Int. J. Advance Soft Compu. Appl, Vol. 13, No. 1, March 2021
Print ISSN: 2710-1274, Online ISSN: 2074-8523

Intelligent System of Effect of Applying the Total Quality Requirements on the House Function

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Abstract

The research extension of this topic falls between a theoretical framework and a practical one. The theoretical framework deals with the true nature of a house, its characteristics, functions and its impact on its surroundings. This framework also addresses the comprehensive quality, its characteristics and requirements. The practical framework includes a statistical analysis between the inputs which represent the housing requirements for achieving quality and the outputs which are represented by what the house accomplishes of these requirements, and the impact of quality requirements on the house in terms of function performance related to achieving the requirements for a practical evaluation of the house performance according to the requirements of quality and sustainability. The analytical aspect was performed using Excel and multiple linear regression software. It was represented by quality of (design, conformity, performance, effectiveness and productivity and its impact on the overall functionality of the house. It can be concluded that it is possible to adopt a model for future forecasts from any period and can be relied upon in terms of housing integration with social, environmental and economic factors. The practical framework showed that the effect of (design quality) has a positive effect on all types of performance, which indicates the importance of this factor, and its ease of directing it in controlling the general evaluation. Moreover, the (competency) variable had a positive effect on job performance.

Keywords: *Total Quality, Total Quality Requirements, House Function, House, Sustainable House.*

1 Introduction

The civilization progress of any country in the world is measured on the basis of several aspects: The first: the utilization of its potentials (material and human) in

order to achieve comfortable housing and good living standards. The second aspect lies in the ranges of utilizing the modern and technical development happening in the world by the treatment of waste and the pollution it causes

The historical roots of quality concern go back to ancient times. In the modern age, the issue of quality has witnessed widespread interest and development since the Second World War, resulting from many motivating factors, the most prominent of which is the fierce competition in the work environment at the national and international levels. The competition in the marginal price value was a reason for excellence through quality. The general reason was the development of quality approaches and methods, until it became the international competition standard.Quality management is one of the most recent approaches to quality in all kinds of production. Today, we find widespread applications in this field, particularly, in the industrialized and technically advanced countries. There has been a sophisticated system for quality, which has made its management a separate knowledge field taught in higher education institutions. On this basis, this research aims at providing modern scientific knowledge about quality management to those interested in this field and seek to apply it in any field of life, including the housing domain (being the space in which a person spends most of his time).

-The Research Problem:

The research problem lies in:

1-Today's world is characterized by a set of accelerating economic and social variables represented by the transition of many countries towards a market economy system - with all the implications of this transition including liberalization of foreign trade, and the growing phenomenon of economic globalization in parallel with the intensification of the regional economic agglomeration process, which has caused problems related to human life.

2-The tremendous development of technology in all fields, and the explosion of the communications and information revolution. This has brought the world into a difficult battle, and the necessity of mutual coexistence to survive and continue to impose existence by striving to adapt to the environment. Thus, there is the problem of environmental compatibility between space and its occupants.

-The significance of the research and selection criteria: Research in life complements and the efforts to provide them are getting momentum. This has generated the proliferation of different industries and activities that aim in the end result to ensure the market and control its indispensable needs. Accordingly, the significance of the research lies in:

1-Environmental quality through reaching a good rate of environmental compatibility.

2-Empowerment, which means that the required material can be surrounded in the manufacturing and use aspects.

3-Economic aspects, the way to achieve the requirements of human comfort with the lowest costs, the best data and the required time. This significance has led to the selection of this topic in light of:

1-The comprehensiveness of the subject, as it addresses complex and intricate topics at the same time.

2- Applicability

3-Proving whether quality can be achieved in the housing system.

