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Competitive Advantage Evaluation Model of Sustainable Housing Design

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Received: 30 June 2020; Accepted: 23 July 2020; Published: 27 July 2020

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Abstract: Owing to the housing design's booming development and fierce competition among industry players, there have been many sensational designs that have not met the requirements of sustainable living, resulting in a serious waste of resources. Therefore, finding the critical factors of sustainable housing design with competitive advantages, and establishing an effective evaluation model along with helping operators make adequate decisions is the imperative topic at present. This study aimed to develop an evaluative model of such competitive advantages focusing on sustainable housing design, with 15 evaluation factors found through literature analysis, delivering 500 questionnaires of the Analytical Hierarchy Process development for housing design customers. A total of 390 were retrieved for a response rate of 78% and 327 are valid questionnaires. The factors listed in sequence are Cost Effectiveness, Tender Reputation and Word of Mouth, Green Materials, Culture and Folk Beliefs, Energy Saving, Energy Recovery, Easy Maintenance, Service Accessibility, Optimal Housing for Preserving Health, Customer Participating Experience, Schedule Control for Design and Engineering, Regulation Compliance, Core Competencies, Identity Representation, Low Operation Cost. Utility theory was then employed to develop a customer-oriented assessment model. Finally, four case studies of housing design were examined with different locations, environments, human qualities, and budgets. The results found that the benefit of the location in a favorable environment was the highest, while the location near the river and the tomb area was the lowest. As mentioned above, the designer needs to create a solution for the influences of Culture and Folk Beliefs, as well as the uneasy maintenance problems caused by the high humidity near the river. Accordingly, there are different responses made for different conditions of houses from designers. Furthermore, the evaluation model can serve as a tool, supporting decision-making related to sustainable housing designers.

Keywords: competitive advantage; analytical hierarchy process; utility theory; sustainable; housing design

1. Introduction

The proportion of housing improvement activities among all economic activities has increased, which indicates that the housing design industry has become a crucial economic field [1]. However, little attention has been paid to quality management problems concerning diverse housing design content engendered by prosperous urban development. Consequently, housing designers frequently overlook the actual needs of their clients, leading to gaps in understanding between the two parties. This greatly affects client satisfaction, and therefore, also reduces designer competitiveness. The major reason for this is that housing design is a high-ratio customized industry influenced by market trends and personal preferences. In addition, many designers work like art creators and blindly pursue appearance aesthetics, but they ignore the actual demands of customers.

McClure and Bartuska [2] asserted that housing design should address problems concerning people's living experiences and interactions with their surroundings as well as fulfill related needs. Compared with other industries, the housing design industry is closely associated with people's daily lives; therefore, housing design should meet people's living needs and must consider all problems related to building users. Lopez [3] stated that housing designers habitually endeavor to create space they consider attractive but easily neglect residents' perceptions, overlooking whether their design addresses living needs. Furthermore, Kamand [4] asserted that housing design has been accused of making problems about the waste of environmental resource and pollution, owing to excessive energy-consuming designs, thus sustainable housing development is one direction that the housing industry needs to face. However, at the same time of facing sustainable housing development, we must also understand the actual problems of marketing competition, that is, the three challenges that today's industry face are service quality, differentiation, and productivity [5]. Therefore, these are bound to the key point about the success of sustainable housing development to bridge the gap between sustainable housing and client satisfaction, and thus to gain recognition and competitive advantage in the market [6].

In view of the above studying motivations, this study establishes the evaluation model with objective, quantitative function and practical suitability through the combination of Analytical Hierarchy Process and Utility Theory to help decision-makers identify key factors and clarify the decision direction to enhance competitive advantage, in order to achieve the purpose of sustainable housing development. (Figure 1).

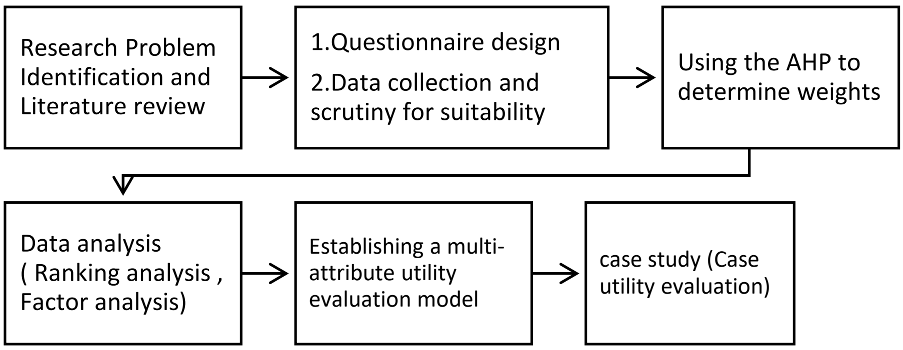


Figure 1. Research framework for the study.

