

# Benchmarking Perceived Quality among Gated Communities Using VIKOR: A Study from Kurdistan Region of Iraq

## Abstract

Gated communities are emerging all over the world day by day. Besides, the product quality of the gated communities are still questionable in some regions. This research aims to benchmark the product quality at each gated community based on the main determinants of the product quality. To do this, data collected from 623 residents from various gated communities through questionnaire. The obtained data has been processed via structural equations modeling and integrated with VIKOR to benchmark the qualities from top to bottom. The results show that "Sulaimani Heights" were the best product among other alternatives while Goizha II was the worst one.

Keywords: Product Quality, Gated Communities, Structural Equations Modeling, Benchmarking, VIKOR

## 1. Introduction

Product Quality is one of the most important elements which satisfies customers and in return firm obtains competitive advantage with it (Aydinli and Demir, 2015; Torlak, Demir and Budur, 2019). In order to achieve product quality, organization must define it first. On the other hand, even the product quality is once defined, it must be known that based on time, the importance of each parameter may show some changes. From that point of view, firms should not only define the parameters that effect product quality perceptions of customers, but also reassess the importance of those parameters over a period of time. Further, it is vital for every organization to benchmark their ability to conform the expectations of customers more than other firms and organizations do so that they can achieve competitive advantage over others. Quality of a product and dimensions of it have been defined by various scholars (Garvin, 1984; Reeves & Bednar, 1994; Sebastianelli & Tamimi, 2002, ) in the previous researches. Garvin (1984) has defined parameters of product quality as; performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Later on, Sebastianelli & Tamimi (2002) have found the relations of those eight dimensions with three multiple definitions of quality such as; user-based definition relates to aesthetics, and perceived quality, the manufacturing-based dimensions relates to conformance, and product-based quality relates to performance and features. Moreover, they couldn't relate durability, serviceability, and reliability with any of those three quality domains.

Investment on gated communities is a special field that increases the importance day by day as the population

of the world keeps increasing. Furthermore, once the options that a customer may select increases, the competition starts. As there are more than one option to select, investors must pay more attention to understand customer expectations and present a better option to the users in order to keep market share and increase more. From this point of view, there are two problems arise; what are the customer expectations? And How good a brand satisfies the expectations of customer comparing to others? In order to answer these questions, scientific techniques of management must be applied adequately. Kurdistan Region of Iraq is the northern part of Iraq where gated communities have been increased enormously (Demir & Mukhlis, 2017) after the United Nations Embargo in 2003 (Demir, 2014). From this point of view, the importance of product quality in gated communities has become more important after then. However, Demir and Mukhlis (2017) have studied the impact of product quality dimensions on the customer satisfaction, repurchase intention, and willingness to pay. They have found that Serviceability (electricity supply, water supply, repair-maintenance...etc.) was the leading dimension which impact the perceived quality of the customers in gated communities. Furthermore, perceived quality was the main determinant which influence customer satisfaction, repurchase intention, and willingness to pay more.

In this study, we have further evaluated the market leaders through benchmarking the product quality in gated communities based on the product quality dimensions of Garvin (1984). To do this, we have evaluated

the total effects of eight product quality dimensions in gated communities on product quality perceptions of the customers. Those effects have been normalized and the weights have been used for calculating VIKOR method. Based on the results, we have given advices to the managers of the gated communities in the region.

## 2. Literature Review

### 2.1. Product Quality

Quality is an intangible dimension which most of the times mistaken with incorrect adjectives such as durability, luxury, expensive... etc. (Crosby, 1979). There are two kinds of quality; service quality and product quality. Service quality is conforming the expectations of customer after they purchase any service (Parasuraman, Zeithaml, and Berry, 1985; Demir, Talaat, and Aydinli, 2015; Demir and Aydinli, 2016; Gronroos, 1988). Further, Lewis and Booms (1983) stated that "Service quality is a measure of how well the service level delivered matches customer expectations. Delivering quality service means conforming to customer expectations on a consistent basis." The idea has been confirmed and supported by many other scholars (Parasuraman, Zeithaml, and berry, 1988; Demir and Eray, 2015, Gronroos, 1988).