-Research Aims: The research aims, in theory and in practice, to achieve the goals that overcome the problems mentioned above and which the research focuses mainly on as follows;
1-Explain the effect of quality requirements on the house in terms of function performance according to the fulfillment of the special requirements (thermal comfort and realization of the requirements and relationships of housing components for the purpose of use).
2-Arrive at a practical evaluation of the housing performance according to the requirements of quality and sustainability.
-Research Hypotheses: To ensure that the research objectives are achieved, it is hypothesized that:
1-Social environment that changes with the development in the field of applying comprehensive quality.
2-Technical potential to achieve the required environmental, social and economic goals.
3-Physical capability that meets the requirements and quality standards in the functional performance of a house in the study area.
-Methodology:
The research methodology is based on the following approaches:
1-The inductive and descriptive approach of the characteristics and requirements of housing in comparison with quality considerations.
2-Studying the effect of this system on housing within the study area.
3-Analyzing the results obtained.
-Research Structure: The research will be based on a structure that includes two aspects:

The first deals with theoretical studies and clarifies the quality standards in terms of their applicability to the house. The second includes an applied and analytical study of models of housing to determine with an eye on the characteristics of housing in the region with the specified overall quality.

This is accompanied with a summary of what has been concluded from the research particularly the practical recommendations.

2 Related Work

The space gradient from the public, the semi-public, the semi-private, and the private, suggesting a sense of feeling and association. Economic levels vary from family to family, which creates differences in the levels of well-being.
The possibility of integration between the traditional thought in designing residential units, as was the case in decades ago, and the modern designs that were affected primarily by the car and expanding the need for services. This integration came through:
A-Technological development and its utilization in different domains of life.
B-The harmony between traditional architectural styles and modern construction through employing form and content to meet simulation considerations between originality and modernity.
C-The development that took place in the diversity of building materials, the introduction of steel and cement, and the possibility of forming them.
Therefore, it is possible to clarify and understand accommodation through a summary of what many researchers in the world have indicated.

First: Linguistically speaking; It comes from stillness and serenity, that is, calmness and stability. Serenity means that something is fixed after moving and is used in settlement [1].

Secondly: terminologically:

1-House is accommodation and utilization, as in the Holy Quran, (God, He has made dwelling for you from your homes)) [2].

The house is the home in which the family stability is established and family relations prevail among the members.

2-The house has several equivalent words including the dwelling unit, the accommodation, the residential unit, etc. Also, the house is the place that provides comfort to the occupants by performing many functions. It is an organizational pattern for the lives of people in the milieu in which they live. It is the creation of an area of space to perform family activities and functions where the person experiences love and cordial relations with those who live with him in the house.

The foregoing survey brings us to the comprehensive definition of housing as: the engineering space designed in technical, functional and aesthetic ways, it is a physical container under whose roof many family activities are practiced. Thus, it is the place specially designed to optimize the use of space, and functionally to perform integrated activities that comfort occupants, and socially it is the isolated space to give freedom of movement and carrying out activities without effects from the external environment.

The nature of the house. The housing units differ according to the nature of the area in which they were constructed as the social, economic, climatic and natural nature take the main features of determining the housing construction. This has led to the determination of the housing characteristics accordingly which became:

Social function, the social function affects the system of functional relationships of housing between, the public and the private. For example, in the regions of Iraq, housing systems change according to the nature of the society, as the north differs from the south, and from the center, despite the fact that the majority of the population in these areas are Muslim and Islam regulates this function.

The Environmental function Sustainable housing aims to fulfill the requirements of environmental performance being one of the functions required by family life systems. If this function were integrated in terms of the thermal and acoustic insulation aspects, it would be necessary to prepare such models of housing units that meet the quality requirements.

The Sustainable house of life activities are the important aspect of the house. They represent the primary goal of building houses. However, the success of the housing unit depends on the amount of space to practice life activities by different family members in different periods of the day. This is very important for how can the housing unit be sustainable when it does not allow the practice of life activities inside it easily. It is usual that any disruption in the functional relations between the spaces of the house results in a functional failure that causes difficulty in use and waste of time and effort or a negative impact on the way the activity is practiced. In addition, daily and routine family work within the house, depends on the way the house was designed, equipment installed, and the way they work.

