RESEARCH ARTICLE

IMPLEMENTATION OF NEW PRODUCT DEVELOPMENT PROCESS BASED ON QUALITY FUNCTION DEPLOYMENT IN A HEALTH INSTITUTION*

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ABSTRACT

The New Product Development process is a significant issue for health institutions as well as for many other organizations. In this study, it is aimed to contribute to the studies in the field with the Quality Function Deployment (QFD) method used in the new product development process in health institutions. For this purpose, an example of the QFD method, whose general area of use is supporting industrial design processes and production processes, is presented within the scope of new product development processes in health institutions, which are a service business. In order to provide a high quality health service delivery, it is of great importance to correctly understand the wishes and needs of the individuals receiving the service. QFD method provides convenience to professionals at this point. In this context, the study was started by examining other studies in the literature and a new product development process based on QFD was created.

Keywords: *Quality function deployment (QFD), voice of the patient, house of quality, quality in health, new product development*

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ARAŞTIRMA MAKALESİ

BİR SAĞLIK KURULUŞUNDA KALİTE FONKSİYON GÖÇERİMİNE DAYALI YENİ ÜRÜN GELİŞTİRME SÜRECİNİN UYGULANMASI*

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ÖZ

Yeni Ürün Geliştirme süreci, diğer pek çok kuruluş için önem taşıdığı gibi sağlık kuruluşları için de hayli önem taşıyan bir konudur. Bu çalışmada, sağlık kuruluşlarında yeni ürün geliştirme süreci içerisinde kullanılan Kalite Fonksiyon Göçerimi (KFG) yöntemi ile alandaki çalışmalara katkı sağlamak amacı güdülmektedir. Bu amaç doğrultusunda, genel kullanım alanı endüstriyel tasarım süreçlerinin desteklenmesi ve üretim süreçleri olan KFG yönteminin bir hizmet işletmesi olan sağlık kuruluşlarında, yeni ürün geliştirme süreçleri kapsamında bir örneği ortaya konulmuştur. Yüksek kaliteli bir sağlık hizmeti sunumunun sağlanabilmesi için, hizmet alan bireylerin istek ve ihtiyaçlarının doğru bir şekilde anlaşılması büyük önem taşımaktadır. KFG yöntemi bu noktada profesyonellere kolaylık sağlamaktadır. Bu kapsamda literatürdeki diğer araştırmalar incelenerek çalışmaya başlanılmış olup, KFG temelli bir yeni ürün geliştirme süreci oluşturulmuştur.

Anahtar Kelimeler: *Kalite fonksiyon göçerimi (KFG), hastanın sesi, kalite evi, sağlıkta kalite, yeni ürün geliştirme.*

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I. INTRODUCTION

In today's world, rapid changes are taking place in the economic and social environment. Every day, a new technological invention is added and organizations struggle to survive within the framework of these innovations. As a result of the increase in innovations and diversity, the products or services that people can choose also increase, so the work of organizations becomes more difficult (Benner et al., 2003). The success of organizations in such an unstable environment requires that they be able to offer products or services with the qualities demanded by the customers to the market at the time they demand, without creating a decrease in the quality of the product and service (Costa et al., 2001). It can be said that it is more complex and difficult for health institutions in the service sector to provide high quality service provision that can meet the wishes and needs of the individuals receiving service (Asunakutlu, 2005). This difficulty is related to health services; consumption is random, has no substitute, cannot be postponed, consumer behavior is irrational, information asymmetry is, the services are public goods, the output cannot be converted into money and externality (Devebakan, 2001). From this point of view, it is necessary for health institutions operating in a tight competitive environment arising from national and international markets to be successful and to be able to offer new products that meet or exceed customer expectations to the market at any time (Lazer and Layton, 1999). Quality Function Deployment (QFD) method emerges as an approach that can provide successful results in the development of new products in healthcare institutions or in the redesign of existing products in line with customer expectations. QFD is one of the methods introduced to support the product design process. As the usefulness of the method has come to the fore, its applications in the field of service have also been revealed in the following years, and it has found its place among the quality improvement tools (Cohen, 1995). Table 1 contains data on seven frequently used quality methods and QFD. When these data are compared, it is seen that the concept of Voice of Customer, which forms the basis of the working principle of QFD, makes a difference compared to the working principles of other methods. While other methods focus on the errors and the process after being included in the process, the process is designed with the target audience from the very beginning of the process and the errors are tried to be eliminated in QFD.

Since new product development is a concept that triggers growth and progress, it has managed to attract the attention of institutions. It is essential for any institution, whether it is a production business or a service business, to present different and remarkable products or services (Mucuk, 2000). There are various factors that lead companies to develop new products. At the beginning of these factors are being sustainable and providing an advantage against their competitors (İlhan, 2018).

In this study, information about QFD, which is an approach that can be used in the new product development process in healthcare institutions, is given and a new product development process based on QFD is presented. Firstly, important literature information was mentioned and in the following titles, the new product development approach based on QFD was explained in this study.

Table 1. Seven Basic Tools of Quality Control and QFD

Quality Tools	Occurrence of Tools	Usage
1. Fishbone Diagram	This diagram was developed by Kaoru Ishikawa in 1943.	• Cause-Effect Diagram. • Focuses on the causes of a problem and their relationship.
2. Check Sheet	It was developed by Walter A. Shewhart in 1931.	• It is a method used in data collection and storage. • It includes questions and focused on process and errors. • It is an improved version of control charts.
3. Control Charts	It was developed by Walter A. Shewhart in 1924.	• It focuses on abnormal changes by examining the change in a process. • It helps to identify and prevent changes in the process. • Although it resembles control charts in some respects, it does not show the control limits of the process. For this reason, they are easier to construct but do not allow the use of all analytical techniques supported by Check Sheet. • Customer requests can be compared and the process can be improved according to the customer, but customers are not included in the process from the beginning with Control Charts.
4. Histograms	It was first derived from the concept of "Historical Diagram" by Karl Pearson in 1891.	• It helps to better understand and recognize the distribution by showing the distributions of the data values. • Focuses on statistical monitoring of processes and making data meaningful.
5. Pareto Analysis	It was developed by Vilfredo Pareto in 1897.	• It is a custom bar chart. • The relative importance of problems or situations is listed visually.
6. Scatter Diagram	Although it was developed by René Descartes in the 17th century, its first definition was made by John Herschel.	• It focuses on the relationship between two data. • In the process, "What affects what and how?" works within the framework of the question.
7. Flowchart	It was designed by Ed Yourdon and Larry Constantine in the early 1970s.	• It is the representation of the steps in a process with graphical symbols. • Various steps in the process are defined and a clearly understanding of the work is provided.
8. Quality Function Deploymant (QFD)	It was introduced by Yoji Akao in the 1960s. In 1972, Shigeru Mizuno and Yasushi Furukawa created the first matrices for the QFD to be implemented at the Kobe Shipyard.	• Customer demands and requirements turn into product/service characteristics in all functional components of processes. • Customer satisfaction is guaranteed from the very beginning of the process and spread to all elements of the system.