Although product quality has similar aspects with the service quality by means of conforming the expectations (Demir, Eray, and Erguvan, 2015), it contains more complicated aspects. Garvin (1984) has determined five approaches of product quality such as:

- Transcendent approach which means innate excellence of product. It is the philosophical aspect of the quality that has been initiated by the Plato's discussion of beauty (Dickie, 1971)
- Product based approach which means the main characteristics of a product that it cannot be evaluated without those characteristics (Garvin, 1984; Griliches, 1971).
- User based approach which defines quality from the end users' points of view. It can be simply defined as fitness for use (Gilmore, 1974)
- Manufacturing based approach which focuses on the supply side of the production and primarily cares about the engineering or manufacturing problems (Garvin, 1984). Simply it aims to "do it right at the first time for the conformance of customer expectations" (Crosby, 1979)
- Value based approach defines quality in terms of price and cost of it. By another meaning, it requires acceptable conformance at acceptable cost (Theil, 1971).
- Garvin (1984) has derived mainly eight dimensions from the five approaches mentioned above. Those dimensions have been;
  1. Performance
  2. Features
  3. Reliability
  4. Conformance
  5. Durability
  6. Serviceability
  7. Aesthetic
  8. Perceived quality

The current research has been studied based on those eight dimensions of product quality. The research consi-

ders gated communities as product and those products have been benchmarked comparing to each other based on the determinants of product quality.

### 2.2. VIKOR Method

Multi-Criteria Decision-Making analysis include many tools such as analytic hierarchy process, TOPSIS, VIKOR...etc. which have been used to compare alternatives (Demir, 2019), rank the importance of each criterion (Ozmen, Demir, and Celepli, 2013)...etc. Further, VIKOR method is one of the multi criteria decision-making analysis that determines the compromise ranking list of alternatives, compromise solutions for complex problems, and the weight stability intervals for choice stability of the compromise solution obtained with the initial given weights (Opricovic & Tzeng, 2004). The model gives best alternative as solution that is closest to the ideal (Opricovic, 1998). Steps for the VIKOR calculation are as follows (Demir, 2019);

Determine the best ( $f_i^+$ ) and the worst ( $f_i^-$ ) values among all alternatives ( $j = 1, 2, 3, \dots, m$ ) and by each criterion ( $i = 1, 2, 3, \dots, n$ ).

If it is a benefit criterion that is to be maximized:

$$f_i^+ = \max_j f_{ij}$$

If it is a benefit criterion that is to be minimized:

$$f_i^- = \min_j f_{ij}$$

Compute  $S_j$  (Eq. (1)) and  $R_j$  (Eq. (2)) for  $j = 1, 2, 3, \dots, m$ .  $S_j$  and  $R_j$  respectively represent utility and regret measures for alternative.

$$S_j = \sum_{i=1}^n \left[ w_i \left( \frac{f_i^+ - f_{ij}}{f_i^+ - f_i^-} \right) \right] \quad (1)$$

$$R_j = \sum_{i=1}^n \max_j \left[ w_i \left( \frac{f_i^+ - f_{ij}}{f_i^+ - f_i^-} \right) \right] \quad (2)$$

Where  $w_i$  is the weight of the criterion

Compute  $Q_j$  (Eq. (3)) for  $j = 1, 2, 3, \dots, m$

where  $S^+ = \min S_j$ ,  $S^- = \max S_j$ ,  $R^+ = \min R_j$ ,  $R^- = \max R_j$ ,  $v$  is the weight for the decision-making strategy of the maximum group utility and  $(1-v)$  is the weight of the individual regret; generally  $v$  is assumed equal 0.5 corresponding to by consensus.

$$Q_j = \sum_{i=1}^n \left[ v \left( \frac{S_i - S_i^-}{S_i^+ - S_i^-} \right) + (1 - v) \left( \frac{R_i - R^-}{R^+ - R^-} \right) \right] \quad (3)$$

Rank the alternatives by the values  $S$ ,  $R$  and  $Q$  in ascending order by forming three ranking lists such that the lower the value the better the alternative.

Propose the alternative  $a'$  as a compromise solution which is ranked the best by the minimum value of  $Q$  if the following two conditions are satisfied:

Condition 1. Acceptable advantage:  $Q(a'') - Q(a') \geq DQ$  where  $a''$  is the alternative which is ranked second by  $Q$  and  $DQ = 1/(m-1)$ .

Condition 2. Acceptable stability in decision making: Alternative  $a'$  must also be the best ranked by S or/and R. If one of the conditions in Step 5 is not satisfied, propose a set of compromise solutions which include:

- Alternatives  $a'$  and  $a''$  if only Condition 2 is not satisfied, or
- Alternatives  $a', a'', \dots, a(n)$  if only Condition 1 is not satisfied; the closeness of the alternative  $a(n)$  ranked  $n$ th by  $Q$  is determined by  $Q(a(n)) - Q(a') < DQ$ .

