steps (Iman, 2002; Koklic and Veda, 2011). It starts with the requirement to identify product profiles, and then a search for information on the related profiles. The set of information gathered will consequently enable the buyer to evaluate these profiles based on certain criteria and hence, to make product choice before completing the purchase cycle with an after-sale evaluation (Louviere et al., 2000).

At the evaluative level, product attributes required by a buyer are determined so that problems identified in real estate can be resolved, and these attributes are evaluated in terms of element, number and importance (Hawkins et al., 1989). Attribute elements include price level, design type, floor size, style presentation, extent of prestige, and image portrayal, for which a buyer considers them in combination during a purchase decision. Number relates to the total evaluative criteria considered in a particular purchase decision-making process while importance concerns the influence that each criterion has in the comparison process.

The accuracy of the evaluation of product alternatives is situational. One situation is where product evaluative criteria do not have any impact on product choice due to the similarity of the levels of criteria between two competing alternatives. Situational factors also affect the importance of a certain evaluative criterion. Location, for example, can be considered as an important criterion if the time factor is ignored.

Having compared all the evaluative criteria for each alternative, the buyer's priority against a particular alternative is formed based on the total utility derived from the attributes that form that alternative. A low level of total utility reflects a smaller degree of importance and vice versa. This forms the basis for assessing buyer's preference in choice of attributes of real estate products. The process of selecting and evaluating product profiles suggest that there will be some trade-off between the profiles, which makes conjoint analysis relevant in determining the design of properties to be developed based on market studies.

In general, the results from a conjoint analysis can serve as a reference for property marketing strategies, especially with respect to applying psychometric methods in understanding some of the aspects of consumer purchasing behaviours (Carrol and Green, 1995). The results from a conjoint analysis provide market intelligence for property developers and marketers to meet their objectives with useful and valid results, and effectively communicate the results to other parties (adapted from Orme, 2010). On a broader scope, the conjoint method helps local planning authorities, housing associations, and development companies to assess or predict the likely consequences of their policies, plans, or investments (Molin et al., 2001).

2.3 Rationales for Using Conjoint Analysis in Residential Studies

The conjoint method used to measure housing choices and residential preferences has been researched for more than three decades (see for example Knight and Menchik, 1974, 1976; Phipps and Carter, 1985; Joseph et al., 1989; Phipps, 1989; Louviere and Timmermans, 1990; Timmermans et al., 1994; Timmermans and Noortwijk, 1995; Molin et al., 2002; Marina and Giaccaria, 2005; Orzechowski et al., 2005; Hsee et al., 2008). The sizeable body of literature on the method as an ex-ante experimental approach to housing/residential choice or preference elicitation has lent a theoretical support for its use. In this context, it has a theoretical validity in principle, in so far as the purpose for its use is concerned.

There has been a debate on the use between conjoint and hedonic approaches to analyzing people's choices, preferences, and utilities (see for example, Earnhart, 2001; Earnhart, 2006). This issue requires specific comparative studies between the stated and revealed preferences of consumers (for example, Kalish and Nelson, 1991; Ben-Akiva et al., 1994). Until such studies are conclusive, the argument for or against either approach is largely qualitative. Combining stated and revealed preference approaches to measure their differences is another option (Ben-Akiva et al., 1994; Timmermans et al., 1994). Such a hybrid approach should be welcome, but it is not the scope of our paper.

The empirical nature of a hedonic analysis makes it useful for inferring about the choices revealed by buyers or their preferences; its calibration for subsequent events is predictive in nature. However, a direct observation on buyers' preferences that is set through traditional hedonic models is not always possible nor does it always provide reliable information. In the hedonic approach, the parametric estimates of a model are dependent upon, among other things, accuracy, comprehensiveness, and timeliness of the data used. Incomplete records, insufficient sales of properties with comparable features within a specified geographic area, time lag, and modeling complexity are among the problems that plague the hedonic method (Childs et

al., 2002; Chay and Greenstone, 2004). Besides, the distinctiveness of design, specificity of target group of buyers, limitedness and localness of the market are important attributes of new residential units. These reasons make the hedonic method unsuitable for estimating new products (Bover and Izquierdo, 2003).

As an ex-ante product design tool (Bauer et al., 1995; Diamantopoulos, 1995; Bergman, et al., 1996; Gustafsson, 1996; Molin et al., 2001), the conjoint method is conveniently executable by using primary data, especially in the planning stages of new products. It is useful in determining the trade-off measurements for analysing preferences and intention-to-buy responses and simulating how consumers might react to changes in current products/services or introduction of new products into an existing competitive array (Green et al., 1999). In particular, it is used to address very specific characteristics of attributes of newly introduced products (such as specific house design) that are not adequately represented in the market (Orzechowski et al., 2005). It helps firms to determine the optimal features of projected, as yet, undeveloped products and services (Marina and Giaccaria, 2005). In our study, the conjoint method is used in a business management process for a new product version (Dolan, 1990; Bernstein and Newcomer, 2009) whereby a developer uses within-reach-customer groups (example, those who visit the developer's office for enquiries) to collect responses about consumer preferences for new products (Molin et al., 2002).

