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EVALUATION OF COURTHOUSE BUILDINGS WITHIN THE SCOPE OF QUALITY FUNCTION DEPLOYMENT: GAZIANTEP ANNEX COURTHOUSE CASE

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Abstract

In this article, the application of Quality Function Deployment method in courthouse buildings is examined through the design of Gaziantep Annex Courthouse Building. The Quality Function Deployment method is defined as a method of product or service development, considering user requests, including the manufacturer and supplier. Despite the emergence in the 1960s, the use of this method in Turkey began in 1990, mainly limited practices in production industry are seen in the construction industry. With the Quality Function Deployment method applied during the design process of the Gaziantep Additional Courthouse Building, which is still under construction, the current building users' problems analyzed in this building. The parking problem in the current building, the request of the judges for a working environment free from noise, meeting and conference rooms according to user requests are considered during design phase and the design was advanced in this direction. When the Quality Function Deployment method is applied from the design stage, it is seen that it improves the quality of the building and ensures that the building has a user-friendly design. The QFD is recommended to be used in the design of courthouse buildings.

1. INTRODUCTION

Nowadays, many companies are looking for ways to reflect customer demands, in other words, the voice of the customer to their products or services in order to meet the increasing user expectations [1]. In this context, the Quality Function Deployment (QFD), was developed in the late 1960s in Japan to create a system that covers all stages of the production process and adds customer expectations to these stages. In 1972, Mitsubishi Heavy Industries launched the first QFD in its current meaning for the purpose of extensive ship design. Later, various applications were made in Toyota and its subsidiary industries [1]. Xerox was first used the QFD methodology in the United States in 1984, after which many major companies such as Hewlett-Packard, Digital Equipment, AT&T and ITT have begun to use the widely accepted methodology [2]. In Europe, it was started to be used ten years later.

In the literature first application of QFD in Turkey seen in the Arçelik company in 1994 was carried out by the dishwasher production [3]. Company in 1995, in a variety of products such as refrigerator and washing machines, have begun to use QFD. With the start of this methodology to be recognized in Turkey, several companies like Tofaş, Ore Mining Industry, BMC and Beko started the implement the QFD method. [2,3]. Quality function deployment in the construction sector is a method used for "designing the most economical, most useful buildings" for customers. The concept of quality in the construction sector is reflected in the whole process from the first stage of the planning to the destruction of the building. It can be said that the concept of quality in architecture depends on the satisfaction of the needs of the users. In a broader sense, the functional quality of a building can be defined by the extent to which it provides appropriate support to the desired activities, creates a pleasant internal climate, has positive, symbolic or cultural meaning, and then provides appropriate economic contribution. [4].

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QFD is a process aiming at user satisfaction by converting user needs into appropriate technical goals and objectives in order to ensure quality starting from the design stage to the final stage of construction [5]. Although the QFD method is not widely used in the construction and architecture sector, it has an immense potential. In this study, the application of quality function deployment in the design process of Gaziantep Annex Courthouse Building is explained.

2. PURPOSE AND EXTENT OF QFD

QFD is a system used to design and develop a product or service according to user demands, including all members of the manufacturer or supplier of organization. In Japan, "deployment" means the expansion of activities, and therefore "Quality Function Deployment" means the responsibility that a company must take in all areas of a company to produce a quality product.

In the term quality function deployment,
• Quality means meeting user needs,
• Function means what to do-intensify attention,
• Deployment means who and when. [6]

Several studies have been conducted to learn about the recognition of the QFD. Studies done by a survey company in the UK showed that 7 percent of the participants were aware of the QFD in the early 2000s, while this number increased in 2007 compared to previous years. [5]. According to the results, 18 percent of the 72 participants were aware of the existence of the QFD [7].

The purpose of the QFD is three-way. First, it allows us to release faster, cost-effective and high-quality products to the market. Second, user-oriented product design is realized and finally provides a monitoring system for the development of future design or processes [6].
The benefits that can be expected as a result of implementing the QFD method are:

•Better understanding of user needs,
•Prioritizing known and unknown user requests and needs,
•Identify user needs and translate them into technical specifications,
•All employees focusing on user satisfaction in the process of producing and delivering a product or service,
•Organizing the efforts and skills of a company or enterprise in all phases of a project from the beginning to the end,
•To increase user satisfaction,
•Improving quality,
•Fewer problems in production,
•Minimizing design repetition with emphasis on communication during the process,
•Documenting the product description according to user needs [6].

Quality function deployment (QFD) is one of the techniques used to address the needs and expectations of a construction company in a more systematic way to ensure the satisfaction of users. QFD is a total quality management (TQM) implementation technique that requires a project to be clearly evaluated outside the basic needs of a project to translate end user expectations into design goals clearly.

2.1.Areas of Usage for QFD

The QFD's priority areas are product development, quality management and user needs analysis. In addition to its application in many industrial sectors, QFD has been successfully applied in non-industrial service sectors such as health, education, banking and football [8].

The implementation of QFD in the construction sector was first realized by Shino and Nishihara in 1990 in the design of new apartment projects in Japan [1]. This method has been found to be useful in defining project process and user requests.

The main reasons for the limited applications of the QFD in the construction sector are the one-off production of the building, the high number of participants (designers, contractors and suppliers), the lack of knowledge of the methodology in the sector and being the construction sector is a service industry rather than a production or product based [2].

However, since design decisions often tend to be unsystematic and partial, further efforts are needed to effectively integrate the QFD into building structures. If the QFD is implemented at an early stage in design development, it can be particularly helpful in: (1) prioritizing project requirements, (2) expressing design criteria, (3) efficient resource management (quality, construction delays, material waste, etc.) [9,10] and (4) transfer of knowledge between disciplines [11].

2.2.Quality House Matrix

The visual result of the QFD is a conceptual scheme. This scheme, which is formed by the combination of sub-matrices and provides communication between functions, is called "Quality House" by Hauser and Clausing since it resembles a house with its roof and rooms.

