Article

Residential Estate Valuation Index (REVI): A Consumer Perspective

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Abstract

Motivation/Problem: Real estate has emerged as one of the most profitable investing options in Indian economy, and its valuation plays an important role in the process. Valuations of real estate are a debatable issue due to lack of research and support knowledge available to the stakeholders and market makers, namely, owners, such as sellers, buyers, brokers and valuers, and lenders, such as bankers and financial institutions. In this article, the author seeks to develop a residential estate valuation index, a consumer perspective.

Methodology: In the first stage the author has identified consumer-centric factors of residential valuation from literature review and grounded theory. In the second stage SPSS & MS Excel techniques are used to find out consumer-driven weights of each factor and to subsequently develop an index matrix.

Output: A residential estate valuation index has been developed.

This study attempts to develop a residential estate valuation index for measuring the consumer behaviour with residential estate, residential estate seen as habitat that is an output/product architecture. This index will be helpful for stakeholders, market makers, sellers, buyers, brokers, valuers, bankers and financial institutions in high-involvement decision-making.

Keywords

Consumer decision, index development, consumer behaviour, real estate, decision-making

Introduction

Consumers face difficulty in purchase decision during house purchase and generally depend on feedback for decision-making, in 'mid- and high-involvement environment countries' as well as Indian

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metros. Existing approach has not been able to answer questions arising on price variability and unpredictability in ground reality. Literature available in architecture and real estate valuation is focused on an economist's way of thinking and continues to assumes real estate as a trading item (as goods or commodity), keeps referring to it erroneously on cash discounting tools for appraisal resting on framework 'similar to demand-supply models of commodities'.

The study's focus is to stimulate thinking in unexplored fields; consumer-centric preferences, choices and associations with 'neighbourhoods, a combination of homogeneous immovable properties'; and 'interaction-based consumer expectations "in and around neighbourhood"', which demands fundamental understanding of 'user utility with real estate' that translates into consumer-centric identity of neighbourhood (where physicality of 'in and around' house and consumer as user are morphed together) as 'perception in consumer mind' and subsequently leading towards 'value of property' as relative snapshot in particular time.

In general, real estate valuation is an independent, neutral and objective estimation of a real estate project or rights and benefits of a real estate on the day of the valuation (Tecim & Cagatay, 2006). Such appraisals are important for stakeholders, namely, lenders, borrowers, intermediaries and professionals, architects, for real estate funds and project developments (Schulz, 2002). However, none of the research work focuses on consumer-centric property valuation.

Our further effort in this study is to develop a robust 'model of comparison' in consumer preferences about 'internal characteristics of neighbourhood' as an index of relative rank-ordering of variability within a 'habitation district's "subject customer groups and customer functions" (Abell, Derek F., 1980) exposed to the same external "environment of infrastructure and services"', that are economic factors, common influences on purchase decision and choices for real estate to a particular consumer group.

The field of consumer research is mostly focused on two major questions: how consumers go about making decisions, and how decisions should be made (Edwards & Fasolo, 2001). Research directives, aimed at researching how consumers should decide, have been emerging lately. Several critiques have appeared against the existing literature that focuses almost exclusively on the marketing perspective and neglects consumers and their difficulties in decision-making (Bazerman, 2001; Gronhaug et al., 2004). One of the most influential areas within consumer behaviour is consumer decision-making (Bargh, 2002; Bettman et al., 1998; Simonson et al., 2001). At the conceptual level, various consumer decision-making models have been proposed in the literature in recent decades. However, many researchers believe that a specific situation- and product-oriented model is needed in studying purchasing behaviour (Erasmusm et al., 2001). Apart from this, investigating decisions that can change lives of consumers, such as purchasing a car or house, can make vital contributions to consumer behaviour knowledge (Wells, 1993). According to Erasmus et al. (2001), an exploratory approach with the intention to unfold the truth may provide opportunities for an understanding of the factors affecting valuation of property.