Looking at the models below, we find that they achieve a major aspect in the sustainability process to carry out life activities in the house.

Stockholm smart housing, (fig.1), which is one of six houses built on the basis of smart life. It was completed in (2000) to suit a four-member-family, with an area of

(200m2). This house demonstrates what can be achieved when using innovative technology with the proper awareness to improve the daily ordinary life of families. It is equipped with an electronic screen which displays Internet, food store information, library, distance to school, traffic, local news, television, radio, internet phone, and video message camera,[12].The resource: [12]

In the Watford area of London, the smart house is similar to what is shown in (Fig.2). It is a model of a house in which the external door does not open with a key but is equipped to receive orders to open and close wirelessly from a mobile phone or a hand computer. Moreover, every part in the house is connected to a network information related to cameras, microphones, displays, computers, TV, video, telephones, washers, etc. You can use the wireless panels spread around the house to run everything from the TV to the lighting, the washing machine, all the way to the dishes and the bathtub, in addition to other smart services such as water supply, cleaning. etc, [3].

Resource: [14], Life inside the smart house is essentially a shift in the way of thinking, and the practice of life here aims to raise the productivity of the individual with more ease in performing his duties by avoiding the largest amount of burdens that can be removed from his way to become more focused in creativity, skillfulness and production as he gets more to enjoy his life,[4]. In conclusion, more intelligent time can be saved compared to a traditional home.

The characteristics of sustainable housing, For the house to be sustainable (environmentally friendly and achieves the requirements of comprehensive quality), the criteria below must be met:

First: the use of natural energies; which means relying on clean energy products.

Second: Environmentally friendly building materials that meet the requirements of the environment.

Third: Methods of preserving water inside the house by rationalizing water consumption in a manner that ensures its continuity.

Fourth: The quality of the air inside the house: This can be achieved by the processes of ventilation and tempering the internal climate by placing windows and furniture, each according to its quality data.

Fifth: House lighting by adopting natural lighting, especially during the day.

Sixth: The philosophy of using colors: The psychology of the house occupant depends on the extent of accepting colors through harmony, mixing and graduation.

Seventh: Acoustic design and avoidance of noise: the thermal and acoustic insulation requirements that the house achieves so that it is acceptable in terms of achieving calm and tranquility.

Eighth: Safe design of the house: By setting the requirements the risks of not being aware of the uses of the housing components, especially by children.

Ninth: The architectural nature compatible with the environment being one of the requirements for overcoming some of the problems of environmental impacts on the housing unit. The architectural design plays a big role in securing functional requirements, and this depends on the nature of the region and the occupants.

Tenth: the garden: The role that outer space plays in achieving the internal improvement processes of the housing unit.

Technical Characteristics, Due to the difference in the function coupled with the great development in technologies and information systems, each housing type has its own characteristics that distinguish it from others. Thus, it had a concept that defines its real state. On this basis, it can be said that the concept of housing implies

that the house is technically designed and executed in a technical manner, which gave it the ability to suggest its behavior according to the needs of the dweller by adapting to the external conditions. That means the ability to program in an electronic way with a set of possible incidents that enable its various components to adapt and act according to the corresponding conditions and variables previously known. It can be said that the degree of the house smartness depends on the amount of what is achieved, the amount of what is used of the techniques, the amount of what it entertains of the possibilities that it behaves in its scope, and the extent of the urban area that works in its scope and deals with its other components including the buildings and networks of facilities,[5]. Thus, the technical characteristics of the house lie in their quality in terms of the building materials used that achieve durability, architectural design, distribution and relationship of the house components with each other, in addition to the house relationship to the surrounding space. With regard to the building materials, we note that the use of building materials with technical characteristics guaranteeing sustainable aspects, achieves quality in environmental characteristics such as thermal and sound insulation .

Resource [13]

The total Quality Management (Requirements - Features)

The concept of quality Quality can generally be defined as usability, and hereby it means all features necessary to achieve the described and implied needs. Thus, quality management has become the job of the general administration to ensure that the customer's needs have been identified and satisfactorily fulfilled in accordance with the requirements.