By using the conjoint method, property developers can still give some good intuition about the actual situation. The method can still intuitively identify the attributes considered most important by the purchasers (Bond, 2001). Furthermore, if properly designed and conducted with careful processing of information, it can lead a buyer to create a realistic purchase decision (Egan et al., 2007). For example, stated preference methods can still provide a good interpretation of the significant relationship between residential preferences (using part-worth utilities) and housing attributes (Molin et al., 2001), provide estimates similar to those obtained by revealed preference choice models (Louviere et al., 2000), and lead to the right demand curves and right pricing decisions (Miller et al., 2011).

2.4 Basic Conjoint Method

The conjoint method can involve identification of the level of utility of a respondent, with a certain array of factors and stimuli by using the part-worth model to enable a number of parameters to be measured (Green and Srinivasan, 1978). This model assumes that the relationship between utility and each attribute is linear, thus, a straight-linear curve connects the utility points to different attribute levels.

In forming stimuli, a fractional factorial design reduces the number of profiles that have to be evaluated, while ensuring enough data are available for statistical analyses, which result in a carefully controlled set of "profiles" for the consideration of the respondents. The main goal in this study is to determine suitable property attributes and the specification level of reasonable attributes by using a multivariate analysis (Hair et al., 2006, 2010; Raghavarao et al., 2010).

Let $p = 1, 2, \ldots, t$ denotes the set of t attributes that are used in a study design. Let y_{jp} denote the level of the $p^{th.}$ attribute for the j^{th} stimulus. In the part-worth model, preference, s_j, for the jth stimulus is given as (Green et al., 1999):

$$S_i = \sum_{p=1}^{t} f_p(y_{jp}) \tag{1}$$

where f_p is a function that denotes the part-worth of different levels of y_{jp} for the $p^{th.}$ attribute. In practice, $f_p(y_{jp})$ is estimated for a selected set of discrete levels of y_{jp} with the part-worth for intermediate y_{jp} obtained by linear interpolation. The buyer's utility function from choosing a set of conjoint attributes is given as:

$$r_i(x, z, s) = \varphi[U_i(x, z, s)] \tag{2}$$

where $r_i = \varphi U_i$ is the respondent's rating or stated cardinal preference or expressed cardinal utility for a given product alternative, i, which forms composite product alternatives, z, with a certain level of preference, s. Ratings are regressed on the attributes that describe the alternative choices of product profiles by using a certain defined functional relationship, φ. The general model for estimating marginal utility with respect to a certain combination of product attributes can be specified as follows:

$$r_i(x, z, s) = \varphi[U_i(x, z, s)] = \sum_{j=1}^{y_j} \sum_{p=1}^{t} \beta_{ij} x_{ij} + e_i \tag{3}$$

where β_{ij} = marginal conjoint utility associated with the $j^{th.}$ level (j = 1, 2, 3...y_j) on the $i^{th.}$ attribute; y_j = number of levels of attribute i; p = number of attributes; x_{ij} = the $i^{th.}$ attribute level of a particular product, x (1 if the $j^{th.}$ level is present, 0 otherwise); e = error term; and other variables and symbols are as previously defined.

Equation (3) is estimated by using the ordinary least squares (OLS) technique. This technique decomposes respondent preferences to derive the marginal utility (regression coefficient) for each attribute level. The marginal utility is then used to calculate each attribute's relative importance (ARI). The first step is to determine the range of the highest and lowest marginal utilities derived

from a given attribute, *i*. The next step is to sum up the ranges of all attributes, $\sum i$. ARI is expressed as:

$$\text{ARI} = (i / \sum i) \times 100 \quad (4)$$

The marginal utility information is also used to form a preference regression equation. This equation can be used to estimate or predict buyer's preference (dependent variable) if the presence of independent variables is known.

3. Data and Methodology

We follow the steps proposed by Gustafsson et al. (2007) with some modifications in applying the conjoint analysis in this study. This involves three stages; namely, the construction of product profiles, preference elicitation and measurement, and statistical modelling.

The first stage involves the determining of attributes and the value levels of attributes in the alternative profiles of newly designed residential property products. We initially select ten of the most important residential property attributes - location, price, type of property, built-up area, design/features, neighbourhood, facilities/amenities, cost of borrowing, promotion, and developer reputation – based on a pilot survey of forty-six respondents in September 2010.[1] However, in order to alleviate the confusion in evaluating too many attributes, only the six most important attributes are selected by mean rank from this survey (see Appendix I).[2] In order to select an attribute level, consideration is given to the difference in the average score for each attribute level with the control attribute level (attributes with a low score level). The attribute level with a difference in score of less than one is then selected.