In view of the existing literature exploring consumer decision-making when purchasing involves high-involvement decision-making and emotionally charged products, like a house, the purpose of this research is twofold: (a) to find consumer-driven factors affecting the value of a house and (b) to develop a consumer-driven residential property value index. Strategic decision-making refers to the process of decision-making with long-term commitments of resources and affecting the budget available for other goods and services (Gronhaug et al., 2004). On the basis of existing literature, we assume that this process involves a certain amount of perceived risk, especially because it represents large financial obligations (Beatty & Smith, 1987; Gibler & Nelson, 2003; Mitchell, 1999). Our goal is also to offer

implications for consumers, real estate valuators and consumer researchers. The house is the most important durable goods in the household and requires high involvement as well as complex decision-making. Hence, the empirical literature in this area and the real estate literature serve as a basis for conceptual and empirical work in this study.

Literature Review

The purchase of a house may be considered as a good example of such a purchase decision. Strategic decisions are being made in a range of fields, including when consumers decide about health issues (Henry, 2001) or financial investments (Henry, 2005). The majority of literature researching individual and organizational customers is dealing with processes related to purchase of durables (e.g., Bayus, 1991; Cripps & Meyer, 1994; Grewal et al., 2004; Hauser & Urban, 1986; McQuiston, 1989; Punj & Brookes, 2002). Buying a house or a car reflects high consumer involvement, as their decision to buy binds their economic resources in the long run (Arndt, 1976; Grewal et al., 2004; Gronhaug et al., 2004; Rosenthal, 1997). Both product categories offer a rich variety of price and quality and are complex and relatively well known to consumers (Bayus & Carlstrom, 1990; Brucks et al., 2000). Similarly, the buying decision for real estate as a subgroup of durables is also complex and demands high involvement (Gibler & Nelson, 2003).

According to Arndt (1976) and Rosenthal (1997), building quality, design, price, building area, land area, interest rate, hygiene and safety are factors on which the worth of a residential property depends. Gronhaug et al. (2004) argued that some external factors affect the consumer-driven value of a house, such as aesthetic appeal, electricity, water supply and communication. Grewal et al. (2004) identified linkages between working place, accessibility to the market, distance to the school, place for worship, sport facilities, reinvestment option and public transport facilities as some other factors affecting vale of a residential property. As far as indexes are concerned there are several methods for constructing house price indexes. Some of these methods were created decades ago, and numerous variants have been developed since. The easiest way to construct indexes is to refer to a summary measure, such as mean or median price per period. Given the heterogeneity of properties, the median is usually preferred to the mean. Median house prices have been used by several researchers, mostly for comparison purposes (e.g., Crone & Voith, 1992; Gatzlaff & Ling, 1994; Mark & Goldberg, 1984; Wang & Zorn, 1997); however, medians also form the basis of publicly available house price indexes. In the US, for instance, the index published by the National Association of Realtors is based on median prices. Such indexes are easy to construct, but they suffer because of little or no control over quality (Case & Shiller, 2003).

No significant work has been found on residential estate index development in the issues of reputed journals over the past 20 years. In fact, hardly any work has been done to measure the value of an immovable property through a standardized approach that could be traced across different customer groups and customer functions in a region. In fact, the real estate valuation in India is a completely ignored area in the literature. This has led to the realization of the research gap that no frame of reference is available for measuring the value of a property. Consequently, our research focuses on the development of a residential estate valuation index (REVI) and identifying factors for measuring the value of a ‘neighbourhood’ within a region of uniformity as perceived by the appraisers. The study has academic and practical significance. It will help lenders, buyers and sellers to measure the value of a property with a standardized reference that would contain both tangible and intangible factors.

Research Objective and Scope

The primary goal of this research is to develop REVI. To achieve this, the goal has been divided into two research objectives (ROs):

RO1: To identify consumer-centric factors of residential valuation
RO2: To develop REVI

Research Design and Methodology

Research Method 1

The study explores factors affecting REVI and the importance of, and linkages between, various factors. The research is based on exploratory research of the conceptual model of buying behaviour associated with purchasing a house. A number of factors prompted the author to utilize qualitative research methods, including in-depth personal interviews with consumers. First, the qualitative approach enables researchers to gain a deeper understanding of consumer behaviour in the context of complex and empirically unexplored product purchase domains. Second, due to the nature of product, the buying process is rather complicated and requires high involvement on the part of a consumer. Third, results of a qualitative study can yield useful directions for further quantitative research (Kumar, Aaker & Day, 1999; McDaniel & Gates, 1998; Miles & Huberman, 1994). So, consumer-driven factors will be identified by developing a questionnaire to be used in a survey and by literature review.