This communication mechanism ensures that the basic facts become timelier and more accurate than traditional development methods. This quality house is also an intensive, productive and educational reference for newcomers to the organization [12]. During the realization of this matrix, communication between product or project development team develops.

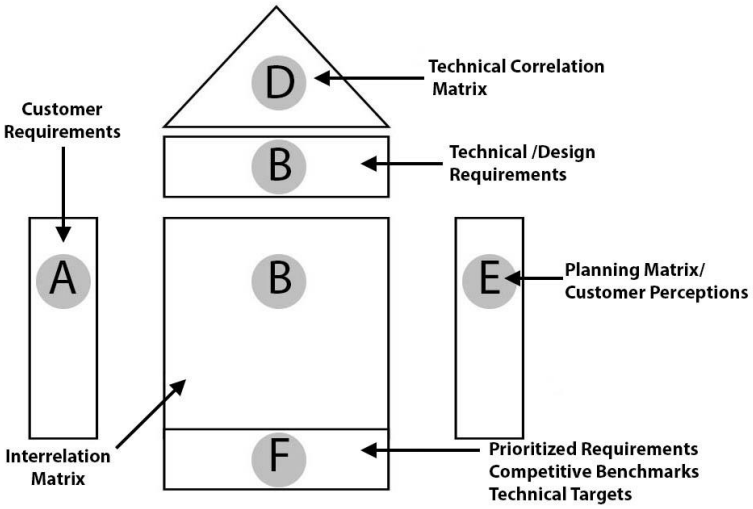

Figure 1: Quality House Matrix-Adapted from [12].

The following steps are applied in the construction of the quality house matrix (Figure 1);

•Establishment of user needs part in the quality house (A)

•Determination of the relationship between technical and user needs or correlation matrix (B)

•Determination of technical specifications (C)

•Determination of correlation or correlations between specifications (D)

•Analysis of user satisfaction significance levels (E)

•Comparison with competitors and setting goals (F) [1].

The quality house is used to develop an analytical and systematic benchmark to measure how well the characteristics of the resulting product meet user demands and needs.

3.IMPLEMENTATION OF QFD TO DESIGN AND CONSTRUCTION PROCESSES

In this study, in order to see how the principles of QFD can be adapted to the construction sector, examples are introduced, and the method is expressed.

QFD can be adapted to the construction sector in different ways. There are studies illustrating the use of QFD before, during and after design [13].

In the construction sector, QFD method was applied to limited projects in the beginning of 2000s, and it was seen that in the following years, especially in developed countries, the samples that the method was adapted increased. Shino and Nishihara examined the use of QFD for the first time in the construction sector and found it to be adaptable to the sector. Two years later in the United States, Oswald and Burati stated that this method improves the project identification process and user needs while reducing cycle time and increasing cross functional communication.

It is possible to list the benefits of application of QFD in construction sector as follows: (i) identifying the requirements list that will maximize the satisfaction level of the user, creating the design parameters in line with these requirements and expectations [14]; (ii) consistency / constructability between design and construction processes; (iii) minimizing problems in the construction process; to prevent loss of time and money due to changes, misconduct or reconstruction; (iv) achieving an optimal balance between user expectations and needs and factors such as the cost of production, production technology, construction time, and usage costs [14]; (v) shortening of design and construction times; (vi) reduction of total costs; (vii) development of relationships between design experts, production experts, suppliers and users [2].
In the light of the research, it can be said that the QFD is a very flexible tool and can be adapted to the construction sector in different ways. However, in most of the exemplary applications, since the QFD was used to integrate the customer requirements with the product, it was examined that the customer requirements were matched with the product characteristics. When it comes to quality in the construction sector, it is clear how critical the interactions of processes within the total life cycle of the product area.
With this fact in mind, it will not be wrong to think that we can obtain answers that meet user requirements by concentrating on processes. Rather than questioning product features that address user requirements one-on-one, examining the relationship between user requirements and processes with a more global perspective can maximize customer satisfaction. Based on this hypothesis, a different perspective has been brought from the examples in the literature and a proposal has been made in order to adapt the QFD to the mass construction sector [2].

Decisions taken at the early stage of the project (planning and design) are strategic decisions that are difficult to return in the future and constitute a large part of the value management work area. In this study, quality function deployment conducted in the most important periods of the pre-design and design stages without adversely affecting, Value Management (VM), which is one important way in improving the functionality and performance values expected from the project, to the Gaziantep Annex Courthouse Building. The original purpose of this study is the integration of the most appropriate aspects of the Value Management and Quality Function Deployment, which are studied separately for the applications of many different disciplines in the literature, by integrating the most appropriate aspects of the structure design in terms of courthouse design.

Both methods address functions such as value gain in products and quality assurance. These two methods are complementary elements in construction works. In this study, from this common point, we have sought ways to find the optimum solution especially for the expectations of construction of courthouse designers, investors and end users.

4.QUALITY FUNCTION DEPLOYMENT STUDY IN GAZIANTEP ANNEX COURTHOUSE DESIGN

4.1. Project Area

Gaziantep Annex Courthouse Building (painted red in Figure 2) which was built in Şehitkamil district of Gaziantep. While selecting a site for courtrooms, location of the site, traffic factor and access to the site, site acquisition cost, sustainability and topography must be considered [15]. The building consists of 4 basement floors + ground floor + 11 floors and roof floor. It was built in addition to the current courthouse building (Gaziantep Courthouse) shown in Figure 2, 3 and 4. The building settled on a land of 18.042 m², has a total of 529 car parks, 394 of which are closed. The base area is 3266 m². The ground level of +885 m is accepted as ± 0.00, which is the ground level of the building [16].