Similarly, we determine the value levels of attributes in the alternative profiles of residential property products based on the mean rank given by the respondents in the pilot sample. Again, in order to reduce complexity in evaluating too many value levels, only the three most important value levels of each selected property attribute are included in this survey (see Appendix II). The cross tabulation of the six selected property attributes and their corresponding value levels' results in a general matrix of product profiles

[1] We adopted this pilot sampling technique for two main reasons. First, it was used in order to corroborate the literature on attributes that determine the buyer's choice of property products. Second, albeit small, the pilot sample enabled us to obtain a consistent ranking of these attributes.

[2] The respondents, in general, cannot deal with more than six attributes without resorting to simplification strategies, and increasing the number of attributes meant that more cards had to be presented to the respondents to obtain meaningful results (Orme, 2009).

shown in Table 1, and accordingly, generates twenty-two full-profile product alternatives (see Table 2).

The second stage involves elicitation of the preferences of prospective buyers for the newly designed residential units, based on the full-profile product alternatives. The respondents are current house owners, but are considering to either purchase or change to another unit. They are carefully chosen to include a representative segment of the eligible population with the required characteristics, such as age group between 35 to 55 years old (actively employed), married with children, middle-to-high-ranked workers, and earning at least RM5,000 per month (to capture the right purchasing power). The sample is drawn in such a way so as to ensure a balanced representation of the Malay, Chinese, and Indian ethnics.

Table 1 Attributes of Newly Designed Residential Properties and Their Value Levels

Attributes	Value Level = 1	Value Level = 2	Value Level = 3
Location (proximity)	Workplace	School	City centre
Price ('000)	RM250- RM350	RM350-RM450	RM450-RM550
Type of property	Semi-detached house	Clustered house	Super-linked house[3]
Built-up area (sq. ft.)[4]	3,000-3,499	2,500-2,999	2,000-2,499
Design and features	Smart-home features	No smart-home features	
Developer reputation	Ranked as one of Malaysia's top 10 developers	Not ranked as one of Malaysia's top 10 developers	

[3] A loosely used marketing term used to describe houses whereby they are joined to each other side-by-side or back-to-back in a row or cluster, with four to eight units per row or cluster. A super-linked unit is normally a premium size unit, larger than a standard unit of 1,540-sq.ft. built-up area.

[4] Popularly coined in the Malaysian context, the term "built-up" area refers to all components of a residential parcel that are improved, such as the main floor area and auxiliary floor area (car porch, set-back, etc.). This is used to differentiate with "land area". Both are normally expressed in square foot or square meter.

Table 2 Description of Twenty-Two Product Profiles

Card ID	Locational Proximity	Price (RM'000)	Property Type	Built-up Area (Sq. ft.)	Smart-Home Feature	Developer's Reputation	Status of Profile
A	City centre	450-550	Super-linked	3,000-3,499	Yes	No	Design
B	City centre	450-550	Clustered	3,000-3,499	No	No	Design
C	Workplace	250-350	Clustered	2,000-2,499	Yes	No	Design
D	Workplace	450-550	Clustered	2,500-2,999	No	No	Design
E	City centre	250-350	Super-linked	2,500-2,999	No	No	Design
F	City centre	250-350	Semi-detached	2,500-2,999	No	Yes	Design
G	School	250-350	Clustered	3,000-3,499	No	Yes	Design
H	School	450-550	Semi-detached	2,000-2,499	No	No	Design
I	School	350-450	Super-linked	2,500-2,999	Yes	No	Design
J	Workplace	350-450	Super-linked	3,000-3,499	No	Yes	Design
K	Workplace	450-550	Semi-detached	2,500-2,999	Yes	Yes	Design
L	School	450-550	Super-linked	2,000-2,499	No	Yes	Design
M	City centre	350-450	Clustered	2,000-2,499	Yes	Yes	Design
N	Workplace	350-450	Semi-detached	3,000-3,499	No	No	Design
O	School	350-450	Clustered	2,500-2,999	No	No	Design
P	Workplace	250-350	Super-linked	2,000-2,499	No	No	Design
Q	School	250-350	Semi-detached	3,000-3,499	Yes	No	Design
R	City centre	350-450	Semi-detached	2,000-2,499	No	No	Design
S	City centre	250-350	Super-linked	2,500-2,999	Yes	No	Hold out
T	School	250-350	Semi-detached	2,000-2,499	No	No	Hold out
U	Workplace	450-550	Semi-detached	3,000-3,499	No	No	Hold out
V	City centre	250-350	Semi-detached	2,000-2,499	Yes	Yes	Hold out

From the original two hundred and fifty randomly targeted middle-high income respondents in Johor Bahru, Malaysia in September 2010, one hundred and fourteen were willing to cooperate. Such a group was chosen because preferences could have been more revealing among relatively more affluent house buyers whose buying decisions are more associated with choices rather than needs. Data collection was conducted over a three-day period, as a purposive sample of potential buyers was invited to a developer's project location. Although small, the sample size was deemed sufficient to derive a reliable conjoint estimating model to address the issue in this study.[5]

A catalogue of twenty-two product profiles is presented and administered as 'product samples' in a series of personal interviews (see sample in Appendix III). The profiles are first arranged at random. Each respondent is then asked to group the product profiles into three categories; namely, "most preferred", "least preferred", and "indifferent".[6] Next, the respondent is asked to rank his/her preference over the entire eighteen grouped product profiles whereby each choice is a product that consists of bundles of attributes at different levels (see Table 2). [Four product profiles are set aside for predictive purposes.]