The contents of the interviews were analyzed using the grounded theory framework, which does not begin with predetermined constructs and their inter-linkages and then seek proof of their validity; instead, it begins with an area of study and allows constructs to emerge from that area of study (Strauss & Corbin, 1990). Given the objective of exploring criteria for measuring consumer awareness, grounded theory seemed an appropriate choice.

The grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1990) seemed an appropriate choice given its strength in fishing out the factors from the data collected from respondents. Grounded theory investigates the actualities in the real world and analyzes the data with no preconceived hypothesis (Glaser & Strauss, 1967).

The methodology has been criticized for its usefulness in finding the relationship between factors. The approach is quite complex and may lead to ambiguity in data gathered, and thus, difficult to handle. More specifically, since an enormous amount of data are collected and need to be interpreted in a limited amount of time, it might introduce bias. Utilizing such an unstructured approach to research limits the researcher's ability to identify some of the important themes and aspects in the research findings that might possibly emerge if the researcher undertakes a 'tight', more theoretically driven approach (Mehmetoglu & Altinay, 2006). Nevertheless, it is quite useful to develop a whole new set of constructs despite some of the limitations associated with this approach.

Application of Grounded Theory Approach

As mentioned earlier, since our objective was to identify the criteria for describing residential estate valuation, instead of asking experts to choose from a set of options we used the grounded theory approach

(Glaser & Strauss, 1967; Strauss & Corbin, 1990) to ascertain factors specific to our research. Although use of grounded theory does not necessitate use of literature review, the author has surveyed the available data to enhance understanding on relevant available data as Glaser and Strauss (1967, p. 3) pointed out, 'He (the researcher) must have a perspective that will help him see relevant data and abstract significant categories from his scrutiny of data.'

Broadly, there have been two approaches to grounded theory. Glaser's (1992) approach requires identification of research issues entirely on the basis of participants' perception. In Strauss and Corbin's (1990) approach, researcher has the freedom to let interviews focus on a particular area in advance and data are gathered in that area. The author had a specific research agenda, and therefore, followed Strauss and Corbin's approach. For this, following steps were followed:

***Step 1*:** Theories cannot be built based on actual incidents or activities as observed or reported, that is, from 'raw data' (Corbin & Strauss, 1990, p. 7); hence, identifying theory from data requires coding data at different levels. 'Coding represents the operation by which data are broken down, conceptualized and put back together in new ways' (Strauss & Corbin, 1990, p. 57). The first step is open coding, wherein transcripts are broken down to 'thought units', which can range from a phrase to several sentences. For open coding, interviews of consumer experts were broken down to thought units, which at times turned out to be just a phrase and at other times three to four sentences. Codes identified are as follows: A was used for the valuation factor; 1, 2, 3 … 4, indicate, respectively, respondent numbers; 'N' if it was not a criterion for residential estate valuation (by that respondent) and 'Y' if it was perceived as a criterion for residential estate valuation; i, ii, iii . . . iv were number of reasons given by a respondent. Thus, A3Yi meant that Respondent 3 identifies a certain criterion in relation to consumers (A) (may have been caused by any factor/reason) that affect their level of awareness (Y) and the first reason (i) that they give for it.

***Step 2*:** The second element of grounded theory, categories, is defined by Corbin and Strauss (1990, p. 7) as higher-level components and more abstract than the concepts they represent. This is done through axial coding, wherein thought units are regrouped into emergent 'categories' (Baskerville & Pries-Heje, 1999), which, for our study, are considered factors of residential estate valuation.