Figure 2: Aerial Photo of Gaziantep Annex Courthouse (Google Earth, Access Date 08.07.2019)

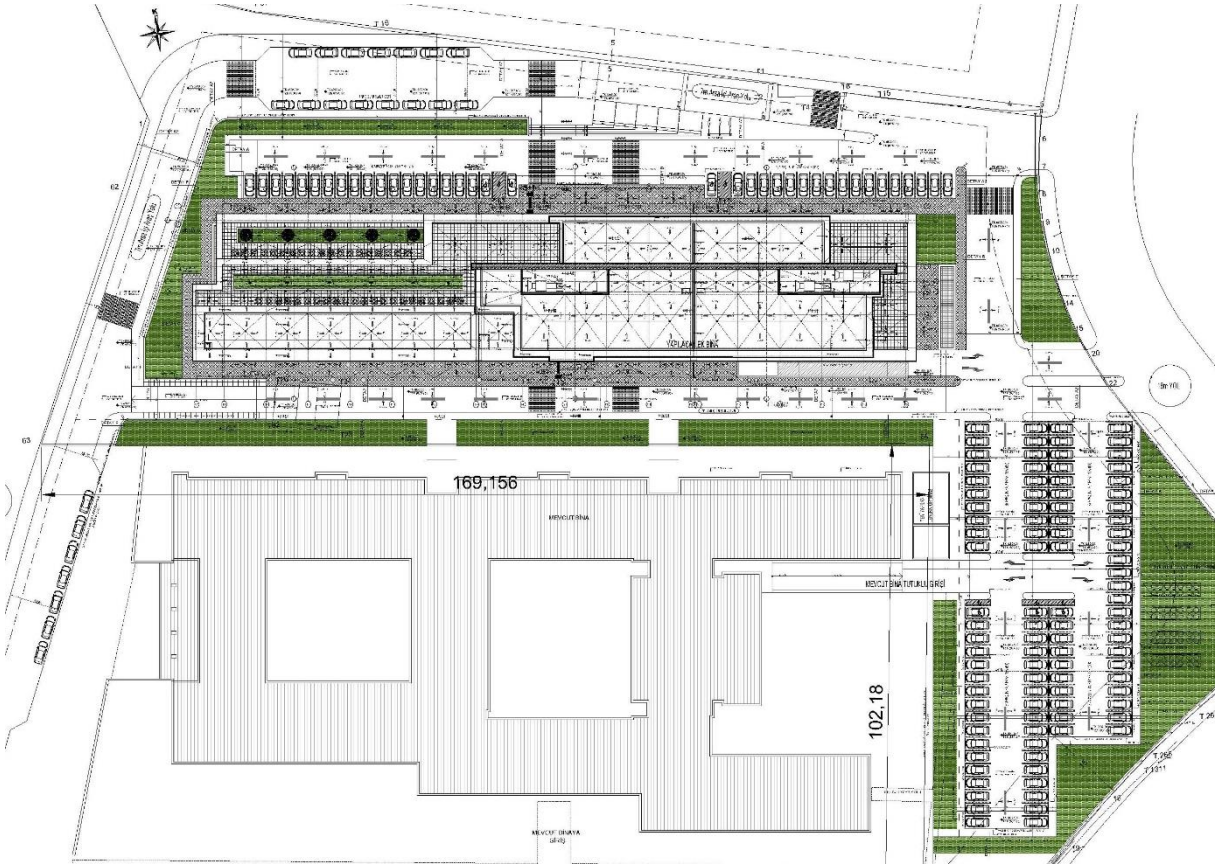

Figure 3: Site Plan of Gaziantep Annex Courthouse Building

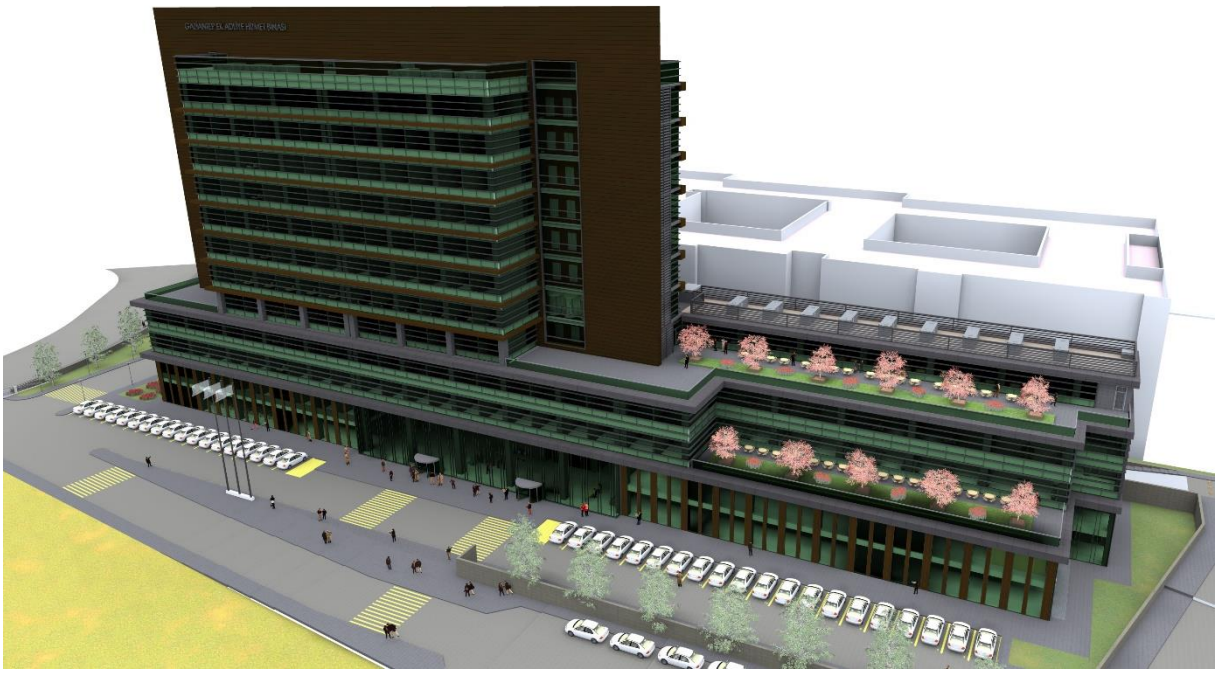

Figure 4: 3D Model of Gaziantep Annex Courthouse Building