Resource: Kolarik (1995); Cartin (1993); Mears (1995)

Considering the other studies on QFD that were examined in the literature, it was seen that the method mostly focused on the House of Quality Matrix and the method could not go beyond this matrix. This study differs from other studies in terms of incorporating the QFD method, which has been mostly studied in production enterprises, into the new product development process by establishing other matrices in the method, and presenting a different perspective to the literature by applying it in the selected health institution, which is a service business.

II. MATERIALS AND METHODS

In the application part of this study, the QFD method was included in the new product development process from the concept development stage and was used to analyze the service quality provided in Suleyman Demirel University Research and Application Hospital, Pediatric Health and Diseases Department. The study has a research ethics committee approval of Suleyman Demirel University in accordance with the no 99/9 and date 30.11.2020.

The main purpose of this study is to include the QFD method, which has mostly been studied in production enterprises, in the new product development process and to apply it in a health institution, which is a service enterprise, and to contribute to the quality of service provided in the Pediatric Health and Diseases Department, Süleyman Demirel University Research and Application Hospital. The

department where the research will be conducted has been finalized as a result of the interviews with the Suleyman Demirel University Research and Application Hospital Quality Department and the Patient Rights and Public Relations Department. It has been stated that it is not appropriate to carry out work in some departments due to Covid-19. Thereupon, it was decided in the Pediatric Health and Diseases Department among the medical units decided together with the department of Quality Units and Patient Rights and Public Relations.

Regarding the QFD, when the other studies examined in the literature are considered, it is seen that the method mostly focuses on the House of Quality Matrix and the method cannot go beyond this matrix. It is another issue that the study aims to set an example for future researchers by establishing other matrices in the method.

The sub-purpose of the study is to set an example, to contribute to the academic literature, and to encourage further practices, with the QFD application concluded within the body of a health institution that provides service output for individuals in the health sector, different health institutions and relevant units in the institutions, practitioners and researchers.

For all these purposes, first of all, a questionnaire study was conducted to determine the wishes and needs of the patients and their relatives. The survey was conducted by the researcher between 01.12.2020-31.04.2021 dates. In the implementation of the questionnaire, it was tried to reach all patient groups who received treatment without making any preference among the patients who received service from the department. The SERVQUAL scale was used in the questionnaire form created to collect first-hand data in the research. The questionnaire form consists of two pages. The open-ended question on the second page of the form helped to gather the needs of patients and their relatives, which is of great importance for the application of QFD.

Information about the target patients and their relatives, which will be needed in the QFD application, was searched, and the data obtained as a result of the evaluation of the questionnaire formed the basis for the QFD application. Thanks to QFD, the needs of the patients and their relatives, whether they can be expressed or not, whether they are explicit or implicit, were determined and migrated to the necessary functional departments in the health institution and transformed into service features, and a flexible and easy-to-understand service development method carried out by a QFD team was presented. The QFD team consists of eight people, including the researcher. The team includes the researcher and her academic advisor, the head of the pediatric health and diseases department, the chief physician, deputy chief physician, the hospital chief director, the hospital manager and the quality director. The meetings of the QFD team were held in a reserved hall within the hospital. A meeting was held and ideas were discussed, while creating each matrix.

After determining the needs of the patients and their relatives, who constitute the basic data in the QFD application, a flow of four matrices for service processes was continued based on "*The Four Phase Macabe's QFD Model*" (Shillito, 1994). In the first stage (Phase 1) of the matrix flows of this study, a "*House of Quality (Service Planning) Matrix*" was created, which shows the service planning process. In the second stage (Phase 2), a "*Service Process Planning Matrix*" was created by associating the technical answers conveyed from the first stage with the service process elements in question. In the third stage (Phase 3), the "*Service Quality Control Matrix*" was created, which relates the service process elements and the service quality control steps, which are followed in order to ensure customer satisfaction in the service production area. The fourth and final stage (Phase 4), the "*Task Deployment Matrix*", was created and the tasks that are of importance for the relevant service production area were planned in detail.

The department where the research will be conducted has been finalized as a result of the interviews with the Suleyman Demirel University Research and Application Hospital Quality Unit and the Patient Rights and Public Relations Unit. In order to determine the sample size for the research, the data of the patients who received service in 2019 in the department where a questionnaire will be applied in the

hospital were used. Due to the Covid-19 and pandemic conditions affecting the world, 2019 data was used as the service figures calculated in 2020 were lower than usual. In 2019, the number of patients receiving service from the Department of Pediatrics was 39,150. If the population size was accepted as 39,150, it was calculated that the sample size should be at least 381 for the research with a 95% confidence level and ± 5 margin of error.

2.1. Application of QFD

After the organizational support was provided before the study, the objectives were determined, the patients and patient groups were defined, the time interval was determined, and the services to be included in the study were decided. In order to carry out the QFD application in the most healthy and correct way, the QFD Team was formed. While forming the team that will take part in the execution of the QFD studies, care was taken to include the necessary representatives from the health institution in the team. A QFD team of 8 people, including the researcher, was formed. The team includes the researcher, facilitator, the head of the pediatric health and diseases department, the chief physician, the assistant chief physician, the hospital chief director, the hospital manager and the quality director.

Determining the needs by listening to the voices of patients and their relatives is the first step of QFD. This process was carried out through a structured questionnaire. As a result of the survey, 400 patients and their relatives were reached. The questionnaires were evaluated with the help of the SPSS 22.0 (Statistics Program for Social Sciences) package program (the package program was accessed from the database of Suleyman Demirel University). In the first part of the questionnaire, 22-item statements were directed to the participants and they were asked to evaluate the expected and perceived quality perception of the institution. The dimensions in the questionnaire were analyzed and formed the basis for another structured questionnaire prepared to determine the importance of the needs of patients and their relatives.

The second part of the questionnaire contains demographic information of the participants. In this section, each question is analyzed in terms of frequency distributions. The data obtained from this section are presented in Table 2. When the findings related to the demographic structure are examined, 65.5% of the participants who answered the questionnaire are women and 35.5% are men. Looking at the marital status of the participants, 89.3% are married and 10.8% are single. When the educational status of the participants is examined, it is seen that 6.3% have completed primary education, 36% have completed high school, 14.5% have completed associate degree, 43.3% have completed undergraduate and other education levels. 20% of the participants are 25 years old and younger, 20.5% are 26-30 years old, 18.3% are 31-35 years old, 18.3% are 36-40 years old and 23% are individuals aged 41 and over.