Findings of Grounded Theory and Interpretation

A workshop was organized in IIT-Delhi, where experts were invited if they (a) had more than 10 years of experience as an established immovable property expert; (b) were architects or civil engineers by profession; (c) were active, practicing professionals in the area of study; and (d) commanded good reputation as a valuer. At a maximum only two top-rated (only long-term performers or stable performers having good reputation and knowledge as viewed by the bankers) valuers from one bank were selected, Thus, overall, 12 valuers were invited to the workshop representing various banks. They were requested to bring along one or two real cases of their choice and were asked to make a presentation on those cases in the workshop. All other participants were asked to guess the property's value and explain the rationale behind their price estimations. Later they were asked to compare their prices with the actual price revealed in the cases that were presented by the experts. It was observed that valuations of property

made by the respondents varied by 10 to 15 per cent from the original valuation of the case studies presented by the experts. Diverse views were observed, and grounded theory was used to find out from the interview transcripts words, combination of words and finally sentences.

Following the process outlined above, after identifying the open codes, we tried to group these open statements into categories. Since the identified categories represented the factors responsible for describing value of a residential property, five factors were identified and symbolized as F1 to F5. These are discussed as follows:

Purchasing Power (F1)

The first set of responses were labelled as *concern for purchasing power*. This seemed to be the most basic category that appeared in many responses. Typical responses in this category are as follows (coding for arguments/thought units is mentioned within parentheses; *n* refers to the respondent number):

- The person who buys any house will be fully aware of their purchasing power (AnYi)
- In modern times consumers go for loan, irrespective of their paying capacity (AnYii)
- Inflation and interest rates are very important for real estate industry (AnYiii)
- More buying capacity means more demand and higher prices. (AnYiv)

Home Characteristics (F2)

We focused on words such as *construction cost* and *land value*. The responses were focused on home characteristics. Typical responses were as follows:

- First step to calculate the value of any property is to calculate land rate and construction costs (AnYix)
- The value of property is dependent on the time of construction of that building (AnYx)
- Locality is very important in terms of parking space and physical surroundings (AnYxi)

Neighbourhood Characteristics (F3)

The responses were pertinent to neighbourhood characteristics. Typical responses included the following:

- You just cannot rely on home characteristics; you need to consider neighbourhood characteristics as well (AnYxiv)
- Quiet, safe, clean and attractive neighbourhood leads to higher prices (AnYxv)
- History of solid property values is these days one of the most important factors for the valuers to keep in mind (AnYx)
- Proposed development projects could significantly alter the character of the community (AnYix)
- Proximity to basic necessary amenities such as schools, metro stations and shopping centres is a very important aspect for valuation. Linkage and *Vaastu* are another important aspect attached to valuation (AnYxiii)

Community Characteristics (F4)

The responses under this category pertained to community characteristics. Typical responses include the following:

- Religion and culture of people living in that society is a vital factor to be taken into consideration in India especially (AnYxviii)
- Class and income of the people is an important part of community characteristics (AnYxix)

Brand Value of Colony (F5)

The responses were pertinent to special characteristics connected to the name of the colony. Typical responses include the following:

- Each colony has its unique property prices; it is well known to people around (AnYxv)
- People agree to pay higher in prestigious colonies (AnYxvii)
- Colony has certain comparable features linked to residents' image (AnYxx)

Table 1 shows the list of factors affecting the value of a residential property.

Research Method 2

For developing an index, factors derived were analyzed statistically using SPSS and MS Excel to find out consumer-driven weights of each factor. A general equation was developed for the entire sample, and

Table 1. Factors Affecting Value of Residential Property

Factor	Citation		
Purchasing power	Grounded theory (Gronhaug et al., 2004)		
House characteristics	Grounded theory		
Neighbourhood characteristics	Grounded theory (Wang & Zorn, 1997)		
Community characteristics	Grounded theory (Wang & Zorn, 1997)		
Brand value of the colony	Brucks et al. (2000)		
Factor	**Null Hypothesis**	**Definition**	**Proposition**
Purchasing power	Purchasing power does not play a significant role in determining the price of a house	The macroeconomic factors such as interest rate, inflation rate, household disposable income and credit availability	We have declined this proposition, including its associations