2. Literature Review

Mendelsohn [7], the earliest scholar to propose discourse on housing design behavior, indicated that housing design is associated with housing consumption and investment: it is influenced by factors such as household attributes, various types of expenditure, asset value, and leisure time; and it aims to maximize the effectiveness of personal expenditure. Regarding relevant discussions today, the Council for Interior Design Accreditation (CIDA, previously FIDER) in the United States defined the job content of interior designers as follows: skills in conducting needs analysis; trends and issues impacting specific populations: elderly, at-risk youth, millennials, etc.; design for inclusivity; design for secure environments; design for human wellbeing, both mental and physical; ability to address human-centered issues; evidence-based research and fundamentals of original research; understanding of current and emerging technology and integration into work/life; balancing privacy and security needs; augmented reality and virtual reality as tools in the workplace; the impact of technology on the human experience; design and renovation of suburban homes for emerging user needs/new uses; design of affordable homes; the attributes and value of empathy; aspects of gender and sexual identity and influences on the built environment; modularity and adaptability related to user needs and the built environment; historical contexts of urban and suburban development and renewal; and current trends and trajectories of land use and development [8].

According to the aforementioned statements, the scope of housing design should incorporate schedule control for design and engineering and cost effectiveness, both of which pertain to the attainment of economic advantages, and encompass regulation compliance and impressive presentation, both of which pertain to tender characteristics. According to Dohr and Portillo [9], housing design reflects social, aesthetic, and environmental perceptions and adopts natural and manmade elements to create indoor spaces that satisfy the lifestyles of people or groups. In other words, it is necessary to make the consideration in the physical, social, economic, and environmental aspects of housing design, in order to maximize the satisfaction of all relevant benefits. [10,11]. This is performed by considering their cultural, psychological, physiological, financial, and historical backgrounds, as well as their behaviors and preferences. Similar to what was revealed by Maslow's hierarchy of needs, clients' basic physiological, safety, social, esteem, and self-actualization needs must be satisfied. Relatively higher levels of needs such as high publicity of a brand and identity representation are viewed as added value by clients and can be fulfilled through housing interior design. When it comes to the issue of improving the quality of life, how to enable people to live in a healthy environment and improve the socio-economic and environmental conditions for present and future generations will be regarded as the main goal of sustainable development [12]. That is to say, sustainable development is progresses that meets human demands and heightens the quality of life in the way in which ecosystems should keep renewing themselves [13]. Although sustainability and development are contradictory, this does not reduce the importance of efforts to minimize the negative influences of urbanization in a rapidly developing world [14].

The impacts of climate change have aroused people's awareness of environmental protection as well as substantially affected people's perceptions of housing design. For example, energy saving awareness, carbon reduction goals, and the use of green materials are currently viewed as residents' social responsibilities [15,16]. Moreover, the evaluation of cost-optimal solutions for sustainable housing design is also a major mission at present, because it will directly affect the developing effectiveness of sustainable housing [17,18]. Therefore, we must consider the economic, environmental and social issues from sustainable housing design, in order to achieve the long-term sustainable results equally [19]. In other words, eco-friendliness is a critical element of housing design. Using green materials in interior spaces as well as designing or selecting facilities associated with the concepts of energy saving, sustainable energy, and energy recovery are critical for housing design today [20,21]. Therefore, it is urgent to obtain a better understanding of the way the adoption of sustainability initiatives at a local level can be adopted, regarding consumer decision-making in housing contexts [22].

Gale [23] suggested that customer value should be incorporated into business strategies to ensure that businesses can sustain their competitiveness. Han, Xie, and Hu [24] further divided the characteristics of customer value into the following four types: interactive value, which is derived from customer interaction; relatedness value, which is comparable, personal, and situational; preferential value, which affects customers' value assessment; and experiential value, which is derived from consumption experiences. From the perspective of housing design, interaction value pertains to value creation and refers to a favorable experience gained by customers through interacting and engaging in experiential activities [25]. Relatedness value refers to customers' overall assessment of product value, determining whether a product features economic advantages such as low operation costs or easy maintenance [26]. Preferential value refers to spiritual value, which satisfies customers' nostalgia for certain people, objects, or events (e.g., preserving the current condition of a house because of its emotional significance to the house owner). This type of value pertains to the concept of linked at the ground and is an emotional factor associated with added value [27]. Experiential value refers to customers' experience of using a product or service and is assessed through service accessibility, tender reputation and word of mouth, all of which pertain to tender characteristics [28]. Therefore, customer value substantially influences the competitiveness of housing design. Housing design companies must think from residents' perspectives to provide designs that satisfy customer value and elevate customer satisfaction, thereby improving their market competitiveness.

Fornell [29] reported that a single factor can be employed to measure overall customer satisfaction because it refers to customers' overall reaction, in which they sum up their level of satisfaction with products and services. However, Zeithaml, Binter, and Gremler [30] reported that customer satisfaction is affected by factors such as product quality, service quality, situational factors, personal factors, and cost and therefore cannot be measured by a single factor; instead, various factors must be examined. Preliminary Evaluation Criteria listed in Table 1.

Table 1. Nomenclature regarding the competitive advantages of sustainable housing design.