Customers' needs may vary over time, which means there is need for a periodic review of quality requirements. If the product meets the customers' expectations when used, this means that the product is of high quality or it is acceptable. So the quality of the product depends on the level of the customer's desires.

Accordingly, quality has been known in many forms, all of which flow into one meaning:

*It was defined by the International Organization for Standardization (ISO) [6], as the totality of the characteristics of a substance that determines its ability to meet the needs described or implied.

*Quality management is defined as the activities of the overall administrative function that defines the quality policy, its objectives, responsibilities and implementation through means such as quality planning, quality control, quality assurance and quality improvement within its requirements.

*Quality control is also known as the operational techniques and activities used to meet quality requirements.

*Quality assurance is defined as all the activities drawn and organized that are carried out within the quality system and explained as needed to secure or find sufficient confidence that a party will fulfill all of the quality requirements.

So quality is an administrative orientation to long-term success through customer's satisfaction. All employees of the institution participate in improving the procedures, products, services and culture prevailing in the workplace. Methods for implementing this approach came from the teachings of great quality pioneers such as Philip Crosby, William Deming, Arman Vignbaum, Caro Ishikawa and Joseph Goran, [7],

The terminological concept of quality

Total Quality Management. There was no specific definition of the concept of Total Quality Management, and the connotations of the words that make up this concept mean the following:
Management: is the ability to influence others to achieve desired goals.
Quality: means fulfilling and exceeding the requirements of the beneficiary.
Total: means searching for quality in every aspect of the work, from identifying the needs of the beneficiary to the evaluation of the beneficiary's satisfaction.
Therefore, total quality management means, in its entirety, a system that includes a set of integrated intellectual philosophies, statistical tools and administrative processes used to achieve goals, and raise the level of customer and employee satisfaction through the continuous improvement of the institution with the active participation of everyone for the benefit of the institution and self-development for its employees, thus, consequently, improve the quality of life in the society,[8]. What an individual (customer) needs of the comfortable housing requirements is only one of the goals of total quality.
Philosophically, quality mean the style and nature of an object, the desire of the customer, and its level of validity, i.e. the philosophy of this term depends on the nature and desire of the occupant of the housing unit, the nature of society in general and on the relevant external influences. Therefore, the philosophy of houses design is functionally acceptable in comparison to the functions they will perform for occupants related to the relationship of housing spaces with each other. Total costs of prevention and evaluation will increase, and costs of internal and external failure decrease. The costs of prevention and evaluation are the costs of achieving good quality, and the costs of internal and external failure are of poor quality. In general, when the cost of achieving good quality increases, the cost of poor quality decreases, [9].
The requirements of Total Quality, Whenever a stage comes, whereby challenges related to people's needs arise, it is imperative for the economic centers in general to adopt scientific methods that are constantly developing to achieve the desires of both sides of the equation (the product and the customer) by investing the active human actors in developing the operational performance with distinct flexibility and efficiency, achieved through the abundance of information, communication technologies and diversity.In the housing field, those who use it seek through a total quality management to create a qualitative leap in the work by preparing building materials and the harmony and adaptability of the design and its functional diversity in a way that is compatible with the environmental, social, economic and institutional variables in a way that is compatible with the developments aimed at achieving the continuity and sustainability of life.

2.1 Total Quality Management Elements

The quality provides comprehensive quality and management, multiple advantages and integrated production, achieves the goals of producers and customers, and reinvests the capital used so as to ensure less time and fewer losses and higher quality. Moreover, it;
1-Organizes the structural pyramid, describing the tasks of each level, continuous archiving, auditing and reviewing the general system of the institution, achieving efficiency (administrative and technical) in performance.
2-Creates a clear method for monitoring and specifying production processes.