(Table 1 continued)

(Table 1 continued)

Factor	Null Hypothesis	Definition	Proposition
Physical characteristics of a house	Home characteristics do not play a significant role in determining the price of a house	1. The price of proportionate land share 2. The replacement construction cost (construction cost as on today minus depreciation) 3. Accommodation (number of bedrooms, toilets etc.) and attributes, features attached to the house, like balcony, terrace, garden, car, servant's quarter, parking, lifts etc. 4. Construction quality of the house, building etc.	
Built-up environment characteristics	Neighbourhood characteristics do not play a significant role in determining the price of a house	Neighbourhood characteristics include the following: 1. Clean, attractive and safety features in neighbourhood; overall positive public perception; level of congestion, roads, parks and other public recreation physical facilities 2. Master planning features, density, surroundings 3. Access to public transportation like metro stations, bus stops, railway stations 4. Proposed development projects beyond the neighbourhood/cluster[a]	
Community characteristics	Community characteristics do not play a significant role in determining the price of a house	1. It includes average income of the people, commonality of region, culture, religion or occupation and lifestyle of the people living in that neighbourhood/cluster.[b] It also includes behaviour/tolerance of community towards utility of houses/indiscipline in the community 2. Performance of RWA (Resident's Welfare Association), well-maintained infrastructure 3. Percentage of occupancy, proximity to community utilities like shopping, restaurants etc.	
Brand value of the neighbourhood	Brand value does not play a significant role in determining the price of a house	1. Brand value of the colony or developer of the township or celebrity associated with colony for which a consumer would like to be associated, for example, some famous personality buying a house in the colony 2. Popular name of colony that connotes to particular living standard/lifestyle, which particularly strongly reflects desired attributes of a particular customer group	

Source: Author's own.

Notes: [a]Cluster is a group of houses that may or may not be making a colony, where general tastes, behaviour and characteristics of people are distinguished from those living in a nearby area.

[b]House is a building for human habitation, especially that is lived in by a family.

a separate equation was derived for each subsample. The following is the multiple regression equation prepared for the study:

$$Y = a + b1X1 + b2X2 + \ldots + bnXn$$

Where: *Y* is the computed prices of property and *a* is the constant or the value of *Y* when *X*s are zero. The *b* values are the regression coefficients and the *X* values are the individual measures of the factors (variables) that are postulated to be important to value. The regression coefficients measure the change in *Y* for a unit change in *Xi*. Individual parcels of real estate can be evaluated by substituting the actual observation for *X*s in the equation.

Development of Questionnaire

In developing questionnaire, questions were designed to address each of the parameter identified in Table 1. As many as 42 points were generated in the questionnaire. A 5-point Likert-type scale was used to collect responses, with response options ranging from *completely agree* to *completely disagree*.

We used a 3-point rating scale developed by Lawshe (1975) to determine the extent of overlap items in the questionnaire and the construct domain. Lawshe's content validity ratio (CVR) was then calculated for each item on each questionnaire. The CVR value was 1.00 when all raters indicate the item was essential, 0.00 when half of the raters indicated it was essential and –1.00 when none of the raters indicated it is essential. Carrier et al. (1990) showed high correlation between the values of Lawshe's content validity and criteria-related validity strategy for an interview guide used to select applicants with prior real estate valuation experience. Minimum CVR value for 10 panelists was 0.62. As many as 41 items qualified in this criterion.

Next, to test the reliability of the questionnaire Cronbach's alpha was used in addition to factor analysis. Warmbrod (2001) reported that 26 out of 29 articles in *The Journal of Agricultural Education* for which internal consistency reliability measures need to be reported used Cronbach's alpha as a measure of internal consistency. Cronbach's alpha normally ranges between 0 and 1. However, there is actually no lower limit to the coefficient. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. George and Mallery (2003) provided the following rules of thumb: '≥.9 = *excellent*, ≥.8 = *good*, ≥.7 = *acceptable*, ≥.6 = *questionable*, ≥.5 = *poor*, and ≥.5 = *unacceptable*' (p. 231). Factor analysis was used to indicate reliability, and only those items that had high loading were used for calculating Cronbach's alphas. Factor analysis is one of the more widely used techniques in the market researcher's arsenal of analytic tools (Stewart, 1981).