Table 2. Demographic Information

Variables	Numerical Distribution (N)	Percentage (%)
Gender		
Women	262	65.5
Men	138	35.5
Marital Status		
Married	357	89.3
Single	43	10.8
State of Education		
Primary education	25	6.3
High school education	144	36.0
Associate degree	58	14.5
Undergraduate degree and others	173	43.3
Age		
25 years old and younger	80	20.0
26-30	82	20.5
31-35	73	18.3
36-40	73	18.3
41 years old and over	92	23.0
Total	**400**	**100**

After determining the patients and their relatives to whom the study will be conducted, a second structured questionnaire was applied to determine the wishes and needs of the individuals and their degree of importance. This survey study was conducted to determine the degree of importance, including the wishes and needs of the patients and their relatives.

2.1.1. Phase 1, Build a House of Quality (Service Planning) Matrix

At this stage, the processes of determining the requirements and technical requirements for improvements in the field of activity of Suleyman Demirel University Research and Application Hospital, Pediatric Health and Diseases Department them in the House of Quality Matrix were discussed. First of all, the needs of the patients and their relatives were created, as seen in Table 3, at the point of Determination of Customer Requests and Importance Levels.

After this stage, the QFD Capture Professional Edition (Developed by the International TechneGroup Inc.) program was used to create the matrices and make the calculations.

Table 3. Requiements of Patients and Their Relatives

Dimensions	Requirements of Patients and Their Relatives
Dimension of Physical Property	**F1.** Ensuring the adequacy of lactation rooms
	F2. Arrangement of children's areas
	F3. Arrangements of waiting areas for patients and their relatives
	F4. Arrangement for people with disabilities
	F5. Revision of examination rooms
	F6. Elimination of equipment problems of patient rooms in the clinic
	F7. Zone off areas for meet eating and drinking needs
	F8. Arrangement of personal hygiene areas
	F9. Arrangement of bloodletting areas
	F10. Arrangement of smoking lounge
Dimension of Service Encounter	**H1.** Reducing waiting period
	H2. Attach importance to the dress and appearance of the employees
	H3. Troubleshoot routing information issues
	H4. Arranging the disruptions in service delivery in Pediatric Health and Diseases Department
Dimension of Consideration and Interest	**A1.** Be attentive to staff behavior
	A2. Equality of service provided for every individual
Dimension of Qualificaion	**T1.** Compliance with working hours and times
	T2. Arrangement of magnetik resonanse imagining
	T3. Arrangement of buildings and furniture in accordance with patients
Dimension of Accessibility	**E1.** Arranging transportation to the hospital and parking facilities
	E2. Increasing to information and information points
	E3. Organizing the appointment system and accessing easy appointments

Secondly, the stages of the planning matrix, which is one of the sub-matrices, have been completed. In this sub-matrix, calculations such as the degree of importance factor, business satisfaction, goal, improvement ration, point of sale, absolute weight and relative weight, as seen in Table 4, were made.

Table 4. Planning Matrix

Dimensions	Reqirements of Patients and Their Relatives	Importance Factor	Business Satisfaction	Goal	Improvement Ration	Point of Sale	Absolute Weight	Relative Weight
DIMENSION OF PHYSICAL PROPERTY	**F1.** Ensuring the adequacy of lactation rooms	3.8375	3.7375	4.8350	1.2936	1.5	7.44	4.76
	F2. Arrangement of children's areas	3.5250	3.6600	4.7525	1.2984	1.5	19.35	12.39
	F3. Arrangements of waiting areas for patients and their relatives	3.2756	3.6400	4.9700	1.3653	1.5	17.88	11.45
	F4. Arrangement for people with disabilities	2.2500	3.0775	4.7325	1.5377	1.0	3.45	2.21
	F5. Revision of examination rooms	3.3625	3.2950	4.9725	1.5091	1.2	6.08	3.89
	F6. Elimination of equipment problems of patient rooms in the clinic	3.5875	3.5475	4.9725	1.4016	1.2	6.03	3.86
	F7. Zone off areas for meet eating and drinking needs	3.9000	3.8225	4.9850	1.3041	1.5	7.62	4.88
	F8. Arrangement of personal hygiene areas	3.4375	3.4175	4.9625	1.4520	1.2	5.98	3.83
	F9. Arrangement of bloodletting areas	3.5125	3.2550	4.9350	1.5161	1.5	7.98	5.11
	F10. Arrangement of smoking lounge	1.4125	2.7650	4.0825	1.4764	1.0	2.08	1.33
DIMENSION OF SERVICE ENCOUNTER	**H1.** Reducing waiting period	3.5000	3.4325	4.9775	1.4501	1.2	6.09	3.90
	H2. Attach importance to the dress and appearance of the employees	2.8875	3.6600	4.7255	1.2911	1.0	3.49	2.23
	H3. Troubleshoot routing information issues	3.7150	3.5250	4.9050	1.3914	1.2	6.20	3.97
	H4. Arranging the disruptions in service delivery in Pediatric Health and Diseases Department	3.7250	3.5425	4.9675	1.4022	1.5	7.83	5.01
DIMENSION OF CONSIDERATION AND INTEREST	**A1.** Be attentive to staff behavior	3.7375	3.0850	4.9850	1.6158	1.2	7.24	4.63
	A2. Equality of service provided for every individual	3.1875	3.1975	4.9725	1.5551	1.0	4.95	3.17
DIMENSION OF QUALIFICATION	**T1.** Compliance with working hours and times	3.3000	3.2400	4.9775	1.5362	1.2	6.08	3.89
	T2. Arrangement of magnetik resonanse imagining	2.8000	3.1425	4.5675	1.4534	1.0	4.06	2.60
	T3. Arrangement of buildings and furniture in accordance with patients	3.7250	3.6325	4.9600	1.3654	1.2	6.10	3.90
DIMENSION OF ACCESSIBILITY	**E1.** Arranging transportation to the hospital and parking facilities	3.5750	3.9550	4.2625	1.0777	1.0	3.85	2.46
	E2. Increasing to information and information points	3.7875	3.3025	4.9525	1.4996	1.5	8.51	5.45
	E3. Organizing the appointment system and accessing easy appointments	3.6750	3.5200	4.9850	1.4161	1.5	7.80	4.99
	TOTAL						**156.09**	**100**

The following steps have been taken into consideration for account while calculating the planning matrix;

Reqirements of Patients and Their Relatives: This stage is the part expressed as customer needs. The expressions determined in the Servqual Scale are included in this section. This column is based on the needs of individuals in service delivery (Cohen, 1995).

Importance Factor: In some studies, these data are created with the data collected from the experts working in the institutions, while in some studies, these data are created with the people who receive service or product offerings from the institutions. In this study, individuals who contributed to the survey study contributed to the determination of the degree of importance. The importance degrees of the requirements were calculated by using the direct rating method. Degrees of importance factor express how much importance patients and their relatives attach to each need.