3-Grants its implementers a tangible advantage in the fields of standardization and thus ensuring control of the market.
4-Facilitates the process of obtaining international evaluation certificates (ISO).
5-Reduces people's reluctance to obtain the product and reduces the passive aspect of advertising.
6-Enhances long-term investment by maintaining or raising the quality level.
7-Increases motivation for workers and consumers when the organization obtains the (ISO).
8-Manpower competes to work in such an institution, as it achieves tangible material and moral profits.
9-Achieves horizontal and vertical expansion of production lines to achieve good profits.
10-Builds good and continuous relationships with merchants and consumers.
11-Reduces disputes between the beneficiary and the producer, enhances the relationship between them, and adopts trust and supports the beneficiary's choice of the material or commodity as examined and conformed in light of the producers' quality control reports, [10].

3 Problem Formulations or Methodology

This part of the research includes the experimental application of quality in housing performance in the study area (Al-Anbar Governorate - Iraq) according to the models analyzed through sustainable housing standards (as individual housing units) being the dominant model in the region and according to the social nature utilizing statistical analysis.

3.1 Research Models

The family need for the housing unit is concentrated in a group of basic components (even if they differ in number and area) such as:
1-Living sector: It includes the family living quarters, the practice of different hobbies, and the reception of relatives. This often constitutes one third of the housing area.
2-Sleep sector: It is preferable that it is located in a relatively quiet part and away from the sources of noise. It should be directed healthily towards the sun. It includes bedrooms, places for changing clothes, studying and possibly playing and a corner for young children. This constitutes mostly one third of the housing area.
3-The services sector: It includes the rest of the elements including the kitchen, bathrooms, toilets, and laundry room. There is a set of considerations that need to be taken into account by the owner of the house when determining the needs of his family for the housing elements and their areas:
A-Distinguishing between important spaces in the house such as the living room (which is the focus of family life and the place for a lot of activities) among other spaces of little use.
B- Utilizing one single space for more than one purpose,
C-The possibility of merging some spaces with each other in order to reduce the area and provide flexibility in use.
D-Determining the actual and continuous need for each component.

3.2 Components and functions

1- First Model:

This model consists of two floors; the ground floor encompasses the guest room, family hall, living room, kitchen in addition to the bathrooms and movement corridors. The first floor includes the bedrooms with their accessories, bathroom in addition to the corridors What prevails over this model (Fig.6) is the adoption of standards for improving the apartment environment through:

1-Isolating the guest room from the family housing units (social standard).

2-Isolating the bedrooms in the first floor, which is a standard for controlling noise, giving comfort and tranquility during sleep.

3–Since the Iraqi family (in general) and the Anbar family in particular usually consist of many members (6 people on average), which means the constant need to use service parts such as bathrooms, therefore the model separates the bathrooms from the bedrooms and guest room (social and functional standard), [11].

4-Reducing the spaces of the corridors and the dimensions of the rooms (environmental standard).

As for the functional performance of this model, it depends on the relationship between the parts of the house and the movement between them.

5- Location of services (functional standard)

-Public spaces. - Privet spaces.

2- The second model:

This model also consists of two floors. The ground floor encompasses the guest room, hall or family sitting, living room, one bedroom, kitchen in addition to the bathroom and movement corridors. The first floor includes the bedrooms with their accessories, bathrooms in addition to the corridors of movement. This model is not different from the first but it is simpler as it has a bedroom on the ground floor that can be approved for the uses of the elderly (Fig.7) - and also it adopts standards for improving the residential environment through:

1-Isolating the guest room from the family housing units (social standard).

2-Isolating the bedrooms in the first floor, which is a standard for controlling noise, giving comfort and peace during sleep.

3–Since the Iraqi family (in general) and the Anbar family in particular usually consist of many members (6 people on average), which means the constant need to use service parts such as bathrooms, therefore the model separates the bathrooms from the bedrooms and guest room (social and functional standard), [11].

4-Reducing the spaces of the corridors and the dimensions of the rooms (environmental standard).

As for the functional performance of this model, it depends on the relationship between the parts of the house and the movement between them.

5- Location of services (functional standard)

-Public spaces. - Privet spaces.