### 2.3. Gated Communities

A gated community is a housing development on private roads closed to general traffic by a gate across the primary access. The developments may be surrounded by fences, walls, or other natural barriers that further limit public access (Grant & Mittelsteadt, 2004). It can be defined also as a guarded place which is surrounded by walls or any kinds of borders to be secured and controlled by security guards (Demir & Mukhlis, 2017). Families and individuals select to live in these developments for assorted reasons such as security, recreational facilities, ethnicity and services...etc. (Demir & Mukhlis, 2017).

In their much-cited study, Blakely and Snyder (1997) estimated that up to 9 million US residents live in 3 million units in around 20 000 proprietary residential communities bounded by walls and entrance gates, while in 1965 there were only about 500 of these private neighborhood government. Other researchers suggest that the global growth in private communities has been influenced by the US experience, although Adham (2005) has claimed that Fatimid Cairo was a gated city (Demir & Mukhlis, 2017).

In Kurdistan Region of Iraq, gated communities have been built enormously. The reason might be renewing the Kurdistan Region. The number of the gated communities have increased more than 10 after 2008 in Sulaimaniyah, Kurdistan Region of Iraq and still new projects are being constructed by investors. (Demir & Mukhlis, 2017). Other reasons might be electricity, water, cleaning...etc. services also are observed not to be very sufficient in the region and needs to be improved. For these reasons, the gated communities are the places where most of the society are willing to live in.

## 3. Methodology

### 3.1. Sampling

The sample utilized for the study included 623 participants who were selected employing a simple random sampling methodology from customers who just lived in nine different gated communities in Sulaimani, Kurdistan Region of Iraq. The respondents were merely invited to complete a survey questionnaire which was distributed in the Kurdish language. Each question was explained, and answers were recorded. The research was conducted throughout various opening hours, with 700 participants responding to the questionnaire. However, 77 of answers were incomplete and inappropriate, thus being eliminated from the study.

The margin of error and confidence interval were of vital importance to the calculation of sample size for the study. As noted by Krejcie and Morgan (1970), categorical

data may have around 5% margin of error. However, this is not always standard and might change (Kotlik and Higgins, 2001). Thus, using Cochran's (1977) formula with 2% of the margin of error and 95% of confidence interval where  $t$  value is considered to be 1.96 the sample size should be around 384. Thus, the sample used in this study is well enough to propose further analysis.

### 3.2. Measurement Variables

The questionnaire that has been used in this study was adopted from the study of Demir and Mukhlis (2017). There has been eight dimensions in total which are performance (six items), features (four items), reliability (four items), conformance (five items), aesthetics (nine items), durability (five items), serviceability (five items), and perceived quality. However, testing reliability of each construct, it was observed that all the dimensions as performance (0.809), features (0.814), reliability (0.811), conformance (0.894), aesthetics (0.920), durability (0.885), serviceability (0.858), and perceived quality (0.872) have been reliable based on the Cronbach's Alpha values.

In answering questionnaires five-level Likert-type scale was used. Answers to questions ranged from 1 (strongly disagree) to 5 (strongly agree).