Construct	Preliminary Evaluation Criteria		Literature
1	Added value	Culture and Folk Beliefs, Customer participating experience, Identity representation, Optimal housing for preserving health	Dohr and Portillo (2011), Gale (2009), Bahareh, et al. (2019), Ali, et al. (2019), Han et al. (2018), Pine and Gilmore (2011) and Richins (2008)
2	Economic advantages	Cost effectiveness, Schedule control for Design and Engineering, Easy maintenance, Low operation cost	Albert et al. (2019), Zeithaml, et al. (2014) Jamie, et al. (2020), and Kotler (2011)
3	Tender characteristics	Tender Reputation and Word of mouth, Service accessibility, Regulation compliance, Core Competencies	Han et al. (2018), Gale (2009) and Schmitt (2011)
4	Eco-friendliness	Green materials, Energy saving, Sustainable Energy, Energy recovery	Cida (2019), Juan, et al. (2019), Cirstea, et al. (2019), Dahlblom, et al. (2020), Egle, et al. (2020), Dohr, et al. (2011) and Delia (2017)

3. Methodology

3.1. Using the AHP to Determine Weights

Analytical Hierarchy Process (AHP) is one set of studying methods to systematize complex problems. It is suitable to assist decision-makers in choosing the appropriate program that can be hierarchically analyzed from different levels and through quantitative methods to find out the trails for making the integrated evaluation [31].

An AHP questionnaire survey was conducted on experts who were housing design customers. A total of 500 questionnaires were delivered; 390 were retrieved for a response rate of 78%. Among these 390 questionnaires, 63 were invalid and 327 were valid.

According to Table 2, cost effectiveness was ranked first primarily because of the economic condition of society, which results in customers tending to expect housing designers to provide a high-quality service within a limited budget. That is, customers want the optimal product at the lowest price. However, the pursuit of cost effectiveness may compromise quality. Therefore, tender reputation and word of mouth were regarded as the second most important factor. This indicates that customers also expect tender to have a good reputation and word of mouth, meaning that tender should have abundant practical experience and be capable of providing high-quality services, and thus, they can be trusted. Furthermore, because of people's rising eco-friendliness and governments worldwide promoting environmental protection, the use of green materials was ranked third in terms of importance. That is, the use of green materials in housing design has become a trend as well as an indicator for customers to evaluate the competitiveness of housing design. The factor of culture and folk beliefs was ranked fourth, indicating the significance of psychological needs to housing design. Local culture, which involves taboos and beliefs, intangibly influences people's psychological perceptions; therefore, design content that follows local people's culture and folk beliefs can provide customers with senses of stability and healing.

Table 2. Weight order of the analytical hierarchy process (AHP) overall evaluation index.

Criteria	Level (1) W_i	Sub-Criteria	Level (2) W_i	Overall W_i	Overall Sequence
Added value	18.34%	Culture and Folk Beliefs (AV1)	37.73%	9.43%	4
		Customer participating experience (AV2)	22.31%	5.58%	10
		Identity representation (AV3)	17.21%	4.30%	14
		Optimal housing for preserving health (AV4)	22.75%	5.69%	9
Economic advantages	39.17%	Cost effectiveness (EA1)	42.26%	10.56%	1
		Schedule control for Design and Engineering (EA2)	19.85%	4.96%	11
		Easy maintenance (EA3)	24.31%	6.08%	7
		Low operation cost (EA4)	13.58%	3.40%	15
Tender characteristics	25.50%	Tender Reputation an# Word of mouth (TC1)	40.07%	10.02%	2
		Service accessibility (TC2)	23.64%	5.91%	8
		Regulation compliance (TC3)	18.78%	4.70%	12
		Core Competencies (TC4)	17.51%	4.38%	13
Eco-friendliness	16.99%	Green materials (EF1)	39.99%	9.99%	3
		Energy saving (EF2)	33.84%	8.46%	5
		Energy recovery (EF3)	26.18%	6.54%	6
Total W_i	100%			100%	

Energy saving and energy recovery were ranked fifth and sixth, respectively; thus, the three factors under the eco-friendliness dimension notably accounted for half of the top six key factors. This implied that people have become highly aware of global warming, energy saving, and carbon reduction. Therefore, green materials were identified as key factors contributing to the competitive advantages of housing design, and the housing design industry should pay attention to this trend and its future development.

3.2. Establishing a Multi-Attribute Utility Evaluation Model

Utility theory is a quantitative theoretical analysis method and was proposed by Bernoulli in 1738. The theory is suitable for evaluating individual preferences and attitudes toward risks and can enhance the objectivity of decisions. For example, Hsueh [32] applied a utility-based model to evaluate the energy conservation performance in households, which clearly demonstrates the advantages of using utility theory for quantitative analysis. The present study adopted a risk-neutral approach to establish the evaluation model, namely a progressive approach, by referring to Dozzi, AbouRizk, and Schroeder [33]. Accordingly, the linear utility equation was defined as follows:

$$u_{\,i}(y_i) = Ay_i + B \tag{1}$$

The utility function was defined as follows:

$$u_{\,i}(y_i) = [1/(y_m - y_T)] \times y_i - y_T/(y_m - y_T) \tag{2}$$

Finally, the relative weight of criteria (W_i) obtained through the AHP and the utility value of each criterion obtained from utility theory were used to calculate the expected utility value (EUV). In other words, the sum of $W_i \times u_{ri}$ was the EUV, calculated using the following equation:

$$\text{Expected Utility Value (EUV)} = \sum\nolimits_{i=0}^{n} (u_{ri} \times W_i) \tag{3}$$