The buyer's trade-offs between different product attributes are then measured from the eighteen sets of product profiles used in determining the purchase decision. By using an 11-point rating scale, the respondent is asked to give his/her scores for the profiles whereby a 100-point score represents a high preference while a zero-point score represents a non-preference (see Appendix IV). This technique is chosen since it is easy to administer and minimise the effects of bias during interviews. The preference rating of the respondent is then decomposed to yield part-worth utility for each attribute level.

In the third stage, the utility scores of the 110 respondents derived from the 18 alternative product profiles are analysed by using OLS based on Equation (3). [A hold-out sample of 46 respondents is retained to test the predictive ability of the conjoint model.] The variables used in this study are shown in Table 3.

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[5] As a rule of thumb, to obtain stable estimates of respondent utilities, most good conjoint studies collect several times more observations than parameters to be estimated (Al-Hakim, 2007). For example, Hsee et al. (2008) use 43 homebuyers, 47 real estate professionals, and 140 respondents, respectively, to estimate five main regression parameters; Timmermans and Noortwijk (1995) elicited 278 respondents to estimate thirty-one regression parameters; while Louviere and Timmermans (1990) use a larger sample of 315 people to estimate 41 regression parameters.

[6] The purpose of this technique is to ensure consistency in measuring the expressed utilities of the 'prospective buyers'. For instance, the lowest-ranked product in the 'most preferred' group should have a higher level of expressed utility compared to the highest-ranked product in the 'indifferent' group. Similarly, the lowest-ranked product in the 'indifferent' group should have a higher level of expressed utility compared to the highest-ranked product in the 'least preferred' group.

Table 3 Variables Used in the Regression (Dependent: Buyer's Expressed Cardinal Utility)

Independent Variable	Attribute's Value Level	Dummy code	Remarks
Loc3	Proximity to workplace	Yes = 1, No = 0	Control variable
Loc2	Proximity to school	Yes = 1, No = 0	
Loc1	Proximity to city centre	Yes = 1, No = 0	
Price3	RM250,000-RM349,999	Yes = 1, No = 0	Control variable
Price1	RM350,000-RM449,999	Yes = 1, No = 0	
Price2	RM450,000-RM549,999	Yes = 1, No = 0	
Type 1	Super-linked house	Yes = 1, No = 0	Control variable
Type 3	Clustered house	Yes = 1, No = 0	
Type2	Semi-detached house	Yes = 1, No = 0	
Area1	2,000 sq. ft. - 2,499 sq. ft.	Yes = 1, No = 0	Control variable
Area3	2,500 sq. ft. -2,999 sq. ft.	Yes = 1, No = 0	
Area2	3,000 sq. ft. - 3,499sq. ft.	Yes = 1, No = 0	
Design	Smart-home feature	Yes = 1, No = 0	
Dev	Ranked as Malaysia's top 10 developers	Yes = 1, No = 0	

Based on the derived regression model, the analysis further proceeds to measuring *total utility* and the *order of preference* to determine the ideal residential attributes that make up the utility profile of a buyer. The total utility of the 18 residential attribute profiles, for a particular 'prospective buyer', is calculated based on the expected value of the dependent variable with pre-determined levels of property attributes. The total utility is then arranged based on the maximum utility rule which assumes that the respondents will select the product that will yield the highest utility on the basis of part-worth. Number 1 rank represents the most preferred profile while number 18 rank represents the least preferred profile..

4. Results and Discussions

4.1 Profiles of Respondents

Table 4 shows the demographic profiles of the respondents. More than half of the respondents are Chinese and more than half of the respondents are males in the age group between 35-45 years old. Professionals, businessmen, top managerial, middle managerial and administrative, and executives make up the majority of the sample. The respondents earning between RM5,000 to RM7,500 per month comprise slightly more than 25% of the sample. The majority of the respondents are married with a household size less than six persons. Aside from that, the majority of them are in the "full-nest one"

category of the family life-cycle and owner-occupiers. Two-thirds of the owner-occupiers have the intention to purchase another house (see Table 5).