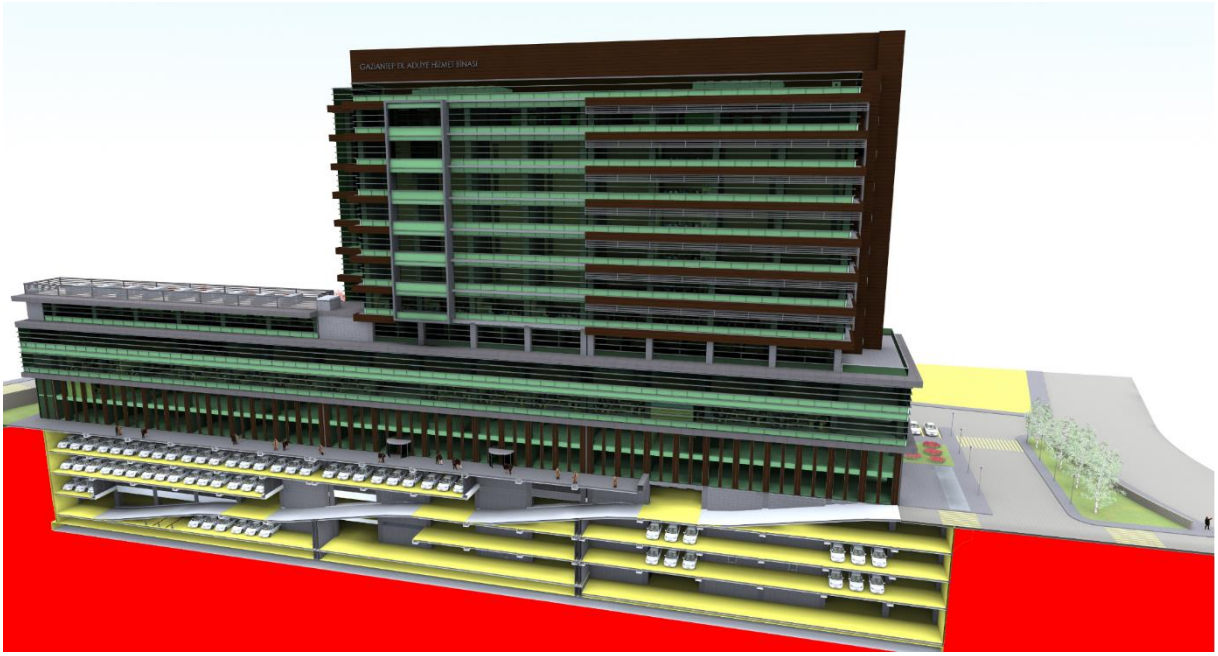

Figure 5: Basement Section of Gaziantep Annex Courthouse Building-4 Floor of Parking Area Designed

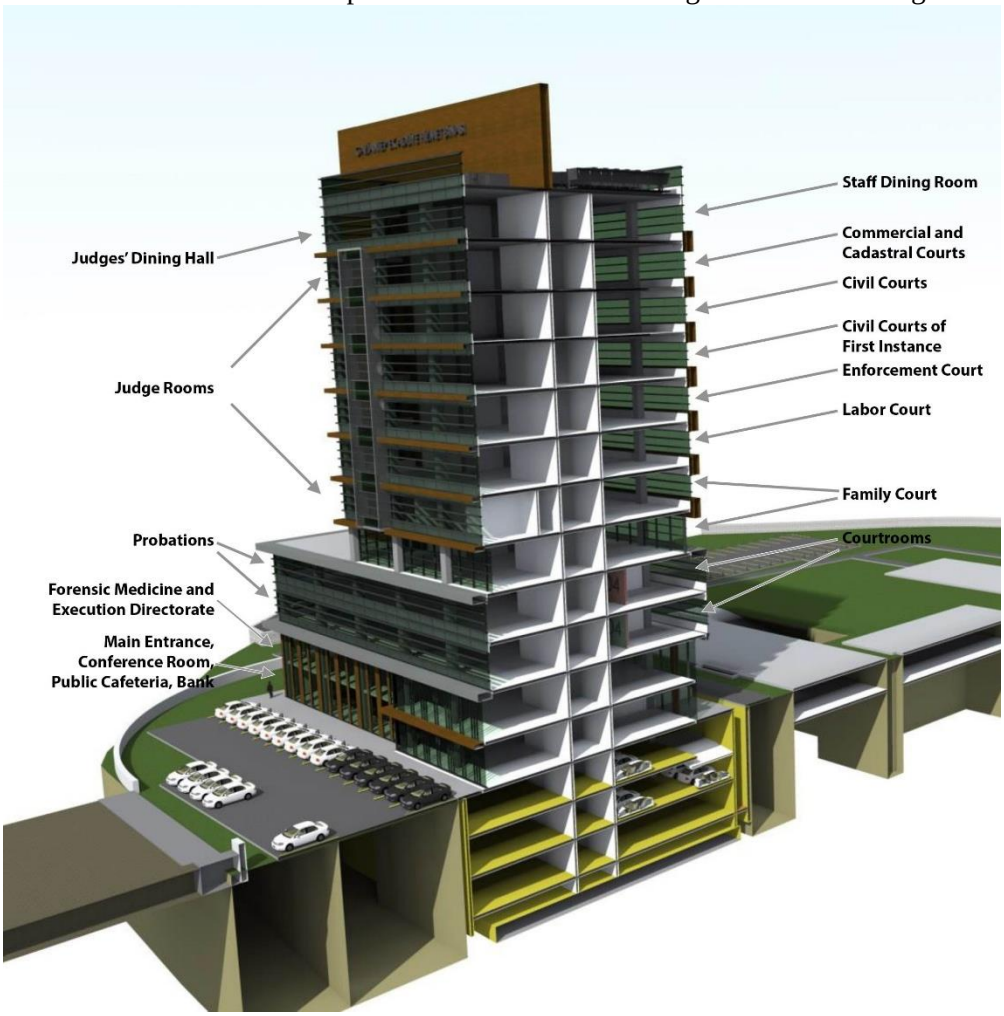

Figure 6: Section Perspective of Gaziantep Annex Courthouse Building- Functions of Building Depicted