3-The third model :

This model also consists of two floors; the ground floor encompasses the guest room, family hall, living room, one bedroom, kitchen in addition to the bathrooms

and movement corridors. The first floor includes the bedrooms with their accessories, bathrooms in addition to the corridors for movement (Fig. 8). This model does not differ from the first except that it is simpler as it has a bedroom on the ground floor that can be approved for the use of the elderly and also it adopts standards for improving the residential environment through:
1-Isolating the guest room from the family housing units (social standard).
2-Isolating the bedrooms in the first floor, which is a standard for controlling noise, giving comfort and peace during sleep.
3– Since the Iraqi family (in general) and the Anbar family in particular usually consist of many members (6 people on average), which means the constant need to use service parts such as bathrooms, therefore the model separates the bathrooms from the bedrooms and guest room (social and functional standard), [11].
4- Reducing the spaces of the corridors and the dimensions of the rooms (environmental standard).

As for the functional performance of this model, it depends on the relationship between the parts of the house and the movement between them.
5- Location of services (functional standard)
-Public spaces. - Privet spaces.

3.3 Comparison according to quality considerations

Among the three models according to quality considerations and their aspects, the three models will be compared:

3.3.1 Quality of design

It is a measure of how well the design fits the requirements of the agreed upon apartment. The most important aspects are the specifications which are of two types:
First: The operational specifications related to the way the house works to perform the required function.
Second: Technical specifications related to design details and the type of material used.

The level of design quality must fulfill the desire of the occupant. This quality is affected by the following:
- Type of building materials used.
- Cost.
- The need for the housing unit.
- Social nature.

3.3.2 Conformity Quality

This consideration indicates the extent of conformity of the house after implementation with the prepared design.

3.2.3 Performance Quality

This consideration indicates the good performance of the house or how well you see the acceptance of the house by the resident. This consideration is an inference or a function of the design quality and conformity quality.

3.4 Quality, Productivity, Efficiency, and Effectiveness

1-Productivity: It is a measure between the inputs (represented by the requirements of the house to achieve quality) and the outputs that represent what the house achieves of these requirements.

$$Productivity = \frac{output}{Input} \times 100 \quad (1)$$

2- Efficiency: It represents the ability to properly use the house to achieve the goals. It is calculated through:

$$Efficiency = \frac{Planned\ input\ to\ actual\ outputs}{actual\ inputs} \times 100 \quad (2)$$

3- Effectiveness: It is a measure of the house ability to achieve goals through productivity and efficiency The previous survey can give valuable signals when applied to the three models of housing used in this research according to the following:

3.5 Application

For the purpose of studying the functional performance of the housing unit, a model has been built which represents the relationship between this unit and the set of independent factors that are believed to have an impact on the pattern of those treatments within the study mentioned in Figs.(7and 8) above.

The multi-linear regression model, which assumes a linear relationship between the set of influencing variables and the weight of the included treatments as an independent variable, has been adopted up to a linear relationship that can be standardized for the purpose of determining the directions and type of the functional performance of the housing unit. This is done for the purpose of drawing possible directions for it, or directing quality to new important axes through reflection in independent facts represented by a group of factors representing engineering facts and nature on the dependent variable (functional performance). As the independent variables are represented by factors including quality of the design, quality of conformity and quality of performance, in all cases their impact on the direction of the function performance represented in the sustainable building in the Iraqi environment can be studied. This indicates the important role of the factors in that relationship, and that controlling the independent variables affects in turn the plans and future directions in the region, and directing the variables into new development axes that move away from tradition and arbitrariness.

3.6 The statistical model

The identification of independent variables comes from the extent of the impact of each variable on the function performance, with a variation in the impact of each variable independently or jointly.

4 Results, Analysis and Discussions

When choosing the inputs for the model the following implications were observed:

First: Design Quality (X1): It represents the design because it relied on in the analysis of the relationship between the components of the house which can be

calculated as well as the set of properties of the material. Other factors included in this variable are the type of building material used.