Table 4 Demographic Profiles of the Respondents

Demography	Frequency	Percentage(%)
Sex		
Male	59	53.6
Female	51	46.4
Age group		
35-40	57	51.8
41-45	22	20.0
46-50	22	20.0
51 and above	9	8.2
Race		
Malay	27	24.5
Chinese	64	58.2
Indian	19	17.3
Marital status		
Single	8	7.3
Married	94	85.5
Divorcee	8	7.2
Household size (married only)		
< 3	12	10.9
3-5	69	62.7
6-10	21	19.1
>10	8	7.3
Age of eldest child		
< 7 years old	52	47.3
7-12 years old	36	32.7
13-18 years old	11	10.0
>18 years old	11	10.0
Occupation		
Skill worker and executive	15	13.6
Semi-professional, junior managerial, supervisor	20	18.2
Professional, middle managerial and administrative	40	36.4
Qualified professionals,businessman and top managerial	35	31.8
Monthly income	29	26.4
RM5,000-RM7,499	18	16.4
RM7,500-RM9,999	48	43.6
RM10,000-RM12,499	15	13.6
RM12,500 and above		
Current home ownership status	3	2.7
Renting	5	4.5
Living with Family	102	92.8
Owning		

Table 5 Intention to Purchase another House

Intention to purchase another property	Frequency	Percentage (%)
Yes	68	61.8
No	34	30.9
Unsure	8	7.27
Total	110	100.0

4.2 Empirical Results

The estimated results of the preferences of respondents for high-cost residential properties are summarised in Table 6. Approximately 74% of the total variation in the expressed preferences of the respondents for high-cost residential properties was explained by the model. The results for some attributes have shown marginal disutility to prospective house buyers in comparison to other attributes in the same category. For example, house proximity to the city and school is slightly less preferred compared to house proximity to workplace. This means, a buyer would prefer a house closer to his or her workplace than to a city or a school. A house priced in the range of RM350,000 to RM500,000 per unit is less preferred than a house in the price range of RM250,000 to RM350,000. In other words, an 'expensive' house is less preferred by a buyer to a 'cheaper' house. Similarly, a house with a smaller built-up area is less preferred to that with a larger built-up area. This is evidenced by a negative marginal utility coefficient for a built-up area of 2,000 sq. ft. to 2,499 sq. ft. and a positive marginal utility coefficient for a built-up area of 3,000 sq. ft. to 3,499 sq. ft. (see Table 6).

A semi-detached or a super-linked house is likely to be superior to a clustered house, in terms of the buyer's preference. The result shows that a house with smart-home features (e.g. security gadget, close-circuit camera, wireless or broad band, and solar heater) is likely to be preferred to one that does not have such features. Similarly, a house built by a reputable developer is likely to be preferred than that built by a non-reputable developer.

4.2.1 Attribute Relative Importance

The relative importance of the six determinant attributes of buyer's preference for a residential property is shown in Table 7. Importance measures are relative and within the study. If the range of the attribute levels that are tested changes, the relative importance of that attribute is also likely to change. Table 7 shows that property type is the most important attribute in influencing buyers' preference for a residential property. This is followed by design and features, price, built-up area, and location, while the least important attribute is the reputation of the developer.

Table 6 Model Summary (Dependent: Buyer's Expressed Cardinal Utility)

R^2		0. 739
Adj. R^2		0.738
F-value		558.8
Sum of Squared Errors		45,700
Standard Error of Estimate		7.28
Sample size		110
Independent Variable	Coefficient	t-value*
Intercept	39.344	75.960
Proximity to city	-5.506	-13.724
Proximity to school	-4.314	-10.752
Price of RM350K	-5.995	-14.943
Price of RM450K	-9.202	-22.934
Super-linked house	9. 727	24.245
Semi-detached house	24.498	61.061
Built-up area of 2,000 sq. ft. – 2,499 sq. ft.	-3.536	-8.814
Built-up area of 3,000 sq. ft. – 3,499 sq. ft.	3.217	8.017
Smart-home features	9.439	27.167
Developer reputation	2.046	5.889

Note: * All variables are significant at $\alpha = 0.01$.

Table 7 Relative Importance of Residential Attribute Profiles

Attributes	**Attribute's Relative Importance (ARI)ea[a] (%)**	**Attribute's Value Level**	**Marginal Utility[b]**
Location	9.6	Proximity to workplace	0.000
		Proximity to school	-4.314
		Proximity to city centre	-5.506
Price	16.0	RM250,000 – RM349,999	0.000
		RM350,000 – RM449,999	-5.995
		RM450,000 – RM549,999	-9.202
Type of Property	42.6	Double-storey super-linked house	9.727
		Double-storey clustered house	0.000
		Double-storey semi-detached house	24.498
Built-up Area	11.8	2,000 sq. ft. – 2,499 sq. ft.	-3.536
		2,500 sq. ft. – 2,999 sq. ft.	0.000
		3,000 sq. ft. – 3,499 sq. ft.	3.217
Design/Features	16.4	With smart home features	9.439
Developer Reputation	3.6	Malaysia's top 10 property developer ranked by The Edge	2.046

Notes: [a] Estimated by using Equation (4); [b] figures shown are the regression coefficients as shown in Table 6. The control variable has a marginal utility of zero.