In Table 3, service accessibility is marked as negative in the criteria column, which means the higher the value, the lower the utility. That is, its value is inversely proportional to the defined maximum and minimum values. For example, the unit for service accessibility was the number of customer complaints received every month. A large number indicates poor customer service. In today's society, customers are highly aware of their rights and interests; therefore, receiving no customer complaints is difficult. However, six customer complaints may be too many and likely to incur lawsuits, and therefore, this number was not included in our discussion of competitive advantages. This study considered that one to three customer complaints a month are generally acceptable; thus, two customer complaints a month was set as the threshold value for service accessibility. For criteria that are not marked as negative in the criteria column in Table 3, the higher the value, the higher the utility. For example, the criterion of energy saving was evaluated based on the categories of electricity, water, and gas saving, which are common forms of energy saving in households. If all three categories were achieved, the utility was the highest, whereas if only one category was achieved, the participants at least paid attention to energy saving. Accordingly, one was set as the threshold value, and zero denoted the worst utility.

Table 3. Optimal and worst expected utility value (EUV).

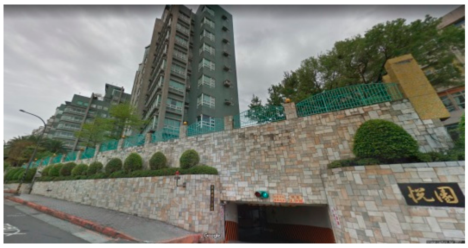
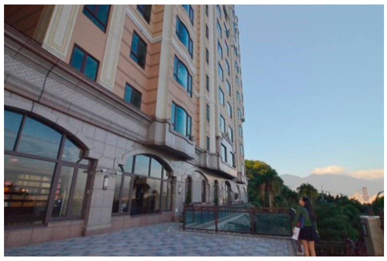
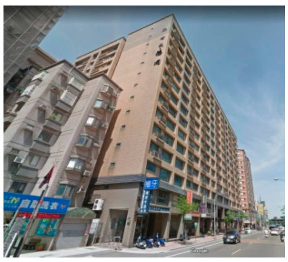
Criteria	$W_i \times 100\%$	y_u	y_m	y_T	y_L	Utility Function (u_{ri})	Worst	Optimal
AV1	9.43	100%	100	60	0	$u(y) = 0.025y - 1.5$	−14.15	9.43
AV2	5.58	Four times/month	4	1	0	$u(y) = 0.33y - 0.33$	−1.84	5.52
AV3	4.30	100, manually determined using fuzzy theory	100	50	0	$u(y) = 0.02y - 1$	−4.30	4.30
AV4	5.69	100, manually determined using fuzzy theory	100	50	0	$u(y) = 0.02y - 1$	−5.69	5.69
EA1	10.56	100%	100	60	0	$u(y) = 0.025y - 1.5$	−15.84	10.56
EA2	4.96	100%	100	70	0	$u(y) = 0.033y - 2.33$	−11.56	4.81
EA3	6.08	100%	100	80	0	$u(y) = 0.05y - 4$	−24.32	6.08
EA4	3.40	100%	100	60	0	$u(y) = 0.025y - 1.5$	−5.10	3.40
TC1	10.02	100, manually determined using fuzzy theory	100	50	0	$u(y) = 0.02y - 1$	−10.02	10.02
TC2 (negative)	5.91	Six customer complaints/month	0	2	6	$u(y) = -0.5y + 1$	−11.82	5.91
TC3	4.70	100, manually determined using fuzzy theory	100	60	0	$u(y) = 0.025y - 1.5$	−7.05	4.70
TC4	4.38	100, manually determined using fuzzy theory	100	60	0	$u(y) = 0.025y - 1.5$	−6.57	4.38
EF1	9.99	100%	100	50	0	$u(y) = 0.02y - 1$	−9.99	9.99
EF2	8.46	Three Category	3	1	0	$u(y) = 0.5y - 0.5$	−4.23	8.46
EF3	6.54	Four Category	4	1	0	$u(y) = 0.33y - 0.33$	−2.16	6.48
Expected utility value (EUV)						−134.64~99.73		

Table 3 displays the calculation results, where the lowest and highest EUVs were −134.64 and 99.73, respectively.

4. Data and Empirical Results

After the weight of each criterion was assessed and the evaluation model was constructed, this study applied the weights and model to four cases located in Taipei. The cases are presented in the following Table 4 (Figure 2).

Table 4. Data analysis of the cases.