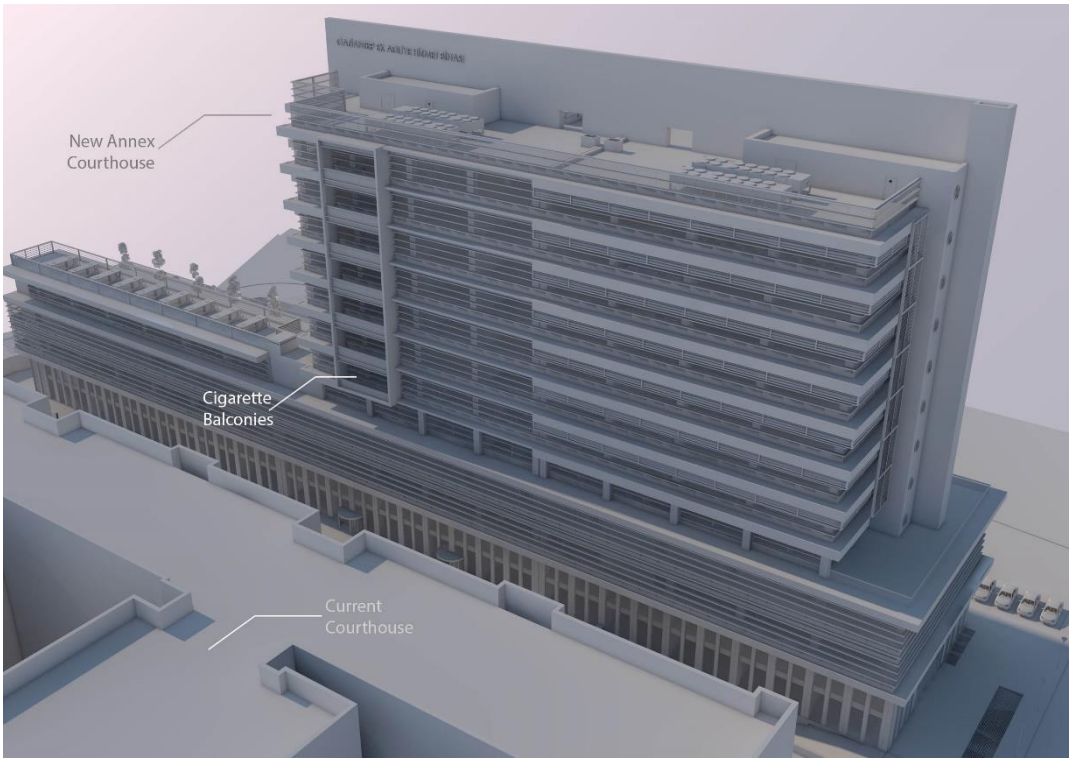

Figure 7: 3D Clay Model of Gaziantep Annex Courthouse Building

4.2.Floor Plans

The basement floors of the building have a height of 3.65 m and normal floors of 4.20 m. The building has a total height of 59 m which puts the building to high building class according to Turkey Building Bylaws. On the 4 basement floors of the building, there are archives, car parks and technical spaces. Figure 5, 8 and 9 shows the basement section of the building. Plans of the building presented partially because of security measures.

As can be seen in ground floor partial plan of the building (Figure 10), there are a total of 4 entrances on the ground floor: 1 for protocol, 2 for public and 1 for staff. Security, information office, waiting area, conference room, PTT, bank, public cafeteria and other office units are located on the ground floor.