Business Satisfaction: Business satisfaction is the column that shows the current performance level of the department in which the study is conducted. It is formed as a result of the evaluations of the patients and their relatives (SERVQUAL Analysis) and the information retrieval from the department.

Goal: The goal column informs the researchers about the targeted performance level. In other words, it expresses the level of performance of the institution to fullfilled each patient requirement (Shahin, 2005). It is significant to targeting, as studies are carried out with limited resources. The data in this column is acquired by the researcher and the QFD team. Hospital management provided the data in the study.

Improvement Ration: The improvement ration refers to the effort required by the institution where the study is conducted to change the level of customer satisfaction for a customer need. This ratio is calculated by dividing the value determined in the target column by the business performance value for each patient requirement. For example, the improvement rate calculated for the requirement of "Ensuring the adequacy of lactation rooms", indicated by the F1 code in the Table 4, is 1.2936, which is obtained by dividing the goal score of 4.8350 by the business satisfaction score of 3.7375.

Point of Sale: Point of sale value expressing to the ability of the good or service to be sold in relation to the level of each customer's needs (Shiu, 1978). The values to be included in the point of sale are determined as a result of the evaluation of the QFD team. The listed values were also used in this study. The most commonly used values for the point of sale can be listed as follows;

1 : No effect on Sales Increasing

1.2 : Has a renable effect on Sales Increasing

1.5 : Has a Strong Effect on Sales Increasing

Absolute Weight: The Absolute Weight Score is calculated using a set of data in the planning matrix. If the absolute weight value is increasing, the value of the patient requirement for QFD increases at the same time (Kurtulmuşoğlu et al., 2016). This value is found by "Importance Factor", "Improvement Ration" and "Point of Sale" values are multiplying the with each other.

Relative Weight: Relative Weight Value is the normalized form of Absolute Weight values. In other words, it is the expression of absolute weight scores as a percentage (Can et al., 2017). It is obtained by dividing the absolute weight score found for each patient requirement by the total absolute weight score.

Third, the technical answers shown in Table 5 were created.

Table 5. Technical Requirements

TECHNICAL REQUIREMENTS
K1. Making physical arrangements in lactation rooms and increasing the number of lactation rooms
K2. Creation of a playground in the garden for children
K3. Increasing the number of seats in the waiting areas both in the outpatient polyclinic and service in the expanding the area
K4. Determination of special areas for people with disabilities
K5. Increasing the number of examination rooms and interior decoration for children
K6. Renewal of items like that patient beds, shelves, etc. in the pediatric health and diseases department
K7. Creation of canteen, cafeteria, patisserie-style sections for patients and their relatives
K8. Increasing the number of personal hygiene areas (washbasins and restroom) and creating a common parent toilet
K9. Create of a separate section for pediatric patients in the bloodletting unit
K10. Creating an area for smokers, taking into account the smoke-free air zone
K11. Reviewing processes to reduce waiting periods in service delivery
K12. Attire and appearance of employees
K13. Guidance tools for foreign patients and their relatives and determination of the personnel who will take special care
K14. Arrangement of the services provided in the patient rooms of the pediatric clinic (regular collection of garbage, supply of linen, provision of companion chair or bed, etc.)
K15. Planning the necessary trainings for employees' interest, friendly approach, openness to help, ability to solve problems and friendly service delivery
K16. Clearly identifying priority disease groups and preventing problems in service delivery
K17. Determining the working hours clearly and ensuring that all employees comply with these times
K18. Reducing appointment times and minimizing problems related to magnetik resonanse imagining
K19. Qualification of equipment
K20. Access to the service delivery point
K21. Routing information issues
K22. Appointment procedures

Technical requirements were focused on and the service offered was defined in a technical language, while creating this sub-matrix. Technical answers show how to supply with the requirements of patients and their relatives. They are positioned at the top of the House of Quality matrix. Technical requirements are determined by the QFD team. This part may include processes, methods, performance measures, facilities, people and departments. The final decision on which aspects to include while creating the sub-matrix rests with the QFD team. There is no general rule regarding the technical answers to be produced. Determinations should be made according to the needs of the research (Guinta and Praizler, 1993).

At this stage, the relationship matrix shown in Table 6 was created fourthly.