Case1	City center in Daan District, Taipei City
Location map	Photo of the building
	
Case2	Sulfur hot spring area in Beitou District, Taipei City
Location map	Photo of the building
	
Case3	Located at the junction of Tamsui and Keelung Rivers and faces toward the back region of the Mount Guanyin tomb area in Wugu District, New Taipei City
Location map	Photo of the building
	
Case4	Suburban area in Taoyuan County
Location map	Photo of the building
	

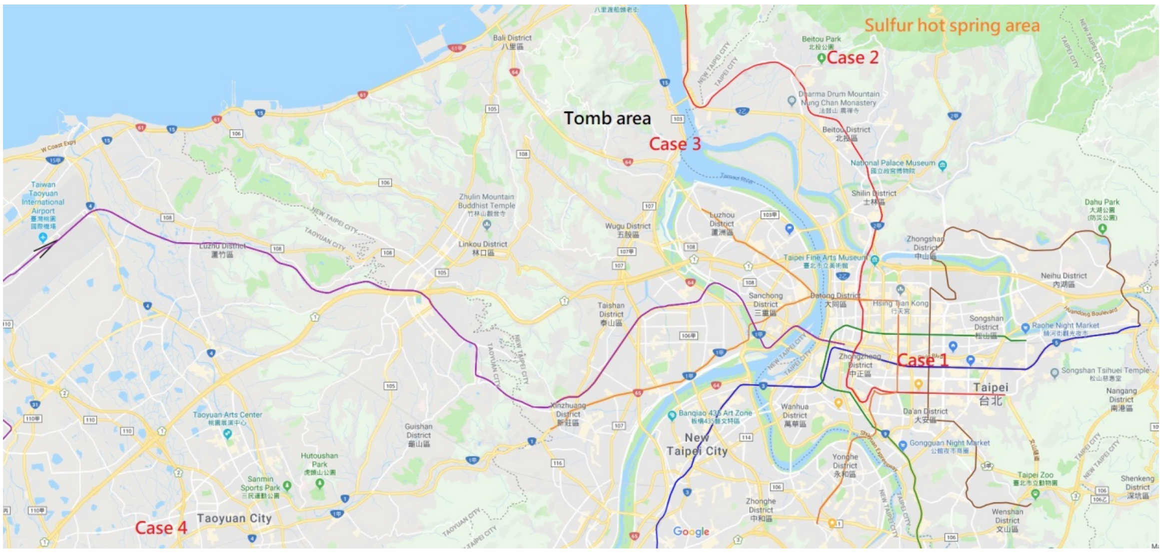


Figure 2. Location distribution of the cases.

These four cases were by the same housing designer. However, the housing designs differed because of the different environments, cultural aspects, climate, and budget associated with the cases, which generated different EUVs.

Regarding the criterion of cultural and folk beliefs, Case 3 was evidently influenced by the fact that it faced the back of a tomb area. Because Case 3 was associated with relatively more taboos and folk customs because of its location, the customer was not fully satisfied with the housing design even though it was designed by the same designer. Therefore, the EUV of Case 3 differed substantially from those of Cases 1, 2, and 4. In addition, regarding the cost effectiveness criterion, the housing design budget for Cases 3 and 4, both of which were located in suburban areas, were relatively low; therefore, the benefit–cost ratios of these cases were less favorable and their EUVs were relatively low. By contrast, Cases 1 and 2 were located in the city center and yielded relatively favorable EUVs because of sufficient budgets. Therefore, budget was a critical factor affecting EUV. In addition, regarding the easy maintenance factor, we determined that Cases 2 and 3 were influenced by sulfur gas produced by hot springs and by the humidity of mountains located at the junction of two rivers, respectively. Sulfur gas and humidity increased the difficulty of maintaining indoor facilities, and thus, less favorable EUVs were yielded. The low operation cost factor indicated that Case 1 allocated a sufficient budget to generate a design that was satisfactory to the customers; however, it was associated with relatively high operation costs. The service accessibility factor warranted attention. Table 3 indicates that the EUV of Case 1 was low because customers in the city center obviously demanded greater services than those in suburban areas. Specifically, they were likely to file customer complaints when they were slightly dissatisfied and fiercely protected their rights and interests. Therefore, service accessibility was a highly unique influential factor.

In addition to the aforementioned factors, the evaluation results of green materials warranted attention. Case 4 was designed with a relatively low budget and had obviously used fewer green materials, revealing that the high cost of green materials substantially influences building material selection. Therefore, lowering the cost of green materials would definitely affect the evaluation results.

Using Table 5, we determined that Cases 3 and 4 exhibited the highest and lowest EUVs, respectively. The EUV of Case 4 was more than twice that of Case 3. This result revealed that the environment was a major influencing factor, especially in Taipei, which features a humid subtropical climate. Certainly, the taboos and folk customs associated with the tomb area were also key factors influencing Case 3. Even though the EUV of Case 2 was not the lowest, we determined that competitive advantages were substantially affected by how environmental issues generated by sulfur hot springs were addressed. Therefore, the decision-makers who were involved in the interior design of building types such as Cases 2 and 3 must strengthen their professional capacity for environmental factors. This would alleviate problems related to the environment (Figure 3).