Second: Conformity Quality (X2): The effect of this variable on performance especially in the selection of three different situations, namely dimensions, and the building material used.

Third: Quality of Performance or Efficiency (X3): The effect of this condition varies between clarity and simple effect.

Fourth: Effectiveness (X4): This variable is fully related to the relationship between the parts and areas covering each component.

Fifth: Productivity (X5): The effect of this variable on performance especially in selecting different models of housing types that characterize the region in terms of providing the capacity, and, in turn, the cost.

-The dependent variable (Y): It represents the value of function performance as an evaluation resulting from the equation and its comparison with five independent variables adopted in each article. This trend represents an indication of the research problem, whereby a difference in the results is observed, as a result of the impact of the independent variables. Thus, the calculation of function performance as a whole is in the final equation. The dependent variable was entered as follows:

YT: General function performance.

YS: Functional performance with design effect.

YTE: function performance due to conformity.

YC: function performance due to proficiency.

YO: function performance due to productivity.

-Model building: The model in the study consists of one stage which is the evaluation stage where (X) values are determined that may give ideal results.

-Model building formula, [12]**:**

To express the relationship by means of the regression analysis and multiple linear correlation, data for the independent variables were entered using (Excel). They gave the results shown in the tables, which express the relationship:

$$Y = a0 + a1X1 + a2X2 + a3X3 + a4X4 + a5X5 \qquad (3)$$

When :

Y:Number of weights for the cases approved in the search.

X1, X2, X3, X4, X5: independent variables.

a1, a2, a3, a4, a5: partial regression constants or parameters, i.e. the amount of change in (Y) when (Xn) is a single unit, constant of the other independent variables.

ao: point of intersection of the slope of the (Y-axis), which is the average response (Y- value) when all (X) values are zero.

4.1 Model Outputs (Total Function Performance Model)

Data were entered and the multiple linear regression equation values were obtained. The results are as in Table (1):

Table 1: Parameter values for the dependent variable

ao =	49.828
a1 =	- 0.528
a2 =	2.44
a3 =	- 0.043

a4 =	- 0.0022
a5 =	0.82

Thus, the general model becomes the following equation:

$$Y = 49828 - 0.528\,X1 + 2.44\,X2 - 1.043\,X3 - 0.0022\,X4 + 0.82\,X5 \quad (4)$$

1. The value of (R^2) = 0.95.
2. The value of (F) (calculated) = 4182.698.
3. The value of (t) is calculated from the table in the following way:

$$tX1 = a1 \div Se.1 = -0.528 \div 0.903 = 0.587 \quad (5)$$

When : (Se.1) is the error grade value for the parameter (a1) .

Thus the values of tX2, tX3, tX4, tX5 are calculated.

In the same way, the general forms were obtained for the detailed cases, as shown in the tables which gives the results as in Table (2):

Table 2: Sub-Credential values

Ys = 44.4 – 0.99 X1 + 2.1616 X2 – 0.033 X3 – 0.0045 X4 + 0.55 X5
YEA = −0.564 + 0.056 X1 + 0.1768 X2 – 0.0007 X3 + 0.00016 X4 + 0.00067 X5
YC = −0.257 + 0.138 X1 + 0.6939 X2 – 0.0026 X3 + 0.00022 X4 + 0.003 X5
YO = 6.249 + 0.268 X1 − 0.59 X2 – 0.0061 X3 + 0.00188 X4 + 0.266 X5
Y(H/H) =1.535 −0.0014 X1 + 0.0065 X2 +0.00014 X3 + 4.45 * (10−5) X4 − 0.0027 X5

4.2 Model Test (Overall Performance)

The outputs of the model in Table (1) show the following values:

1. R^2 test: The value of (R^2) is (0.95), which means that (95%) of the changes in the number of total treatments are considered by the five independent variables, so the multiple linear regression equation is significant.