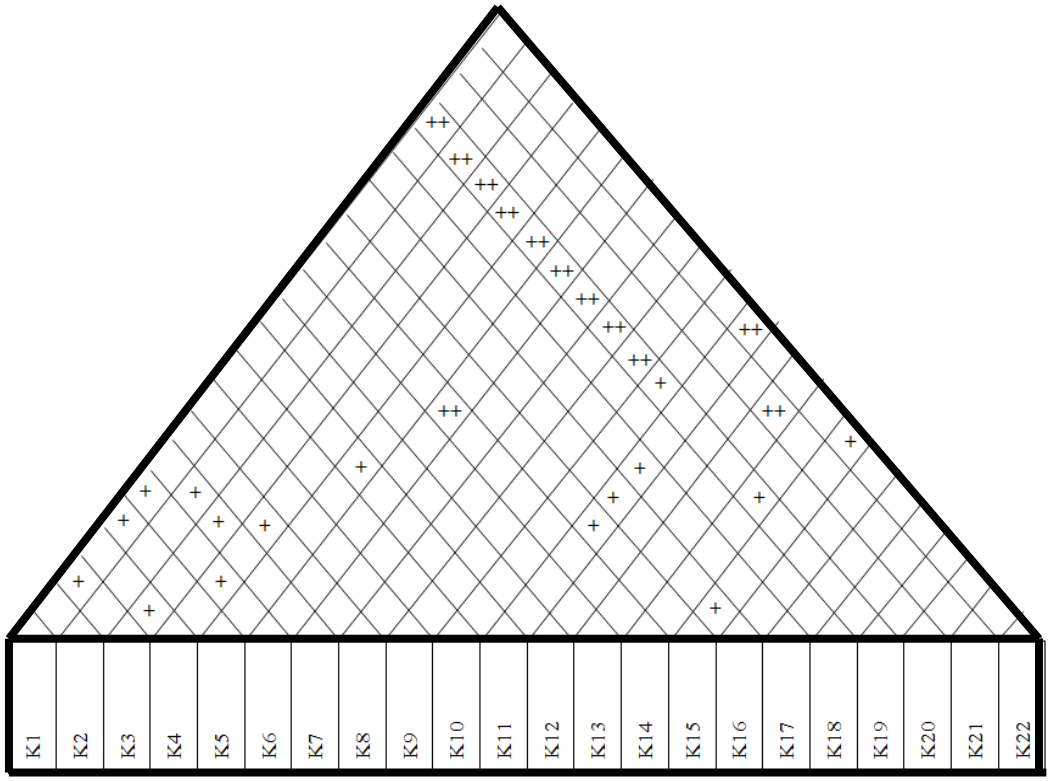
Table 6. Relationships Matrix

Dimensions	I \ II	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13	K14	K15	K16	K17	K18	K19	K20	K21	K22	Importance Factor	Business Satisfaction	Goal	Improvement Ration	Point of Sale	Absolute Weight	Relative Weight
Dimension of Physical Property	F1	○													▲					●				3.838	3.738	4.8	1.29	1.5	7.44	4.76
	F2		○	▲		●		▲		▲														3.525	3.66	4.8	1.3	1.5	19.4	12.4
	F3	▲	▲	○	▲			●																3.276	3.64	5	1.37	1.5	17.9	11.5
	F4			●	○	▲	▲														▲			2.25	3.078	4.7	1.54	1	3.45	2.21
	F5			▲		○	●					▲								●				3.363	3.295	5	1.51	1.2	6.08	3.89
	F6			▲			○		▲						●					●				3.588	3.548	5	1.4	1.2	6.03	3.86
	F7		▲	▲				○	▲											●				3.9	3.823	5	1.3	1.5	7.62	4.88
	F8	▲							○		▲				▲					●				3.438	3.418	5	1.45	1.2	5.98	3.83
	F9									○		▲				▲								3.513	3.255	4.9	1.52	1.5	7.98	5.11
	F10							▲			○													1.413	2.765	4.1	1.48	1	2.08	1.33
Dimension of Service Encounter	H1					▲				▲		○				●	●	●	▲				●	3.5	3.433	5	1.45	1.2	6.09	3.9
	H2												○			▲								2.888	3.66	4.7	1.29	1	3.49	2.23
	H3											●		○		▲						▲	▲	3.715	3.525	4.9	1.39	1.2	6.2	3.97
	H4						▲					▲			○	▲								3.725	3.543	5	1.4	1.5	7.83	5.01
Dimension of Consideration and Interest	A1											●	▲	▲		○		●				●	●	3.738	3.085	5	1.62	1.2	7.24	4.63
	A2				▲	▲				▲				▲		▲	○	▲					●	3.188	3.198	5	1.56	1	4.95	3.17
Dimension of Qualification	T1											●				●	▲	○					▲	3.3	3.24	5	1.54	1.2	6.08	3.89
	T2											▲		▲		●	▲		○				▲	2.8	3.143	4.6	1.45	1	4.06	2.6
	T3	●	●	●	●	●	●	●	●	●	●			▲	●					○				3.725	3.633	5	1.37	1.2	6.1	3.9
Dimension of Accessibility	E1																				○			3.575	3.955	4.3	1.08	1	3.85	2.46
	E2																				▲	○	▲	3.788	3.303	5	1.5	1.5	8.51	5.45
	E3																						○	3.675	3.52	5	1.42	1.5	7.8	4.99
Absolute Weight		50.8	90	97	37	78	50	84.2	40	57	22	74	16	34	57	73.8	34	48.2	16.9	83	20	45	76						156	100
Relative Weight		4.29	7.6	8.2	3.2	6.6	4.2	7.11	3.3	4.8	1.9	6.2	1.3	2.9	4.8	6.24	2.9	4.07	1.42	7	1.7	3.8	6.4							

Symbol	Meaning	Numeric Values
(Blank)	No Relation	0
▲	Potential Relation	1
●	Medium Relation	3
○	Strong Relation	5

In the fifth stage, the relationship between the technical answers shown in Figure 1 was examined.

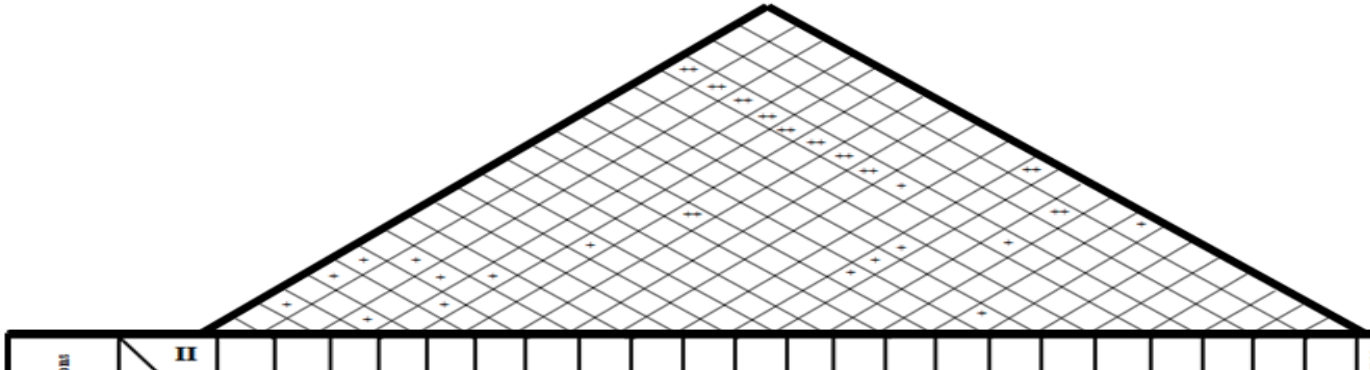
Figure 1. Roof/Colleration Matrix



Symbol	Meaning
++	Strong Positive Relation
+	Positive Relation
(Blank)	No Relation
x	Negative Relation
xx	Strong Negative Relation

In the last stage, all these sub-matrices were combined to form the House of Quality Matrix.