### 3.3. Procedures

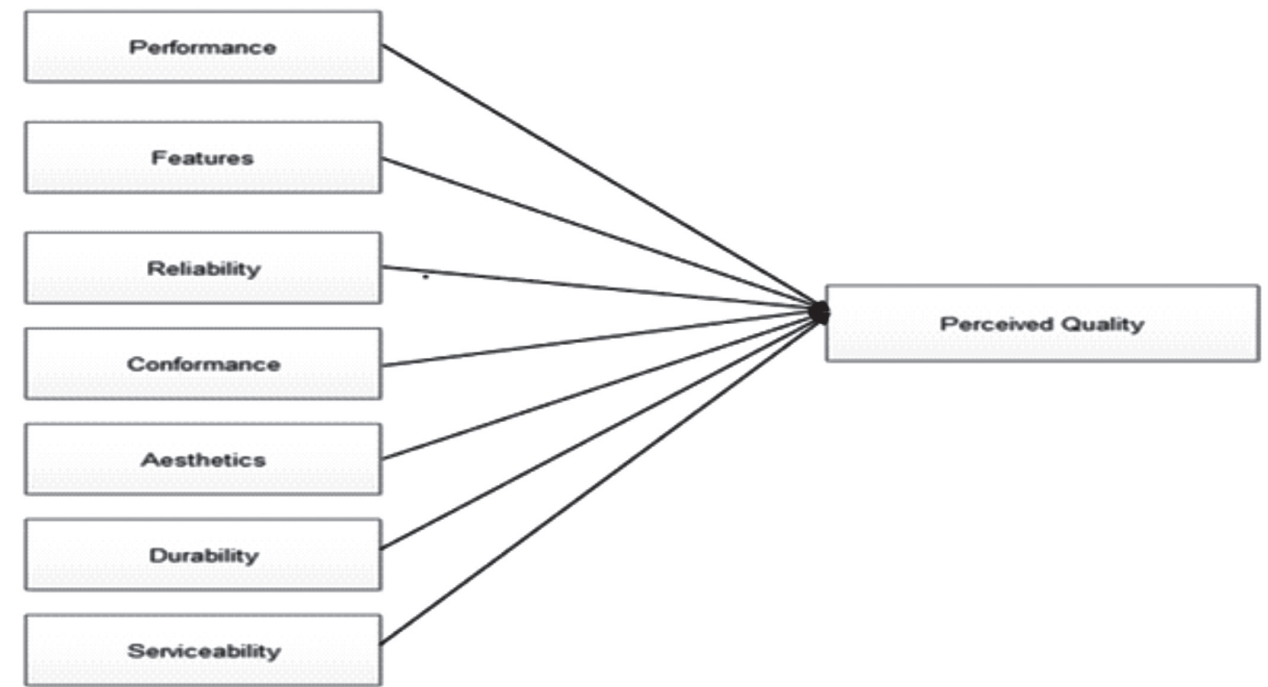
In order to benchmark product quality of gated communities, we have initially proposed structural equations modeling to determine the importance weights of each dimension for the perceived product quality. For the next step, we have normalized the weights which are total standardized weights of each dimension on perceived quality. However, ANOVA has been proposed to determine the perceived values of each dimension (performance, features...etc.) at each gated community. Furthermore, multi-criteria decision-making analysis method has been proposed. VIKOR model has been selected among the various models.

## 4. Data Analysis and Findings

### 4.1. Structural Equations Modeling

In this section, we have proposed structural equations modeling in order to determine the importance weights of each construct on perceived quality in gated communities. To do this, we have tested the impact of performance, features, reliability, conformance, aesthetics, durability, and service quality on perceived quality through the model which has been shown in the Figure 2 below.

When the results of the model is observed, it has been seen that performance ( $\beta = 0.154, p < 0.05$ ), features ( $\beta = 0.146, p < 0.05$ ), reliability ( $\beta = 0.272, p < 0.05$ ), conformance ( $\beta = 0.135, p < 0.05$ ), aesthetics ( $\beta = 0.135, p < 0.05$ ), durability ( $\beta = 0.167, p < 0.05$ ), and serviceability ( $\beta = 0.389, p < 0.01$ ), had directly and significantly influence on perceived quality. The table below further illustrates.



III. 1. Model of the structural equations modeling (SEM); Source: own resources

Table 1. Summary of the structural equations modeling

Dependent		Independent	Estimate	Significance
Product Quality	<---	Aesthetics	0.188	<0.05
Product Quality	<---	Performance	0.154	<0.05
Product Quality	<---	Conformance	0.135	<0.05
Product Quality	<---	serviceability	0.389	<0.01
Product Quality	<---	Durability	0.167	<0.05
Product Quality	<---	Reliability	0.272	<0.05
Product Quality	<---	Features	0.146	<0.05

Given in the table above, there are standardized estimates of independent variables on the product quality. Further, these standardized estimates have been used for the further analysis of multi-criteria decision-making analysis.

### 4.2. Normalization

The standardized estimates on product quality are the importance weights for the further analysis. From this point of view, those estimates can be evaluated as the importance levels of each criteria in analytic hierarchy process results. The difference is that analytic hierarchy process uses only inconsistency levels for model fit. Besides, the structural equation modeling having incremental and absolute model fit indexes which provides more accurate importance levels.

The sum of all importance levels must equal to one in order to determine the appropriate comparative importance of each criteria to one another. On the other hand, the results of structural equation modeling is not necessarily equal to one. For this reason, we have normalized standardized estimate by the formula below;

$$\frac{\text{Standardized estimates of each independent variable}}{\sum \text{Standardized estimates of each independent variable}}$$

The results of the normalization is shown on the table below.