Table 5. Case utility evaluation.

Criteria	$W_i \times 100\%$	Case 1		Case 2		Case 3		Case 4	
		y_i	$U_{ri} \times W_i$	y_i	$U_{ri} \times W_i$	y_i	$U_{ri} \times W_i$	y_i	$U_{ri} \times W_i$
AV1	9.43	90	7.07	80	4.72	40	−4.72	90	7.07
AV2	5.58	3	3.68	1	0	1	0	2	1.84
AV3	4.30	90	3.44	75	2.15	70	1.72	90	3.44
AV4	5.69	80	3.41	80	3.41	90	4.55	70	2.28
EA1	10.56	80	5.28	80	5.28	60	0	50	-2.64
EA2	4.96	70	0	70	0	90	3.17	90	3.17
EA3	6.08	70	−3.04	80	0	70	−3.04	90	3.04
EA4	3.40	50	−0.85	60	0	65	0.43	80	1.70
TC1	10.02	80	6.01	80	6.01	75	5.01	70	4.01
TC2	5.91	2.5	−1.48	1.5	1.48	2	0	1	2.96
TC3	4.70	80	2.35	80	2.35	90	3.53	90	3.53
TC4	4.38	80	2.19	70	1.10	80	2.19	80	2.19
EF1	9.99	70	3.99	60	1.99	60	1.99	40	−1.99
EF2	8.46	1	0	1	0	2	4.23	2	4.23
EF3	6.54	1	0	1	0	1	0	3	4.32
(EUV)		32.05		28.49		19.06		39.15	

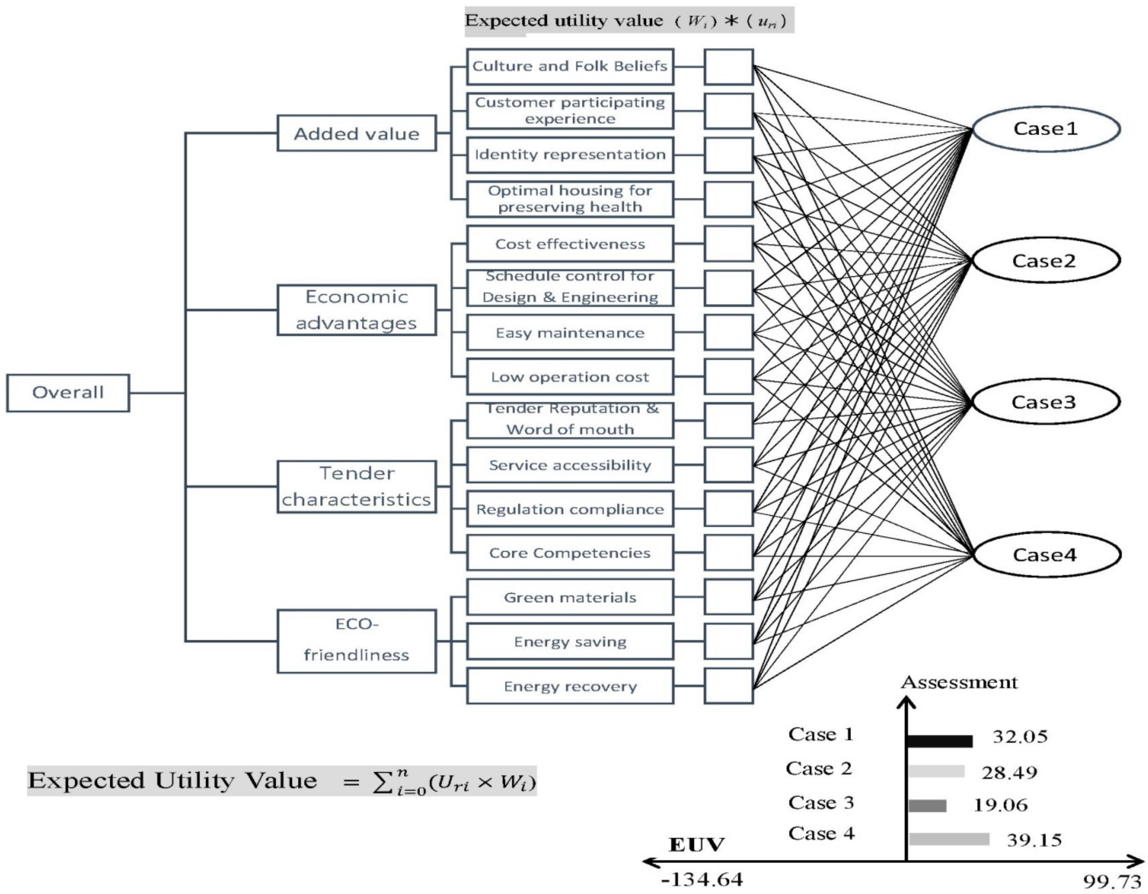


Figure 3. Schematic of the assessment results for Cases 1–4.