Table 7. House of Quality (Service Planning) Matrix



Dimensions	I \ II	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13	K14	K15	K16	K17	K18	K19	K20	K21	K22	Importance Factor	Business Satisfaction	Goal	Improvement Ration	Point of Sale	Absolute Weight	Relative Weight
Dimension of Physical Property	F1	○													▲					●				3.838	3.738	4.8	1.29	1.5	7.44	4.76
	F2		○	▲		●		▲		▲														3.525	3.66	4.8	1.3	1.5	19.4	12.4
	F3	▲	▲	○	▲			●																3.276	3.64	5	1.37	1.5	17.9	11.5
	F4			●	○	▲	▲														▲			2.25	3.078	4.7	1.54	1	3.45	2.21
	F5					○	●					▲								●				3.363	3.295	5	1.51	1.2	6.08	3.89
	F6			▲			○		▲						●					●				3.588	3.548	5	1.4	1.2	6.03	3.86
	F7		▲	▲				○	▲											●				3.9	3.823	5	1.3	1.5	7.62	4.88
	F8	▲							○		▲				▲					●				3.438	3.418	5	1.45	1.2	5.98	3.83
	F9									○		▲				▲								3.513	3.255	4.9	1.52	1.5	7.98	5.11
	F10							▲			○													1.413	2.765	4.1	1.48	1	2.08	1.33
Dimension of Service Encounter	H1					▲				▲		○				●	●	●	▲				●	3.5	3.433	5	1.45	1.2	6.09	3.9
	H2												○			▲								2.888	3.66	4.7	1.29	1	3.49	2.23
	H3											●		○		▲						▲	▲	3.715	3.525	4.9	1.39	1.2	6.2	3.97
	H4						▲					▲			○	▲								3.725	3.543	5	1.4	1.5	7.83	5.01
Dimension of Consideration and Interest	A1											●	▲	▲		○		●				●	●	3.738	3.085	5	1.62	1.2	7.24	4.63
	A2				▲	▲				▲				▲		▲	○	▲					●	3.188	3.198	5	1.56	1	4.95	3.17
Dimension of Qualification	T1											●				●	▲	○					▲	3.3	3.24	5	1.54	1.2	6.08	3.89
	T2											▲		▲		●	▲		○				▲	2.8	3.143	4.6	1.45	1	4.06	2.6
	T3	●	●	●	●	●	●	●	●	●	●			▲	●					○				3.725	3.633	5	1.37	1.2	6.1	3.9
Dimension of Accessibility	E1																				○			3.575	3.955	4.3	1.08	1	3.85	2.46
	E2																				▲	○	▲	3.788	3.303	5	1.5	1.5	8.51	5.45
	E3																						○	3.675	3.52	5	1.42	1.5	7.8	4.99
Absolute Weight		50.8	90	97	37	78	50	84.2	40	57	22	74	16	34	57	73.8	34	48.2	16.9	83	20	45	76						156	100
Relative Weight		4.29	7.6	8.2	3.2	6.6	4.2	7.11	3.3	4.8	1.9	6.2	1.3	2.9	4.8	6.24	2.9	4.07	1.42	7	1.7	3.8	6.4							

2.1.2. Phase 2, Create of Service Process Planning Matrix

The service process planning matrix, which is the matrix after the House of Quality the QFD method used in the study, includes associating the technical answers transferred from the first matrix with the service process elements that have an important place in the service production process. The service process planning matrix formed by the service process elements shown in Table 8 and the technical answers transferred from the previous stage is as shown in Table 9.

Table 8. Service Process Elements

1. Appointment	**S1.** Acceptance of patients' appointment requests
	S2. Informing patients about appointments
	S3. Entering patient information into the system
	S4. Confirmation of transactions
2. Check in/Registration Procedures	**S5.** Welcoming the patients
	S6. Completing the necessary registration procedures of the patients
	S7. Providing necessary guidance to patients
	S8. Transfer of patients to the point where they will receive service
	S9. Processing of hospitalized patients
3. Service Process	**S10.** Managing consulting services
	S11. Managing staff attitudes and service delivery processes
	S12. Managing the special requests of patients and their relatives
	S13. Management of processes related to medical analysis, examinations and results
	S14. Management of service delivery times
	S15. Control and management of equipment
	S16. Management of room allocation processes for patients who will receive service in the service
	S17. Considering patient requests in service delivery
	S18. Transactions of Patient Accompanist
	S19. Management of patient transfer and processes
	S20. Management of suggestion/complaint processes of patients and their relatives
	S21. Management of emergencies
4. Check out Procedures	**S22.** Managing the discharge and discharge procedures of patients

Table 9. Service Process Planning Matrix

TECHNICAL REQUIREMENTS	RELATIVE WEIGHT	SERVICE PROCESS ELEMENTS																					
		1. Appointment				2. Check in/Registration Procedures					3. Service Process												4. Check out Procedures
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22
K1	4.29												▲			▲							
K2	7.6												▲			▲							
K3	8.17												▲			▲	▲						
K4	3.19												▲			▲							
K5	6.56												▲			▲							
K6	4.21												▲			▲	○	○	▲				
K7	7.11												○			▲							
K8	3.34												▲			▲							
K9	4.79												▲			▲							
K10	1.87												▲			▲							
K11	6.21	○				●	●				▲	●		○	○					○	▲		○
K12	1.33										▲		▲										
K13	2.88	●	●			○		○	▲		▲	●											
K14	4.81												▲				○	○	▲				
K15	6.24	●	●	●	●	●	○	●	●	●	○	○		▲	▲			▲	▲	●	○	○	○
K16	2.87	○	●			▲	●				▲				●								
K17	4.07	●	●			●				▲	●				▲								▲
K18	1.42										●			○									
K19	7.03												▲			○							
K20	1.68							▲	▲	▲													
K21	3.81		○					●						▲					●				
K22	6.42	○	▲	○	○	○					●				▲								
Absolute Weight		117.07	73.65	50.82	50.82	98.93	40.28	46.23	23.28	24.47	80.22	58.47	92.74	48.2	56.39	86.28	53.27	51.34	26.69	49.77	37.41	31.2	66.32
Relative Weight		9.26	5.82	4.02	4.02	7.82	3.18	3.65	1.84	1.93	6.34	4.62	7.33	3.81	4.46	6.82	4.21	4.06	2.11	3.93	2.96	2.46	5.24

Symbol	Meaning	Numeric Values
(Blank)	No Relation	0
▲	Potential Relation	1
●	Medium Relation	3
○	Strong Relation	5

2.1.3. Phase 3, Create of Service Quality Control Matrix

The purpose of creating this matrix is to determine the necessary quality control criteria for the service process elements that are thought to be critical in order to produce services that can provide satisfaction as a result of the services that patients and their relatives benefit from.

Service process elements migrated from the previous matrix are located on the left side of the service quality control matrix. At the top of the matrix, the created process and quality criteria, namely service quality control steps, are placed. The Service quality control steps shown in Table 10 were determined by the QFD team. The service quality control matrix created is as shown in Table 11.

Table 10. Service Quality Control Steps

Service Quality Control Steps
R1. Assigning the right healthcare personnel to appropriate service processes
R2. Organizing in-hospital trainings and within the pediatric health and diseases department
R3. Teamwork
R4. Support of equipment
R5. Developing interpersonal communication within the health institution
R6. Ramp up care services
R7. Ensuring delegation of authority when necessary
R8. Create a procedure
R9. Adaptation and familiarization of pediatric patients to the service delivery process
R10. Development of service standards

Table 11. Service Quality Control Matrix

Service Process Elements \ Service Quality Control Steps		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Relative Weight
1.Appointment	S1	○		▲		▲			▲		●	9.26
	S2	▲		●		○			▲		●	5.82
	S3	●				○					▲	4.02
	S4	●				●	▲				○	4.02
2.Check in/Registration Procedures	S5	○	▲			○						7.82
	S6	○				▲				○		3.18
	S7				●	○						3.65
	S8				○	●						1.84
	S9			●			●		○	○		1.93
3.Service Process	S10	○	●		▲	▲	▲				▲	6.34
	S11		▲	▲		○	○				○	4.62
	S12				○		○	○				7.33
	S13				○						○	3.81
	S14							▲	○			4.46
	S15				○			▲				6.82
	S16						○	▲			▲	4.21
	S17				▲		●			●		4.06
	S18				●						●	2.11
	S19								○		▲	3.93
	S20	○				○		○				2.96
	S21			○				▲	▲			2.46
4.Check out Procedures	S22	▲							○			5.24
Absolute Weight		184.98	31.46	49.43	126.68	157.71	109.13	68.78	95.34	37.73	124.28	
Relative Weight		18.76	3.19	5.01	12.85	16.01	11.07	6.97	9.67	3.82	12.64	100

2.1.4. Phase 4, Create of Task Deployment Matrix

The task deployment matrix, created by the QFD team and shown in Table 12, clarified the tasks that were determined to be important in service delivery and suggestions such as by whom, where, how and when these tasks should be performed.