Table 2. Normalized weights

Dependent		Independent	Estimate	Normalized weights
Product Quality	<---	Aesthetics	0.188	0.130
Product Quality	<---	Performance	0.154	0.106
Product Quality	<---	Conformance	0.135	0.093
Product Quality	<---	Serviceability	0.389	0.268
Product Quality	<---	Durability	0.167	0.115
Product Quality	<---	Reliability	0.272	0.187
Product Quality	<---	Features	0.146	0.101
Sum of total standardized effects			1.451	1.000

Table 3. Product quality values of providers for each criterion

Criterion	City Name	Mean	Normalized Weights	F*	F-	Si
Performance	Pasha City	3.8463	0.106	3.967	2.885	0.012
	Sulaimani Heights	3.9667	0.106	3.967	2.885	0.000
	White City	2.8853	0.106	3.967	2.885	0.106
	German Villages	3.6332	0.106	3.967	2.885	0.033
	Goizha III	3.7547	0.106	3.967	2.885	0.021
	Goizha II	3.5649	0.106	3.967	2.885	0.039
	Goizha I	3.6364	0.106	3.967	2.885	0.032
Derwaza City 3.6587			0.106	3.967	2.885	0.030
	Pasha City	3.7606	0.101	3.798	2.457	0.003
	Sulaimani Heights	3.7976	0.101	3.798	2.457	0.000
	White City	2.4568	0.101	3.798	2.457	0.101
	German Villages	3.4657	0.101	3.798	2.457	0.025
	Goizha III	3.4474	0.101	3.798	2.457	0.026
	Goizha II	3.2435	0.101	3.798	2.457	0.042
Features	Goizha I	3.6883	0.101	3.798	2.457	0.008
	Derwaza City	3.2302	0.101	3.798	2.457	0.043
	Pasha City	3.7189	0.187	3.719	2.861	0.000
	Sulaimani Heights	3.6600	0.187	3.719	2.861	0.013
	White City	2.8605	0.187	3.719	2.861	0.187
	German Villages	3.6750	0.187	3.719	2.861	0.010
	Goizha III	3.5925	0.187	3.719	2.861	0.028
Reliability	Goizha II	3.3864	0.187	3.719	2.861	0.072
	Goizha I	3.3818	0.187	3.719	2.861	0.073
	Derwaza City	3.2178	0.187	3.719	2.861	0.109
	Pasha City	3.8508	0.093	4.220	2.767	0.024
	Sulaimani Heights	4.2200	0.093	4.220	2.767	0.000
	White City	2.7671	0.093	4.220	2.767	0.093
	German Villages	3.5519	0.093	4.220	2.767	0.043
Conformance	Goizha III	3.5925	0.093	4.220	2.767	0.040
	Goizha II	3.0455	0.093	4.220	2.767	0.075
	Goizha I	3.7091	0.093	4.220	2.767	0.033
	Derwaza City	3.7200	0.093	4.220	2.767	0.032
	Pasha City	3.7670	0.130	4.126	2.807	0.035
	Sulaimani Heights	4.1259	0.130	4.126	2.807	0.000
	White City	2.8070	0.130	4.126	2.807	0.130
Aesthetics	German Villages	3.6261	0.130	4.126	2.807	0.049
	Goizha III	3.4172	0.130	4.126	2.807	0.070
	Goizha II	3.0808	0.130	4.126	2.807	0.103
	Goizha I	3.3232	0.130	4.126	2.807	0.079
	Derwaza City	3.4827	0.130	4.126	2.807	0.063

Durability	Pasha City	3.6721	0.115	3.772	2.656	0.010
	Sulaimani Heights	3.7722	0.115	3.772	2.656	0.000
	White City	2.6557	0.115	3.772	2.656	0.115
	German Villages	3.4968	0.115	3.772	2.656	0.028
	Goizha III	3.2138	0.115	3.772	2.656	0.058
	Goizha II	3.2083	0.115	3.772	2.656	0.058
	Goizha I	3.3788	0.115	3.772	2.656	0.041
Service-ability	Derwaza City	3.3185	0.115	3.772	2.656	0.047
	Pasha City	3.7049	0.268	4.130	2.687	0.079
	Sulaimani Heights	4.1300	0.268	4.130	2.687	0.000
	White City	2.6868	0.268	4.130	2.687	0.268
	German Villages	3.4885	0.268	4.130	2.687	0.119
	Goizha III	3.3849	0.268	4.130	2.687	0.138
	Goizha II	3.3318	0.268	4.130	2.687	0.148
	Goizha I	3.4909	0.268	4.130	2.687	0.119
	Derwaza City	3.3644	0.268	4.130	2.687	0.142

For the further analysis of multi-criteria decision-making, normalized values have been used. The next section represents the VIKOR calculation for benchmarking of product quality at every gated community in Sulaymaniyah, Kurdistan Region of Iraq.