This study shows that a house is no longer a basic need, but a symbol of achievement and social acceptance to middle-high income earners. The main concern of the buyers in purchasing a house is not the price because of higher financial capacity. They prefer larger houses with more features. Interestingly, location is the second to last important attribute that influences buyers' preference. As location choice involves trade-offs, the higher-income households choose larger houses over accessibility. This is because the respondents are mostly married couples who have their own transport and/or have reasonable access to public transport facilities.

Developer reputation is the least important attribute relative to the other five attributes. However, it was not totally excluded from the decision making process. Therefore, developers should build their reputation through branding efforts in providing quality housing, reasonable prices, and good customer relationships as well as carry out their social responsibilities.

The buyer's preference can also be described from the marginal utility evaluated at each attribute level. The most important attribute level is the attribute with the highest marginal utility. This study shows that double-storey semi-detached house is the most preferred type of property whereas super-linked and clustered houses are both acceptable to the respondents. It also shows that smart-home features are the second most preferred attribute. The price range between RM450,000 to RM549,999 and RM350,000 to RM449,999 are the least preferred prices, and this reflects that house buyers are utility maximisers.

4.2.2 Total Utility, Order, and Real Value of Buyer's Preference

Based on the part-worth utility concept, the total utility can be determined from combinations of part-worth utilities. Therefore, the preference model estimated can be used to calculate the total utility for the eighteen alternative product profiles. The binary variables are replaced in Equation (3) with a dummy variable equal to "1" if the attribute level is present in the profile and equal to"0" otherwise. The calculated total utility is then ranked by order of preference according to the *axiom of utility maximization*. In the neoclassical economics, the rule assumes that every buyer will choose a product with the highest utility (Green and Krieger, 1993). The total utility and the order of preference of the eighteen attribute profiles of residential property are shown in Table 8. Table 8 reveals that the highest preference for a high-cost residential property is profile Q, followed by profiles K, N, F and R, whereby the buyers combine semi-detached houses with other attributes. The buyers will purchase other types of property if the most ideal one is not available. This gives rise to 'trade-off' for less preferred attribute combinations. This selection process continues until all eighteen attribute profiles are evaluated. In our study, the least preferred profile of high-cost residential property attributes is profile B.

Table 8 Total Utility and Order of Preference for Alternatives Profile

Card ID	Location (Proximity)	Price (RM'000)	Type of Property	Built up Area (sq. ft.)	Smart-home Feature	Reputable Developer	Total Utility	Rank
Q	School	250-350	Semi-detached	3,000-3,499	Yes	No	72.185	1
K	Workplace	450-550	Semi-detached	2,500-2,999	Yes	Yes	66.127	2
N	Workplace	350-450	Semi-detached	3,000-3,499	No	No	61.064	3
F	City centre	250-350	Semi-detached	2,500-2,999	No	Yes	60.383	4
R	City centre	350-450	Semi-detached	2,000-2,499	No	No	48.805	5
J	Workplace	350-450	Super-linked	3,000-3,499	No	Yes	48.339	6
I	School	350-450	Super-linked	2,500-2,999	Yes	No	48.202	7
A	City centre	450-550	Super-linked	3,000-3,499	Yes	No	47.020	8
H	School	450-550	Semi-detached	2,000-2,499	No	No	46.791	9
P	Workplace	250-350	Super-linked	2,000-2,499	No	No	45.535	10
C	Workplace	250-350	Clustered	2,000-2,499	Yes	No	45.247	11
E	City centre	250-350	Super-linked	2,500-2,999	No	No	43.565	12
G	School	250-350	Clustered	3,000-3,499	No	Yes	40.293	13
M	City centre	350-450	Clustered	2,000-2,499	Yes	Yes	35.791	14
L	School	450-550	Super-linked	2,000-2,499	No	Yes	34.066	15
D	Workplace	450-550	Clustered	2,500-2,999	No	No	30.143	16
O	School	350-450	Clustered	2,500-2,999	No	No	29.035	17
B	City centre	450-550	Clustered	3,000-3,499	No	No	27.853	18

To observe the 'trade-off' pattern in the process of selecting a high-cost residential property, two aspects of choice have to be examined. First, there is the attribute that a buyer finds difficult to give up, and then, the one that s/he finds easy to make concessions. Second, there is the product that a buyer finds difficult to make concessions and otherwise. The level of concession can be known for each attribute by looking at the individual regression coefficients and ARI (see Tables 6 and 7, columns 2). For example, it is interesting to note that profile K has the same location as profile N, but with a smaller area and a higher price, yet it is slightly better off than profile N. The critical factor in this case is that, unlike profile N, profile K has smart home features included, besides being backed up by a reputable developer characteristic. Similarly, for profiles F and R, they have the same location (and both do not have smart home features), but profile F stands out because it has a bigger built-up area and a lower price than profile R. The level of concession can also be known for a particular product profile as a whole by looking at the difference between total utility figures of two alternative profiles (see Table 8, column 8). For example, the total utility difference between the 'first rank' and the 'last rank' residential profiles (Q and B) is 44.332 while that between the 'first rank' and 'second rank' is only 6.058. This means, product profile B could have been more easily conceded compared to product profile K.