Sample for the Study

A judgemental sample (N = 60) was drawn from New Delhi, India. The sample was not stratified according to income distribution, age, family size, gender and education. Criteria for judgement were as follows: Anyone who bought a house in the past two years for self-use, had availed bank loan on property purchased and had gone through the exercise of property selection experience was selected.

Initial efforts by students revealed that owners were not willing to discuss details of property purchased. Experts' discussion with owners elicited responses, however. The researcher himself did

the sampling. No workers were appointed or assigned. The questionnaire was available in English only. Respondents were approached in person, and a common meeting point was either the bank or his house; thus, we ensured that the procedure was understood by each respondent and each question was filled properly.

Data Analysis

Factor analysis was performed, using SPSS 17.0, in order to bring down the parameters affecting consumer awareness index. Varimax rotation was used to get maximum intercorrelation between factors. The result of factor analysis is shown in Table 2. Only factors with loading greater than 0.5 and eigenvalue greater than 1 were considered for development of REVI.

Cronbach's alpha was calculated for only those items with high loading, and their corresponding values are given in Table 3. Hence, we can see that only 4 factors qualify for the above criteria and are chosen for measuring the REVI.

Table 2. Hypothesis and Definitions

Questions	Physical Characteristics of a House	Built-up Environment Characteristics	Residents Characteristics	Brand Value of the Colony
I knew very well the size of house as my requirement to purchase	0.756			
Appearance of building and surroundings gives fair idea about residents	0.643			
The new constructions are able to deliver better utility than old constructed houses within the same area	0.588			
I was sure to shift to this newly purchased house from my existing place of stay	0.534			
I agreed to pay premium to join in the same occupation profile of people			0.654	
I agreed to pay premium to join with people of certain culture			0.876	
I am indifferent towards religion of neighbours			0.889	
I am a supporter of multiple uses of the house like shop/office by neighbours and residents in society			0.595	
I believe in multiple use of house (using as office or other use) for value of money			0.521	
I paid higher for house with the possibility and scope for extensions			0.552	
I have compromised in neighbourhood of house			0.618	
I agreed to pay premium to join with people of certain lifestyle			0.792	

(Table 2 continued)

(Table 2 continued)

Questions	Physical Characteristics of a House	Built-up Environment Characteristics	Residents Characteristics	Brand Value of the Colony
I considered income profile of people in the neighbourhood as one of the factors before buying the house			0.830	
I am willing to pay higher for active and performing RWA (Resident Welfare Association)		0.686		
My decision was dependent on facilities like transportation, metro, railways, airport etc. among the final list of properties shortlisted for buying		0.822		
I am willing to pay higher for features and attributes attached to house, common areas, balconies, servant room, reserve parking, lift		0.774		
I considered percentage of occupancy in society (neighbourhood) before buying the house		0.520		
I have compromised distance of house from city centre/work centre		0.523		
I agree to pay higher due to opportunities coming in approachable distance		0.724		
Proximity to community utilities like shopping, restaurants etc. was same among the final list of societies (neighbourhoods) shortlisted for buying		0.801		
In my purchase decision, association to colony name gave me sense of achievement				0.556
There is sense of achievement in appreciation of my house by visiting friends and relatives				0.610
I agree to pay higher in prestigious colony associated with role-model personalities				0.543
Some colonies were higher priced than others, even with similar house types, within similar geographical similarities				0.712
House is used to entertain (formal business guests and officers) to maintain prestige and status				0.821
I will pay more for associated builder/ developer of repute.				0.672
I preferred to purchase house in a well-known society (neighbourhood)				0.511
Colony location is more important than the size of the house (inside)				0.691
Eigenvalues	1.6432	3.2693	3.0040	2.0326

Source: Author's own.

Table 3. Weight Calculation

Factor Number	Factor	Cronbach's Alpha
1	Physical characteristics of house	0.739
2	Built-up characteristics	0.722
3	Neighbourhood characteristics	0.689
4	Brand value of the colony	0.532

Source: Author's own.