5. Conclusions

Because of environmental changes and economic recession, the housing design industry is facing increasing competitive pressure in the market. For housing designers, simply possessing professional design skills is not sufficient for them to cope with such pressure, especially in today's society where consumers are influenced by the trend of cultural diversity and their needs are difficult to grasp.

From the four cases in the case study, the factors that were likely to lead to differences in competitive advantages were identified as cultural and folk beliefs, cost effectiveness, easy maintenance, low operation cost, service accessibility, and green materials. In particular, cultural and folk beliefs and easy maintenance were highly influenced by a building's location within the environment, indicating that site surveys and data collection are vital and housing designers should develop appropriate strategies in response to local characteristics of specific regions. Moreover, cost effectiveness and green materials were significantly influenced by customer budget. Therefore, housing designers should enhance their ability to analyze budget allocation to formulate the most suitable housing design project. The factor of low operation cost was caused by the excessive contents of a housing design project; numerous facilities inevitably results in high maintenance costs. Therefore, housing designers must strike a balance between design contents and cost. Service accessibility is related to the rise of customer awareness of their rights and interests, which has resulted in an increasing demand for high-quality services in economically developed urban areas. Housing designers should develop measures to respond to this trend.

To sum up the study results, the housing of locations, human qualities, and budgets have a great influence on the competitive advantage of sustainable design and will affect the interaction of the 15 sub-criteria. Under the same designer's operating ability, it is easier to obtain the high benefits for the housing location in a favorable environment, while the benefits of the housing location near the river and the tomb area were the lowest. This means that the designer did not particularly solve the problems from culture and folk beliefs and the uneasy maintenance problems caused by the high-humidity near the river, as well as the effectiveness of budgets involved, which leaded to reduce the competitive advantage. That is to say that the designers should adjust the designing strategy according to the housing characteristics about different locations, environments, human qualities, and budgets in order to enhance the competitive advantages of the sustainable housing design. Therefore, employing the evaluation model can indeed assist the designers to analyze the housing cases as the reference of decision-making, and propose an effective program for the factor with the lower EUV, which can greatly enhance the competitive advantages of sustainable housing design.

This study targeted northern Taiwan as its research area, which belongs to the attribute of an Asian island region, and did not include other different latitudes, regions or cultures, and so on. Accordingly, future studies are recommended to include regions with dissimilar characteristics to construct evaluation models suitable for different regions. The authors are thankful to the editors and anonymous reviewers for their useful comments that helped to improve the quality of this paper.

Author Contributions: Conceptualization & Formal analysis: P.-K.W., S.-G.S. and Y.-H.P.; Investigation: P.-K.W.; Resources: P.-K.W.; writing—original draft preparation: P.-K.W.; writing—review and editing: P.-K.W.; All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Joint Center for Housing Studies of Harvard University. *Improving America's Housing*; Report for Harvard Design Sch.; Joint Center For Housing Studies Of Harvard University: Boston, MA, USA, 2019.
2. Mcclure, W.R.; Bartuska, T.J. *The Built Environment-A Collaborative Inquiry Into Design And Planning*; John Wiley & Sons: Hoboken, NJ, USA, 2007; p. 143.
3. Lopez, R. Sense of place and design. *J. Focus* **2010**, *7*, 16. [CrossRef]