2. F. test (computed): Table (1) shows the calculated value of (F), which was (4182.69) compared to the tabular (F) which equals (2.96) at the probability level of (5%) , and (4.69) at the probability level of (1%). It is noticed that the calculated (F) is greater than the tabular, that is, the estimated equation is significant at the probability level.The model can be adopted for future predictions from the (R^2) and (F) tests, and it can be used for any future period of time in terms of the integration of housing with the social, environmental and economic factors.

4.3 Models Detailed Tests

1. R^2 test: R^2 ranges between (0.95-082) for all models, and therefore all models are dependent on the future prediction of treatments, that is, the perpetuation of development.

2. F test: The calculated (F) values range between (74968-18.47). Compared with (F) tabular, all calculated values are greater than the tabular and equal to (2.69) at

the probability level of (5%) , and (4.69) at the probability level of (1%) , that is, the morally estimated model at the level of the probabilities (1%) and (5%) .

4.4 Discussion and analysis of the results

The total environmental treatment model (Yt).

Table (1) shows the model outputs that represent the values of the multiple linear regression equation, where the effects of each variable vary, as follows:

A. The overall function performance rate is (49.828) in the absence of any effect of the independent variables.

B. The quality of the design positively affects the value of performance.

C. The quality of the match negatively affects it.

D. Other variables affect, negatively or positively, the performance efficiency, and the effect of each variable represents the stability of the rest of the variables.

Table (2) shows the effect of each variable on this case, as follows:

A .The performance rate is (44.4), when the values of all variables are zero.

B. An increase in variable (X3) one unit means an increase in its value of (2.16) .

C. Other variables negatively affect the equation.

-General conclusions from the statistical models:

The different values. These effects can be confirmed by the following:

The variable (design quality) is of a positive impact on all types of performance, which indicates the importance of this factor and the ease of directing it in controlling the overall evaluation.

The variable (efficiency) has a positive impact on the function performance.

Table (3): The general effects of independent variables on the functional performance of a house.

Table 3: The effects of the functional performance of a house

Processing type	X0	X1	X2	X3	X4	X5
Y total	+	-	+	-	-	+
Ys	+	-	+	-	-	+
Yt	-	+	+	-	+	+
Yc	-	+	+	-	+	+
Yo	+	+	+	-	+	+
Y (H/H)	+	-	+	+	+	-

(+): Positive effect. (-): Negative effect (Xo): variable values = zero.

Resource: Researcher's work relying on output forms using excel and multiple linear regression

Table 4 The table shows the value outcomes of the independent variables and their corresponding to the approved variable zero, which represents the general functional performance of the house

Table 4: Macro functional performance model

Y	X1	X2	X3	X4	X5
49.82802681	0.820360249	-0.002268433	-0.004264527	2.442270723	-0.52863560
26.21639683	0.039348742	0.002812379	0.027474607	1.982627457	0.90302524
#N/A	0.959331024	22.92499847	#N/A	#N/A	#N/A
#N/A	4182.69883	14	#N/A	#N/A	#N/A
#N/A	10991203.02	7357.777768	#N/A	#N/A	#N/A

Resource: Researcher 's work relying on output forms using excel and multiple linear regression

5 Conclusion

1-The house has the property of a variation in function performance depending on many considerations, some of which have direct and significant effects, while others have indirect effects.
2-Design is one of the variables that have a significant impact on the performance and sustainability of the house.
3-Efficiency of performance comes from the efficiency of other features and therefore it is a comprehensive variable in determining the housing performance pattern.
4-When the requirements of the comprehensive quality are rooted in the variables affecting the housing unit, this leads to the prolongation of the life and sustainability of the house.
5-The quality of conformity directly affects the housing function.
6-Other variables affect, negatively or positively, the performance efficiency, and the effect of each variable is confirmed by the rest of the variables.
7-The adopted variables differ in terms of the change whether positively or negatively.
8-The functional relationships between the housing components and their exploitation are affected by the social nature of the occupants and the society.
6-Adopting total quality management to ensure durability for a longer period.

ACKNOWLEDGEMENTS
The authors wish to thank the patients for their assistance in all periods of study.

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