Table 12. Task Deployment Matrix

WHO	WHAT	WHEN	HOW	AT WHAT INTERVALS	WHY
Hospital Head Management	Regulations regarding the appointment system	in 6 months	Revising the appointment system and applying the MHRS system	Continuity	To reduce the time loss of individuals benefiting from service delivery and to provide more effective service delivery.
Hospital Head Management	Regulations on information services	in 6 months	Appointment of appropriate and sufficient personnel for information services	Continuity	To reduce the time loss of individuals benefiting from service delivery and to provide more effective service delivery.
Quality Management Committee	Regulations on guidance and orientation	in 6 months	Assigning personnel for guidance and orientation	Continuity	To reduce the time loss of individuals benefiting from service delivery and to provide more effective service delivery.
Hospital Head Management	Watch the prosess of service times	Coordinating in a period of 3 months. Daily follow up every 6 months	At this point, the waiting period of individuals is a enormous problem. It has been determined that the problems in the appointment system have a important place here, and when these problems are resolved, this stage will also be in order.	Continuity	To reduce the time loss of individuals benefiting from service delivery and to provide more effective service delivery.
Education Committee	Organizing in-hospital trainings and trainings within the department of pediatrics	in 6 months	Within the institution, some problems have been identified, especially in interpersonal communication. In particular, training can be organized for this situation.	Continuity	For healthcare professionals to work more comfortably and communicate more effectively with patients.
Hospital Head Management	Supply with the special demands of patients and their relatives, equipment and software arrangements	in 12 months	Demands of the patients and their relatives such as eating and drinking areas and personal cleaning areas, children's areas, adequate breastfeeding rooms, necessary equipment for the attendants in the service, blood collection section and arrangement of smoking areas have been determined. Hospital management can revise them by providing the necessary support. For cigarette areas, a joint study can be carried out by activating the tobacco board.	Continuity	In order to provide the most accurate service for the purposes of the health institution, both in appearance and function.

III. FINDINGS

After the phase of determining the needs of the patients and their relatives, which forms the basis of the QFD application, the QFD application was started. The first stage of the process was the House of Quality matrix seen in Table 7. When the importance factors of the requirements after the Quality House matrix are examined, the ones with the highest degree of need, respectively, with the F2 code "*Arrangement of children's areas*" with a rate of 12.39%, and with the F3 code "*Arrangements of waiting areas for patients and their relatives*" with a rate of 11.45%, respectively. It is seen that there is the need for "*Increasing to information and information points*" with E2 code, which has a rate of 5.45%. These ratios expressed in the relative weight column indicate that the fulfillment of the F2, F3 and E2 coded requirements has a high impact on patient satisfaction. At the same time, these requirements can be expressed as the points that the institution should primarily provide improvement and reflect these improvements during service delivery to individuals.

The last three requirements were F10 coded "*Arrangement of smoking lounge*" with 1.33%, F4 coded "*Arrangement for people with disabilities*" with 2.21%, and H2 coded "*Attach importance to the dress and appearance of the employees*" with 2.23%. These rates are; Compared to other customer requirements, the requirements coded F10, F4 and H2 do not have a high impact on patient satisfaction.

Considering the needs of all patients and their relatives, it is seen that the performance of the institution in terms of expectations of individuals is insufficient. When the business performance column was examined in more detail, it was understood that the F10 coded "*Arrangement of smoking lounge*", F4 coded "*Arrangement for people with disabilities*" and A1 coded "*Be attentive to staff behavior*" were the weakest points. Among the F2, F3 and E2 coded requirements, which are relatively more important among the needs of patients and their relatives, it is seen that the E2 coded "*Increasing to information and information points*" need more improvement. This is followed by the requirements of F3 coded "*Arrangements of waiting areas for patients and their relatives*" and F2 coded "*Arrangement of children's areas*".

When the technical part of the matrix is evaluated, technical answers that come to the fore in ensuring the satisfaction of patients and their relatives can be seen. When the relative absolute weights of the technical requirements are examined, the answers in the first three rows are K3 coded "*Increasing the number of seats in the waiting areas both in the outpatient polyclinic and service in the expanding the area*" with 8.17%, and K7 coded "*Creation of canteen, cafeteria, patisserie-style sections for patients and their relatives*" with 7.11% and K2 coded "*Creation of a playground in the garden for children*" with a rate of 7.6%. These technical answers have more impact on the service provided to patients and their relatives than other technical answers. It can be interpreted that the steps to be taken at the point of realizing these technical requirements will increase the quality of service delivery.

The next step of QFD from the House of Quality Matrix was the Service Process Planning Matrix. At this stage, it has been revealed which process steps are more effective on the satisfaction levels and satisfaction of individuals. As seen in Table 8, the process elements S1 coded "*Acceptance of patients' appointment requests*", S5 coding "*Welcoming the patients*" and S17 coded "*Considering patient requests in service delivery*" are be in the first place. These elements, which are at the top of the list compared to the others, can be shown as points that should be emphasized while providing service. If the health institution catches breakthroughs or improvements on these issues, it will be able to increase patient satisfaction.

The third matrix of the QFD application is the Service Quality Control Matrix. At this stage, the service process elements and the service quality control steps determined are correlated. In other words, it gives a clue to the institution about which control steps should be put into practice in order for the service process elements to function well. As seen in Table 10, the quality control steps of R1 coded "*Assigning the right healthcare personnel to appropriate service processes*", R5 coded "*Developing interpersonal communication within the health institution*" and R4 coded "*Support of equipment*" are

be in the first three places. From here, it can be interpreted that these control steps should be given priority when other resources, especially management resources, will be directed for service delivery.

The last step of the QFD application was the creation of the Task Deployment Chart. This chart is a collective request and recommendation chart for the institution where the research is carried out as a result of the information gathered from all the matrices carried out during the QFD application and is accepted as the service output (product) revealed as a result of the New Product Development Process. In Table 12, it is stated that the tasks should turn into a concrete output in order to increase the quality of service delivery as a result of the tasks mentioned.