#### 4.3. VIKOR

After the process of values determination, VIKOR method has been applied to evaluate the product quality gated communities in Sulaymaniyah, Kurdistan Region of Iraq. Proposing this method, best performing gated communities in the sector have been ranked gradually. This problem consist of eight alternatives with seven criteria. Values of each service quality for each company has been shown on the Table 3 along with the best ( $f^*$ ) and the worst ( $f^-$ ) values for each criterion. Later on, the values of  $S_j$ ,  $S_j^-$  and  $R_j$ , and  $Q_j$  values have been calculated and shown on the Table 4. Given in the concerning table,  $S_i$  values represent distance rate of each alternative to the possible ideal solution at each criterion,  $S_j$  represents distance rate of each alterna-

tive to the possible ideal solution at all criterions together,  $R_j$  represents distance rate of each alternative to the possible the worst solution at all criterions together,  $Q_j$  represents the best ideal solution among all alternatives. The details can be seen on the Table 4.

Given in the Table 4,  $Q_j$  represents closeness to the ideal solution based on the all alternatives together. It is not necessarily to be the absolute ideal, but competitively with the other alternatives in the same market. Results of global utility regret ( $S_j$ ) and ( $R_j$ ) values show consistency with the maximum utility ( $Q_j$ ) that "Sulaimani Heights" is the best gated community from the product quality point of view. Besides, Derwaza City, Goizha II, and White City was the worst products among the gated communities. Details of the ranks can be seen on the Table 4. With these results, it can be concluded that "Sulaimani Heights" is the best product quality provider in Sulaimani, Kurdistan Region of Iraq.

Table 4. Ranking results of gated communities

	V	$S_j$	$R_j$	$S^-$	$S^+$	$R^-$	$R^+$	$Q_j$	Rank
Pasha City	0.5	0.163	0.079	1.000	0.013	0.268	0.013	0.206	2
Sulaimani Heights	0.5	0.013	0.013	1.000	0.013	0.268	0.013	0.000	1
White City	0.5	1.000	0.268	1.000	0.013	0.268	0.013	1.000	8
German Villages	0.5	0.307	0.119	1.000	0.013	0.268	0.013	0.357	3
Goizha III	0.5	0.381	0.138	1.000	0.013	0.268	0.013	0.432	5
Goizha II	0.5	0.538	0.148	1.000	0.013	0.268	0.013	0.531	7
Goizha I	0.5	0.385	0.119	1.000	0.013	0.268	0.013	0.396	4
Derwaza City	0.5	0.466	0.142	1.000	0.013	0.268	0.013	0.483	6

## 5. Conclusion

The aim of this paper was to benchmark the product quality of the gated communities in Sulaimani, Kurdistan Region of Iraq. To do this, we have gathered data from various gated communities and proposed structural equations modeling in order to obtain the coefficient values of the determinant dimensions. The coefficient values have been integrated with the VIKOR method in order to propose the benchmarking.

The results show us that serviceability and reliability were the main parameters which impact the product quality perceptions of the customers respectively. With these results, the city managers must care about the serviceability in their gated communities for increasing the product quality perceptions of the customers. To do this, they can;

Provide convenient payment system of services and products such as electricity, water, monthly service expenditures...etc.

They can create an online payment system which will make customers pay the bills online through their credit cards.

Create a fast maintenance team who will behave friendly, responsive, and do their job reliably while solving problems or repairing the tools.

The benchmarking results show that "Sulaimani Heights" is the best product quality provider among other alternative gated communities. Besides, based on the observations, it can be revealed that it is the most expensive gated community, also. This might be a disadvantage for the investors. Further, researchers must consider this problem in the next studies.

When the site difficulties and limitations of the current study is considered, it can be concluded that data collection was the most problematic part of the research. The residents haven't been keen on filling the survey questionnaire. Secondly, it was hard to get permission from the managers to contact with the residents who are the customers on the gated community investors. The research has been conducted only in Sulaimani and cannot be generalized to all Iraq. The following researchers can collect data from all Iraq in order to draw a more general picture of the country.

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