Figure 8: Section Perspective of Gaziantep Annex Courthouse Building

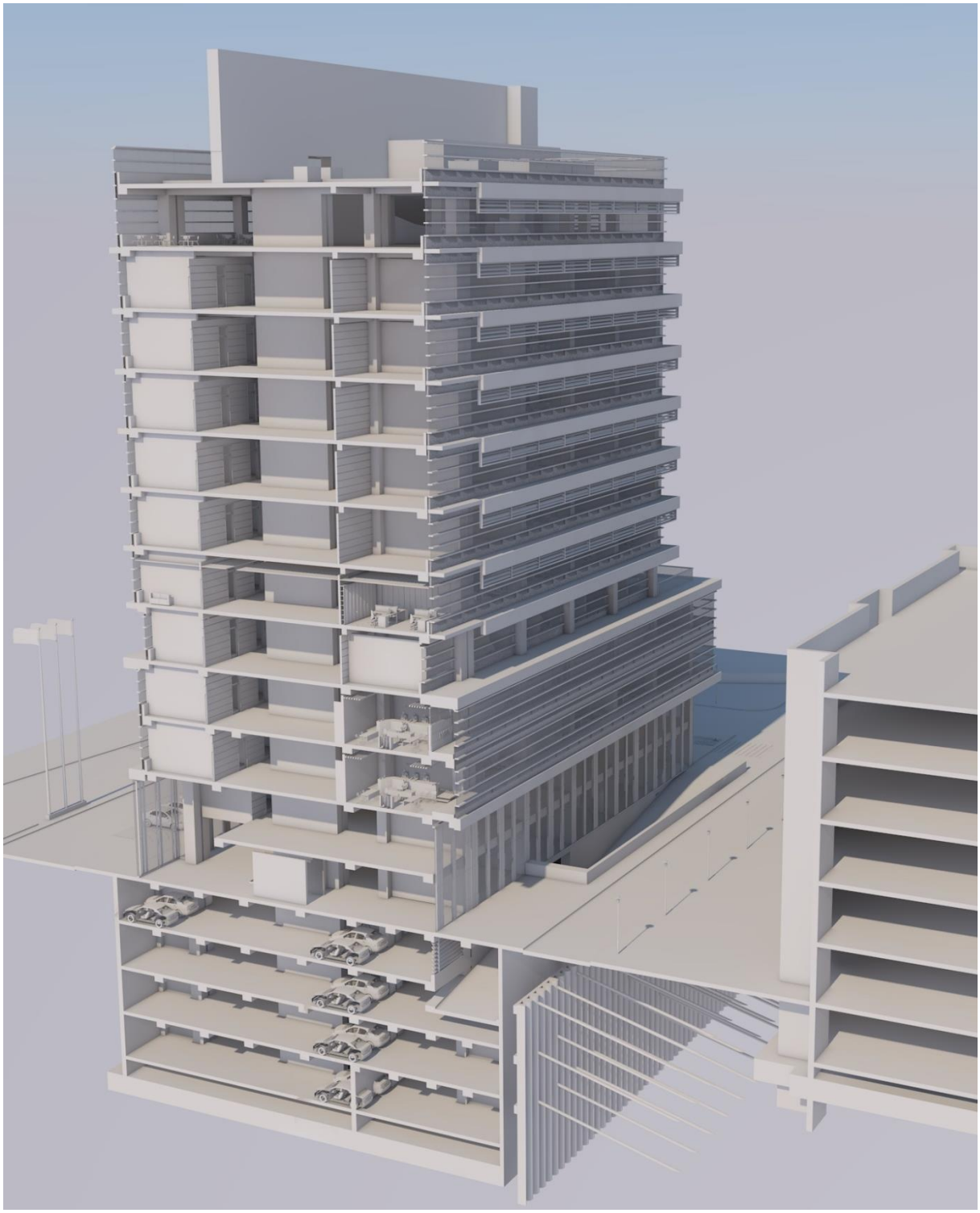

Figure 9: Relationship Between the Current Courthouse and the Annex Building (Section)