It is clear from the above table that only four factors are statically non-overlapping out of five factors identified. Also all the four factors had an eigenvalue greater than 1.

Consumer-driven Weights Derivation

All over the world, various rankings are being used based on some arbitrary weights, to compare between different brands and companies, which help the consumers ascertain brands that hold leadership position in the area of interest. For example, *Fortune* magazine uses 'company revenue' to determine the list of top 500 global corporations; *Interbrand* uses corporations' discounted value to derive the list of 100 most valuable brands. Although the above approaches are very robust as illustrated by the popularity of the rankings, it is not always possible to come up with one factor that determines the rank or use of the concept of discounted value.

The importance of determination of appropriate weights cannot be emphasized enough. The aim of the research is to arrive at a consumer-determined REVI. Hence, it was important to arrive at a set of weights that capture consumer behaviour. Weights may vary from customer function to customer group. The four factors identified and used in the questionnaire are mentioned in Table 4 along with their average scores and relative weights. The pie chart distribution of weights has been shown in Figure 1.

From the data obtained, we can conclude that neighbourhood characteristic is the most important factor of real estate valuation followed by physical characteristics of house and brand value of the colony. At same time we can conclude that for Delhi, the REVI can be expressed by the following equation:

$$\mathrm{REVI}_{\mathrm{Score}} = \mathrm{a}_1\mathrm{X}_1 + \mathrm{a}_2\mathrm{X}_2 + \mathrm{a}_3\mathrm{X}_3 + \mathrm{a}_4\mathrm{X}_4$$

Where $\mathrm{X}_{1\ldots}\mathrm{X}_4$ are factors of real estate valuation (see Table 4) and $a_1 \ldots a_4$ are consumer-driven weights of each factor.

In our case REVI is given by

Table 4. Factor Weight Calculation

Factor Number	Factor	Average Score	Weights
1	Physical characteristics of house	3.81	0.26
2	Built-up characteristics	2.89	0.19
3	Neighbourhood characteristics	3.85	0.27
4	Brand value of the colony	3.57	0.25

Source: Author's own.

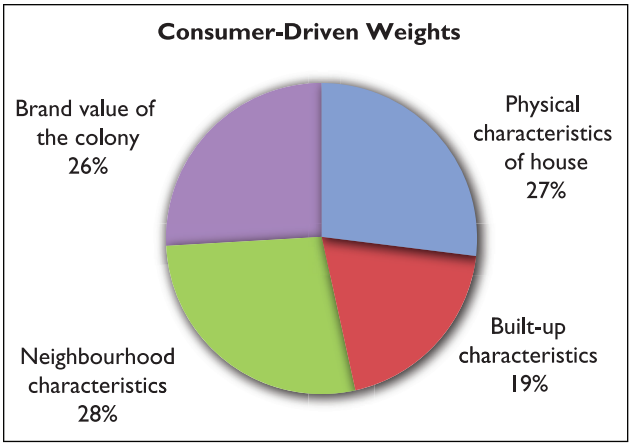

Figure 1. Factors Cronbach's Alpha Values

Source: Author's own.

$$\text{REVI}_{\text{Score}} = .26X_1 + .19X_2 + .27X_3 + .25X_4$$

So, the total score of any neighbourhood within that customer function can be evaluated with the help of weights calculated above.

Limitations and Assumptions

Research has led to an index comprising factors that affect property prices and weights of these factors. Weight of factors may be dependent on social, cultural, lifestyle perception and architectural characteristics of the neighbourhood. In this scenario the weights given to REVI parameters is relative and may vary subsequently depending on the expectation composition of customer group and customer function, query, placed on process of morphogenesis in the neighbourhood on particular time. Assumptions considered during this research work are listed as follows:

Neighbourhood: Each real estate unit is unique in nature. It is a product of architecture containing solution for a customer group for residential land use, and within this group, housing function has identifiable boundaries. What lies inside the boundaries of this group housing is named as 'neighbourhood'. And beyond there are many solutions available to the 'consumer group'. The customer has different purchase options and the freedom of choice (basket of variability that meets same customer function) influenced by 'environment of infrastructure and services' and other economic factors. Thus, environment of infrastructure, services and economic factors have a direct bearing on purchase decisions and choices for real estate in an urban housing environment. Homogeneous group housing is one of the examples, which is termed as *neighbourhood* in this article. Heterogeneous group housing is combination of more than one type of cluster.