4. Kamand, M.R.; Hassan, A.; Bakar, A.; Amin, A.T. Energy-efficient design for sustainable housing development. *J. Clean. Prod.* **2014**, *65*, 380–388.
5. Kotler, P. *Marketing Management: Analysis, Planning, Implementation and Control*, 13th ed.; Prentice-Hall Inc.: Englewood Cliffs, NJ, USA, 2011.
6. Chan, A.P.; Adabre, M.A. Bridging the gap between sustainable housing and affordable housing: The required critical success criteria (CSC). *J. Build. Environ.* **2019**, *151*, 112–125. [CrossRef]
7. Mendelsohn, R. Empirical Evidence On Home Improvements. *J. Urban Econ.* **1977**, *4*, 459–468. [CrossRef]
8. Cida Summit Report. A Strategic View to the Future. pp. 6–8. Available online: http://www.accredit-id.org (accessed on 5 November 2019).
9. Dohr, J.H.; Portillo, M. *Design Thinking For Interiors, Inquiry, Experience, Impact*; John Wiley & Sons: Hoboken, NJ, USA, 2011; pp. 254–264.
10. Maleki, B.; Casanovas Rubio, M.D.M. The Multi-criteria Assessment of Sustainable Residential High-rise Building Design. In Proceedings of the 19th European Roundtable for Sustainable Consumption and Production (ERSCP 2019) Institute for Sustainability Science and Technology, Universitat Politècnica de Catalunya, Barcelona, Spain, 15−18 October 2019.
11. Karji, A.; Woldesenbet, A.; Khanzadi, M.; Tafazzoli, M. Assessment of Social Sustainability Indicators in Mass Housing Construction: A Case Study of Mehr Housing Project. *J. Sustain. Cities Soc.* **2019**, *50*, 101697. [CrossRef]
12. Yigitcanlar, T.; Kamruzzaman, M. Planning, development and management of sustainable cities: A commentary from the guest editors. *Sustainability* **2015**, *7*, 14677–14688. [CrossRef]
13. Ingrao, C.; Messineo, A.; Beltramo, R.; Yigitcanlar, T.; Ioppolo, G. How can life cycle thinking support sustainability of buildings? Investigating life cycle assessment applications for energy efficiency and environmental performance. *J. Clean. Prod.* **2018**, *201*, 556–569. [CrossRef]
14. Yigitcanlar, T.; Kamruzzaman, M.; Teriman, S. Neighborhood sustainability assessment: Evaluating residential development sustainability in a developing country context. *Sustainability* **2015**, *7*, 2570–2602. [CrossRef]
15. Li, J.; Li, G.; Sun, X. Environment And Green Brand Authenticity And Its Effects Towards Brand Purchase Intention, The Case Of Green Building Material. *J. Environ. Prot. Ecol.* **2019**, *20*, 1842.
16. Cirstea, S.D.; Tiron-Tudor, A.; Nistor, R.L.; Cirstea, A.; Fulop, M.T.; Fulop, R. Energy And Economic Development 'Distances' In Eastern Europe. *J. Environ. Prot. Ecol.* **2019**, *20*, 254.
17. D'Agostino, D.; Zacà, I.; Baglivo, C.; Congedo, P.M. Economic and Thermal Evaluation of Different Uses of an Existing Structure in a Warm Climate. *Energies* **2017**, *10*, 658. [CrossRef]
18. Filer, J.E.; Delorit, J.D.; Hoisington, A.J.; Schuldt, S.J. Optimizing the Environmental and Economic Sustainability of Remote Community Infrastructure. *J. Sustain.* **2020**, *12*, 2208. [CrossRef]
19. Qin, H.T.Y.; Im, L.P.; AbdulLateef, O. Sustainability of Affordable Housing: A Review of Assessment Tools. *J. Eng. Manag. Appl. Sci. Technol.* **2020**, *11*, 8.
20. Dahlblom, M. *Towards Sustainability with Building Services Systems: By Focusing on Material Choices, Energy Use and Thermal Indoor Climates in Residential Buildings*, 1st ed.; Avd Installationsteknik; LTH; Lunds Universitet: Lund, Sweden, 2020.
21. Klumbyte, E.; Bliudzius, R.; Foikades, P. A SIPOC based model for the sustainable management of facilities in social housing. In Proceedings of the 2020 Conference Series: Earth and Environmental Science, Thessaloniki, Greece, 23–25 October 2019; Volume 410, p. 012081. [CrossRef]
22. Judge, M.; Warren-Myers, G.; Paladino, A. Using the theory of planned behaviour to predict intentions to purchase sustainable housing. *J. Clean. Prod.* **2019**, *215*, 259–267. [CrossRef]
23. Gale, B.T. *Managing Customer Value, Creating Quality and Service that Customers Can See*; Free Press: New York, NY, USA, 2009.
24. Han, X.; Xie, N.; Hu, L. Antecedents Of Customer Engagement And Its Effect On Buying Behavior In Virtual Community—Based On Self-Determination Theory. *J. Serv. Sci. Manag.* **2018**, *7*, 125–142.
25. Pine, B.J., II; Gilmore, J.H. *The Experience Economy: Work Is Theatre and Every Business a State*; Harvard Business School Press: Boston, MA, USA, 2011; pp. 25–42.
26. Zeithaml, V.A.; Stephen, W.B.; Binter, M.J.; Salas, J. *Profiting from Services and Solutions: What Product-Centric Firms Need to Know*; Business Expert Press: New York, NY, USA, 2014.
27. Richins, M.L. The Nature Of Materialism. In *Na-Advances in Consumer Research*; Lee, A.Y., Soman, D., Eds.; Association for Consumer Research: Duluth, MN, USA, 2008; Volume 35, pp. 257–261.

28. Schmitt, B.H. *Experience Marketing: Concepts, Frameworks and Consumer Insights*; The Free Press: New York, NY, USA, 2011.
29. Fornell, C. *Satisfied Customer: Winners and Losers in the Battle for Buyer Preference*; St Martins Press: New York, NY, USA, 2007.
30. Zeithaml, V.A.; Binter, M.J.; Gremler, D.D. *Services Marketing: Integrating Customer Focus across the Firm*, 7th ed.; Mcgraw-Hill: New York, NY, USA, 2017.
31. Saaty, T.L. *The Analytic Hierarchy Process*; McGraw-Hill: New York, NY, USA, 1980.
32. Hsueh, S.L. A fuzzy utility-based multi-criteria model for evaluating households' energy conservation performance: A Taiwanese case study. *Energies* **2012**, *5*, 2818–2834. [CrossRef]
33. Dozzi, S.P.; Abourizk, S.M.; Schroeder, S.L. Utility-Theory Model For Bid Markup Decisions. *J. Constr. Eng. Manag.* **1996**, *122*, 119–124. [CrossRef]