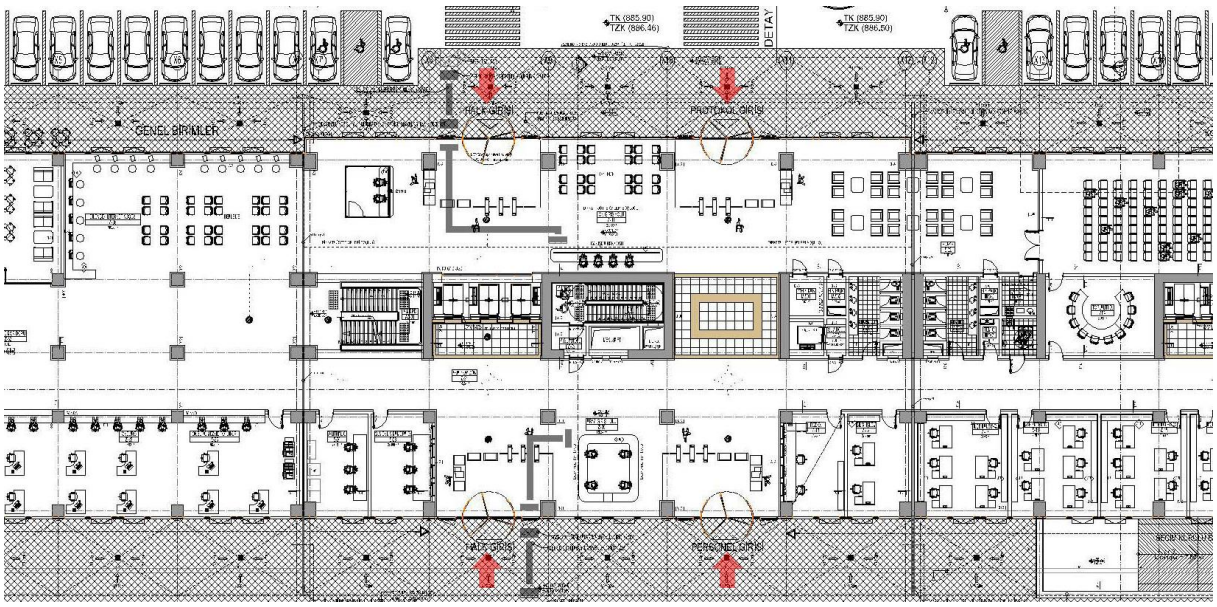

Figure 10: Ground Floor Partial Plan of Gaziantep Annex Courthouse Building

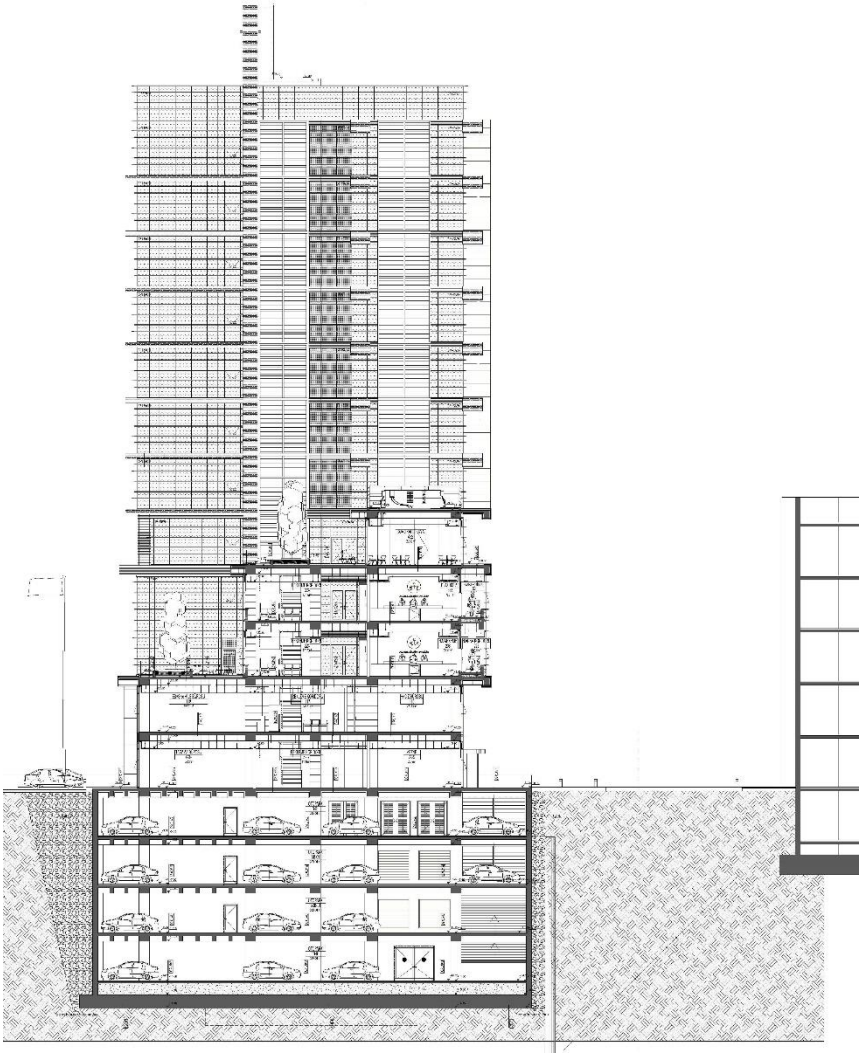

Figure 11: AA03 Section of Gaziantep Annex Courthouse Building

As can be seen in Figure 6, on the 1st floor there are enforcement and family departments and the other necessary office units. The courtrooms are located on the 2nd and 3rd floors. In addition, a green terrace

created in relation to the waiting area on 2th floor showed in Figure 4 and 11. Judge rooms must be separate from public areas for a better working environment [17]. As can be seen in Figure 12, the courtrooms separate the judges' corridor (painted red in Figure 12) and the public corridor.

Figure 12: 2th Floor Partial Plan of Gaziantep Annex Courthouse Building

On the 4th floor there are staff cafeteria, psychologist and pedagogue rooms. As can be seen in Figure 4 and 11 a green terrace has been created in relation to the cafeteria on this floor.
On the 5th, 6th, 7th, 8th, 9th and 10th floors there are judge rooms, clerk rooms and other necessary office units. As can be seen in Figure 13, dining hall for staff and judge located on 11th floor (yellow area represents for prosecutors, blue for staff).

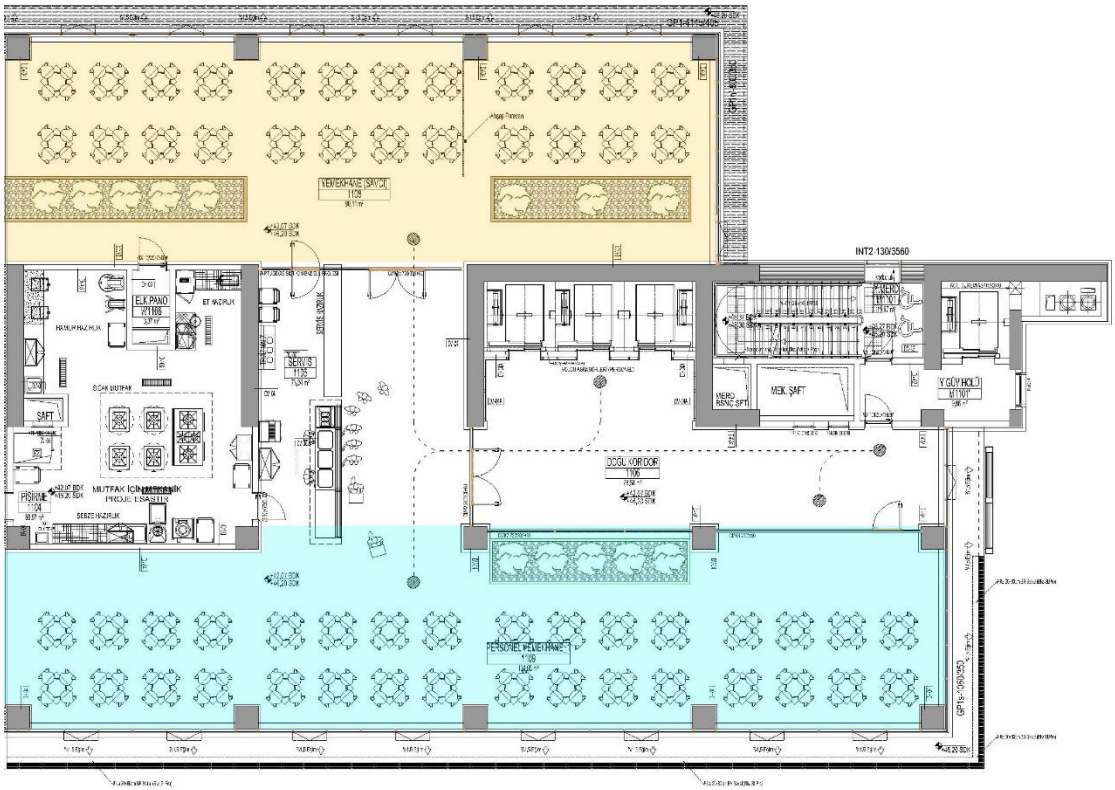

Figure 13: 11th Floor Partial Plan of Gaziantep Annex Courthouse Building

4.3.Arrangements Made Within the Scope of Quality Function Deployment in the Building

As a result of the interviews with the users of the courthouse, the requests for the design were highlighted and evaluated together with the requests of the court building manager. Quality House Matrix adapted to the project can be seen in Figure 14. Accordingly, the items in the following table have been made suitable for the user.