Unique character: A vacant housing unit is only a concrete structure with unique architecture. Occupation of housing by users/owners' families and their 'interaction in and around neighbourhood'

Table 5. Property Utility Matrix

Market Behaviour Perspective	Other	Enterprise	Property Business
	Self	Residential Characteristics	Investing Surplus
		Self Owner utility perspective	Other

Source: Author's Own.

lead to the emergence of unique characteristics associated with the lifestyle and sociocultural attributes of those families; of course, it naturally takes time for such unique characteristics and a specific identity that distinguishes one neighbourhood from another to emerge. This association results unique positioning of the Neighbourhood, however, process is dynamic manifests on change of consumer lifestyle or replacement of users, on due course of time change moves towards equilibrium. This unique character is slow process and it is gradual adjustments to a direction of its own.

Property or 'value of property': 'Property' has been used in generic terms in this article, whereas residual land value in general and floor space index (FSI, 1 unit of floor area ratio [FAR] in particular) can only be understood by experienced professionals, who calculate a property's value by deducting 'construction value' from the composite unit rate, which is further derived from 'market realizable value' divided by covered area.

Location variation: We have assumed that clusters are homogeneous to an extent and involve planned development. Thus, planning results in similarity or uniformity in characteristics within a neighbourhood. REVI is useful for professionals to assess the median value of such 'micro variations'. Each unit has a micro variation due to alterations in layout and structure providing for better exposure to sunlight or better ventilation. Role of domain experts is not ruled out to examine and calculate the impact of such variations. This index can prove to be an important tool to professionals in this area. However, this index is in no way a replacement for expert opinion.

Pure residential: This research is limited to residential customer functions or 'residential characteristics' only. There is scope for further research to explore other categories of use. Plotting two key factors on a matrix led to the emergence of a category termed *residential*, but other categories identified during the process of this research have not been included in this article.

Conclusion, Further Research and Applications

REVI is an outcome of conscious and deliberate effort to develop the measurability of consumer behaviour with residential estate, residential estate seen as habitat that is an output/product of architecture. There is paucity of reliable scales in this unexplored new knowledge domain, which overlaps with the domain of architecture, consumer of 'product as an output from architecture' and investment decision-making in immovable assets known as real estate.

Our focus on users' interface morphing into property prospecting and results in positioning in consumers mind. When measured through Consumer driven weights and ranks given by them against various criteria; thus, their inputs led to the creation of REVI, the subject of this article. REVI is a comparative ranking index on which neighbourhood where the property to be assessed is situated (colonies)

or CGHS (cooperative group housing societies) can be ranked. Thus, it can be a robust tool to rank and assess the value of neighbourhoods falling in different categories.

REVI is an innovative tool that lays down the foundation for further research in real estate valuation because the findings of this study cannot be construed as globally applicable to different market segments in the real estate, for example, commercial properties, as our study focussed only on residential dwelling units. Hence, further research is warranted to further contribution or improvise upon our findings. To make it further relevant, REVI can be linked to various studies that focused on consumer behaviour in various cities/regions. REVI can be useful for stakeholders as well in the real estate market. The study findings can be used in property investment that requires high-involvement decision-making, and REVI can facilitate a detailed, in-depth analysis in real estate valuation. It can assist in decision-making related to house purchase. Consumers face difficulty in purchase decision during house purchase and generally rely on intermediaries' feedback for decision-making, especially in high-involvement environment countries, and more particularly metros in India. It is also useful for intermediaries (e.g., architects and allied engineering professionals, bankers and lenders, and other intermediaries such as property professionals and valuers) who are directly involved in the transactions between the buyers and the sellers in the real estate market.

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