The true value of the respondent's selection was assessed on a comparative basis, by looking at property attributes and profiles. For example, the double-storey clustered houses and double-storey super-linked houses are not considered when other attribute levels are offered. The attribute level whereby concession is easy to make is associated with the property developed by the reputable developers. The concession on the largest built-up area and location proximity to workplace is made only if the respondents decided to forgo the lowest price range of the property. Given such a scenario, the respondents mostly consider the semi-detached house which is the most difficult to compromise.

4.2.3 Validity Test

The internal validity of the conjoint analysis can be assessed based the correlations of the mean utility score from the hold-out sample and the predicted levels of utility. Pearson's rho 0.874 is significant at the 0.01 level which indicates the high degree of linear association between the predicted utility and the utility derived from the 'hold-out' sample. In addition, the predicted total utilities of buyers for 'hold-out' product profiles (cards S, T, U, and V) from using the 'hold-out' sample of respondents are reasonably accurate, whereby the prediction errors are below ±20% (Table 9).

However, some caveat has to be observed with regards to the predictive ability of the conjoint function. Some large discrepancies in the predictive capability of the model are noticed. The buyer's expressed utility is severely

under-predicted for the product profiles represented by cards O, L, and E. In addition, only about 36.4% of the product profiles are predicted under a ±10% margin of error; and 27.2% of the product profiles are predicted with a ±20% margin of error. Overall, there are about 54.5% of the product profiles for which the buyer's revealed utility is predicted with an acceptable level of margin of error (i.e., less than ±20%).

Table 9 Predicted Utilities versus 'Hold-out' Utilities of Respondents

Card No.	Predicted Mean Utility	Holdout Respondents' Revealed Mean Utility	Mean Prediction Error (%)
A	47.020	51.00	-8.46
B	27.853	36.00	-29.25
C	45.247	62.60	-38.35
D	30.143	40.60	-34.69
E	43.565	72.60	-66.65
F	60.383	49.00	18.85
G	40.293	51.60	-28.06
H	46.791	49.00	-4.72
I	48.202	51.60	-7.05
J	48.339	49.00	-1.37
K	66.127	57.80	12.59
L	34.066	60.40	-77.30
M	35.791	47.20	-31.88
N	61.064	47.30	22.54
O	29.035	64.40	-121.80
P	45.535	42.20	7.32
Q	72.185	60.60	16.05
R	48.805	59.80	-22.53
S	**49.470**	**46.55**	**5.90**
T	**60.306**	**72.25**	**-19.81**
U	**67.059**	**61.45**	**8.36**
V	**66.285**	**72.29**	**-9.06**

5. Conclusion

This study has revealed that location, price, property type, built-up area, smart-home features, and developer reputation make up a substantial portion of the preferences expressed by buyers in residential property purchase decisions. In the process, these attributes can be analysed to reveal trade-offs between some of the selected attribute levels in order to determine the elements that can be given up to obtain other elements that cannot be given up as easily. This is done to ensure the maximum attainment of personal utility from a particular purchase decision.

Some implications of this study can be highlighted. As a product strategy, a double-storey semi-detached house with a size of more than 2,000 sq. ft. and additional product features could have been the most preferred property type among middle-high income earners. This type of house, in the top five, is preferred to a super-linked or a clustered house. In this context, the buyer's trade-off for design features and built-up area can help developers to provide better choices in property design and space. The buyers' preferences for smart-home features, in particular, can provide some useful clues with regards to features of security elements to be specifically itemised and included in the conjoint analysis.[7]

Proximity to city centre is less important than other locational attributes. In fact, project location can be equally attractive even if it lacks proximity to the city centre so long as there are ample job opportunities in the nearby areas and has good access to main roads that connect various major population centres or destinations. The project location must also have good access to public facilities, business areas, recreational areas, and learning institutions.[8]

In terms of pricing strategy, the middle-high income earners are willing to give up per unit house price of RM250,000 to RM349,999 to go for a higher price range if other quality attributes such as a larger built-up area is available. In order to increase the buyer's utility, the price range should be maintained while providing buyers with other quality attributes, such as more spacious floor area, better location, and additional product features.

As to promotion strategy, effective information on property type and its unique features should be emphasised in the advertising campaign, particularly in advertisements and brochures.

With respect to product positioning strategy, this study has shown that the majority of potential high-cost residential buyers are well-to-do middle-high-income married couples with white-collar jobs or business people, aged 35 to 45 years old. They already owned a house, but will possibly purchase another larger unit, such as a semi-detached house with unique design and features. Therefore, marketing strategies can be planned based on their demographic characteristics in order to meet their needs with regards to house design, promotion, location and pricing. In particular, the five critical components of a successful marketing strategy need to be in place; namely, marketing mapping, and product, price, promotional, and distribution strategies (Iman, 2002).