Table 1: Arrangements Made Within the Scope of Quality Function Deployment in the Building

• Solving the parking problem: The parking problem caused by the previously constructed building has been made suitable for the needs of the user with the large parking solution, which is solved in 4 floors of basement in the new structure.
• Units belonging to common use are located on the ground, 1, 2, 3 and 4 floors, and the building offices are moved to the upper floors, which are accessed through a quiet and controlled passage.
• The cafeteria to be used by the public and the cafeteria to be used by the staff are separated according to user requests. The public cafeteria was placed on the ground floor and the staff cafeteria on the 4th floor.
• Green terraces are located on the upper floors according to user requests.
• In accordance with the requests of the users, the meeting rooms were designed between the court rooms, accessible only to the members of the court.
• Because there was a lot of smokers in building staff, cigarette balconies and terraces were added to the building, to prevent them to prevent them from constantly using the elevator and aging it to go down and back.
• Sunshades have been added to the windows considering the climatic conditions and latitude.
• Because the courts are tense environments, some designs have been made to break the tension. The public cafeteria has been designed as a factor that relieves tension as it has eating and drinking activities. At the same time, open public terraces were added to the building in relation to the cafeteria.

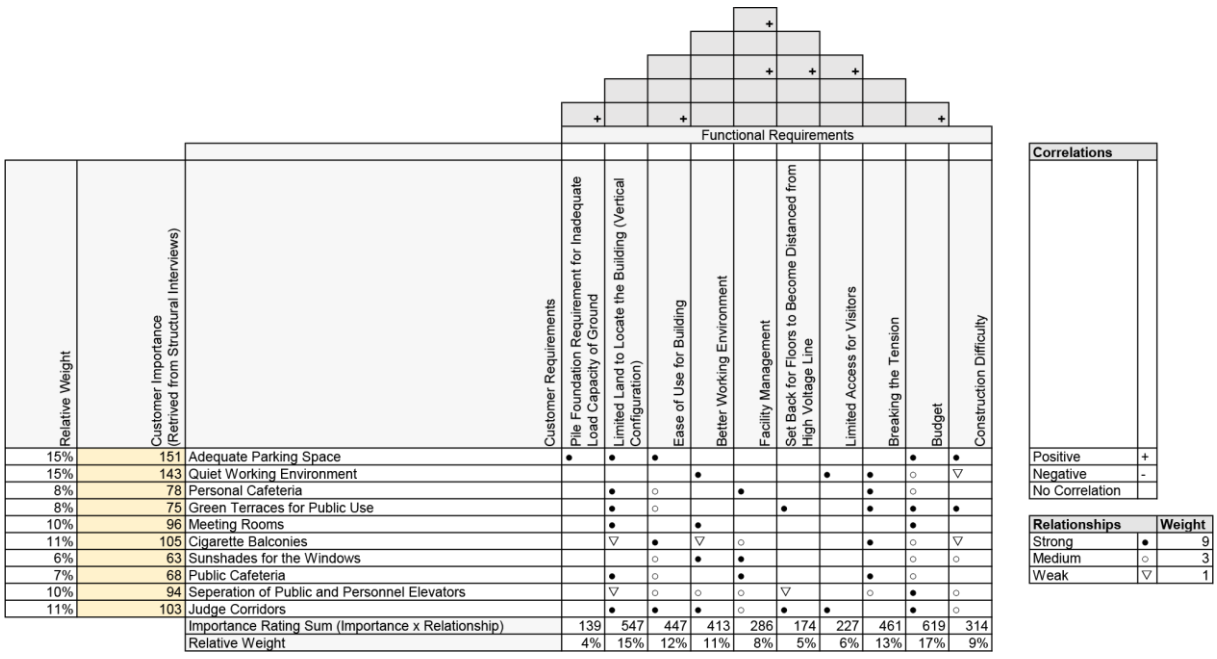

Figure 14: Quality House Projection for Gaziantep Annex Courthouse Building

5.CONCLUSION

The purpose of this study is to adapt the Quality Function Deployment (QFD) method which was introduced in Japan in the 1960s and started to be used in Turkey in 90's, to the design process of courthouse buildings. Although the use of the Quality Function Deployment method is common in the manufacturing industry, it is less common in the construction industry. It is seen that this method, which is applied in order to integrate user requests into design and increase quality by designing in communication with the user, is suitable for the purposes of construction and architecture industry. In this context, the application of QFD method through Gaziantep Additional Courthouse Building was examined. In the design of Gaziantep Annex Courthouse Building, which was designed in addition to the pre-built courthouse, the deficiencies reported by the courthouse user about the current building were completed by taking into consideration the design of this new building. The lack of parking in the current building was solved by adding 4 basement car parks to the new building. In accordance with the requests of the users of the courthouse, the units which are open to the public use are planned on the lower floors, while the units requiring limited access such as the judge rooms are moved to the upper floors and a quiet working environment is provided. It is aimed to make a user-friendly design and increase the quality by evaluating the user requests. In addition to the existing design criteria, user requirements were understood by this method and attempted to be realized in the process of design.

Considering all these, it is seen that the Quality Function Deployment method can be applied at the courthouses' design stage and it is seen that the implementation of this method will contribute to providing a better-quality environment to the users.

INFORMATION

This article is produced from Gaziantep Annex Courthouse Building Architectural Project, the author is the architect of the building. This work was produced from the Gaziantep Annex Courthouse Building Architectural Project, of which the author is the architect of the project.

CONFLICTS OF INTEREST

No conflict of interest was declared by the author.

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