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[7] For example, smart-home features include automatic gates, roof-top sensors, sensor-based garage lighting, security alarms, intercom devices, readily fixed wireless broadband, telephone and video/audio control devices, furrow garden sprinklers, etc.

[8] These are additional information that we obtained from the interviews with the respondents.

Buyer's evaluation on developer reputation can serve as a strategy for competition. This will be useful for product development and indirectly help assess demand for residential properties. Important elements of a good reputation, such as quality product, timely delivery, commendable customer relationship, larger market share, and good social responsibility can be further investigated to ascertain if they should jointly be considered as a positioning package in property marketing.

Finally, despite the claimed complexity of property purchase decisions, it can be somewhat simplified through the proper application of elicitation method of buyer's expressed preference via the conjoint method. When properly used, the conjoint analysis provides a reliable and useful tool for estimating the potential utility of a prospective buyer which results from a selected set of pertinent property attributes.

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Appendix I: Pertinent Attributes of Residential Properties [a]

	Pilot Sample	Mean	Std. Error of Mean	Sum	Rank
Location	46	**1.7391**	0.1568	80	***1***
Price	46	**3.3913**	0.3222	156	***2***
Type of Property	46	**4.3043**	0.3431	198	***3***
Built up Area	46	**5.1522**	0.3077	237	***4***
Design/ Features	46	**5.3913**	0.3412	248	***5***
Neighbourhood	46	6.0652	0.3397	279	7
Facilities/Amenities	46	6.1522	0.2899	283	8
Developer Reputation	46	**5.6957**	0.3893	262	***6***
Cost of Borrowing	46	7.9130	0.2689	364	9
Promotion	46	9.2174	0.2324	424	10

Note: [a] The attributes ranked from 1= most important to 10= least important.

The six most pertinent attributes by mean rank, are printed in bold and italics.

Appendix II: Three Most Pertinent Value Levels of Attributes in Residential Properties [b]

	Pilot Sample	Mean	Std. Error of Mean	Std. Deviation	Sum	Rank
1. Location						
City Centre	46	**3.8696**	0.2991	2.0288	178	***3***
Working Place	46	**2.4348**	0.3103	2.1045	112	***1***
Main Highways	46	5.4348	0.3255	2.2076	250	6
Shopping Facilities	46	3.9565	0.2304	1.5629	182	4
School	46	**3.5000**	0.3181	2.1577	161	***2***
Recreational Areas	46	5.2609	0.3005	2.0378	242	5
Hospital/Medical Centres	46	5.8261	0.2045	1.3873	268	8
2. Price						
RM250,000 - RM349,999	46	**1.5652**	0.1479	--	72	***1***
RM350,000 - RM449,999	46	**1.8478**	0.0759	--	85	***2***
RM450,000 - RM549,999	46	**2.8261**	0.0645	--	130	***3***
RM550K and above	46	3.7609	0.1129	--	173	**4**
3. Type of Property						
Terraced	46	3.2826	0.1544	--	151	**4**
Super-linked	46	**2.5000**	0.1346	--	115	***3***
Clustered	46	**2.3043**	0.1115	--	106	***2***
Semi-detached	46	**1.9130**	0.1860	--	88	***1***
4. Built-Up Area						
< 2,000 s.f.	46	3.3478	0.1622	--	154	**4**
2,000 s.f. - 2,499 s.f.	46	**2.1739**	0.1330	--	100	***2***
2,500 s.f. - 2,999 s.f.	46	**2.0652**	0.0901	--	95	***1***
> 3,000 s.f.	46	**2.4130**	0.1905	--	111	***3***

(*Continue…*)

(*Appendix II Continued*)

	Pilot Sample	Mean	Std. Error of Mean	Std. Deviation	Sum	Rank
5. Design Features						
Tall Windows	46	**2.4565**	0.1606	--	113	***3***
Smart-Home Features	46	**2.2609**	0.1598	--	104	***1***
Lifestyle Bathrooms	46	2.8913	0.1530	--	133	4
Internal Courtyard	46	**2.3913**	0.1771	--	110	***2***
6. Developer's Reputation						
Quality Product	46	**1.3913**	0.1183	--	64	***1***
Timely Delivery	46	**2.2174**	0.1200	--	102	***2***
Customer Relationship	46	**3.1304**	0.1147	--	144	***3***
Market Share	46	4.2826	0.1269	--	197	5
Social Responsibilities	46	3.9783	0.1878	--	183	4

Note: [b] The attributes rank from 1= most important to 10= least important.
The value levels of the three most important attributes by mean rank, are printed in bold and italics.

Appendix III: Example of Newly Designed Product Profile

Appendix IV: An 11-Point Utility Rating Scale

Lowest Preference Highest Preference

0	10	20	30	40	50	60	70	80	90	100