As a result of the QFD application, many data were obtained that will be beneficial for the service delivery of the Pediatric Health and Diseases Department. In order for the data revealed in the QFD application to have a positive return on behalf of the institution, it must be put into practice and concrete steps must be taken. Although the data obtained as a result of the study carried out in Suleyman Demirel University Research and Application Hospital, Pediatric Health and Diseases Department, were presented to the management, concrete steps that could be taken were discussed with them. The final decision on whether or not to put this data into practice rests with the organization and management. As a result of the interviews, it was stated by the management that the Covid-19 process had a negative effect on the physical and equipment features such as waiting areas or playgrounds. In addition, it has been reported that some studies have been carried out to improve the appointment system and even an application has been made to the MHRS system[1]. In addition, it has been stated that the H1 coded "*Reducing waiting period*" requirement is closely related to the H3 coded "*Troubleshoot routing information issues*" requirement and that steps can be taken in this regard. In addition, it was determined that the E2 coded requirement for "*Increasing to information and information points*" also affected the H1 coded requirement, and the institution management stated that it would deal with this issue as soon as possible. In addition to all these, the issue of re-activating the tobacco board and continuing its activities was also discussed. By fulfilling his responsibility for the implementation of the QFD phases, the researcher fulfilled the purpose of this study in providing information about quality service delivery to the institution.

As a result of the research, the QFD application helped to shorten the different stages in the new product development process. That is the matrix applications in the QFD process were used instead of the steps in the New Product Development Process.

IV. RESULTS AND DISCUSSION

After the 20th century, which is known as the "productivity century", it is stated that the 21st century is the "quality century" (Juran, 1999). Two of the many meanings of the word "quality" are critical to the management of quality. First, "quality" is the product feature that meets customer needs and thus ensures customer satisfaction. In this sense, quality is income oriented. Second, "quality" is to be free from errors that require repeated work or defects that result in customer dissatisfaction (Alramazanoğlu et al., 2021). In this context, it can be stated that high quality service provide is one of the prerequisites that businesses in the service sector must fulfill in order to be successful in today's highly competitive environment (Kaya, 2005). Quality Function Deployment (QFD) may be a good option for patient-focused strategies that will provide patient satisfaction. With the Quality Function Deployment (QFD) method, which is one of the patient-focused Total Quality Management applications, health institutions managers can provide a high quality service to their patients, whose wishes, needs and expectations are determined, that meets or even exceeds these requests, needs and expectations (Karahan, 2019).

[1] *It is the Central Physician Appointment System (MHRS) that provides examination appointment services to all health institutions and organizations affiliated to the Ministry of Health in Turkey.*

In this study, an application example is presented by including the QFD method, which supports the improvement of service quality, customer satisfaction and saturation, into the new product development process, taking into account the characteristics of health institutions.

In the academic literature, there are various studies on QFD. The study of Radharamanan and Godoy (1996) at Santa Maria University Hospital is one of the first examples of the method in the health sector. Researchers investigated how to cater to patient expectations by using the QFD method in the study. They emphasized issues such as rapid response, appropriate treatment, post-treatment follow-up, and good counseling as important patient expectations.

Kriewall and Widin (1991) used QFD in the design of the Cochlear Implant, a medical device that enables patients with severe hearing loss to hear better.

Nallıoğlu (2014) designed a medical equipment cabinet that can be controlled based on computer systems in order to manage materials in hospitals with an automation system using the QFD method in the thesis she presented.

In the study conducted by Dehe and Bamford (2017) in the United Kingdom, they conducted a QFD application during the opening process of the healthcare institution by interviewing people living in that area about how a new healthcare institution should be.

Although there are many studies that measure service quality by including the original SERVQUAL scale in the management of health institutions, it is recommended and emphasized in the literature to adapt the SERVQUAL scale according to the requirements of the service (Kaya, 2003). Patients who receive service from health institutions also evaluate the service they receive by taking into account the health professionals who provide health services to them and the hotel services offered. For this reason, SERVQUAL and QFD can be used together in order to listen to the voice of the patients comprehensively, in order to improve the quality of service in a health institution with a patient focus.

Karahan (2019)'s dissertation, a SERVQUAL scale modified according to the needs of a university hospital was developed and an integrated QFD application was made with fuzzy logic. The author stated that in the academic literature at the time of the study, there was no study in the health sector that used the modified SERVQUAL scale and fuzzy logic integrated.

While this study was being conducted, the authors reached to QFD studies integrated with SERVQUAL in the field of health, as well as different studies using fuzzy logic or Kano Model. Some sample studies are listed above. When these case studies and some studies in the literature are examined, some gaps have been found. For starters, it is seen that it is limited to the house of quality matrix, when the studies in the literature related to Quality Function Deployment are examined. What is meant here is that other matrices in the method are not sampled except for the house of quality matrix. Another gap concerns the new product development process. The usability of this process is often associated with production business enterprises like QFD. But new product ideas are not only associated with products but also with services. Many different businesses, such as health institutions that provide service output, can benefit from this process to increase customer satisfaction. At this point, QFD emerges as a useful method that researchers can apply in the new product development process (Yenginol, 2008). Another study that has the output that the studies on qfd are more in production business is the study of Unal and Toraman (2022). They conducted a bibliometric analysis of thesis studies published in YÖKTEZ between 1995 and 2020 about of QFD. In the study, it was determined that the number of theses carried out in service enterprises is more limited than in production enterprises and it is less in health-related studies than in other fields. As a result of the researches, a few studies have been reached on the application of the sevqual-based quality function deployment model in the new product development process. At the time of the this study, no example was found in health institutions.

QFD aims to facilitate the new product development process from product conceptualization to production requirements; however, conventional QFD has its shortcomings. Even though modified QFD models have been proposed in literature, a comprehensive model is necessary (Lee and Lin, 2011). This is where the new product development process comes into play. Some examples, especially related to these integrated studies, are listed below.

Akao and Mazur (2003) referred to the use of QFD in product development and new product development processes and the richness of its applications in different industries.

Lockamy and Khurana (1995) presented a study that proposes to demonstrate how QFD can be used as a mechanism to incorporate Total Quality Management (TQM) into the product design process. Provides a case study illustrating the use of QFD by the Chrysler Motors Corporation, as well as preliminary conclusions on the use of QFD to facilitate TQM in new product development.

Curcic and Milunovic (2007), in measuring the quality of soap produced, customer satisfaction was addressed by including quality function deployment in the new product development process.

Delice and Güngör (2009), a new QFD optimization approach combining MILP model and Kano model is suggested to acquire the optimized solution from a limited number of alternative DRs, the values of which can be discrete. The proposed model can be used not only to optimize the product development but also in other applications of QFD such as quality management, planning, design, engineering and decision-making, on the condition that DR values are discrete.

Akbaba (2003) in his dissertation, he made an adaptation of QFD in lodging industry. This study is one of the rare studies in which other matrices are sampled apart from the quality house matrix. In addition, Akbaba (2005) conducted a study on a QFD-Based product development process for tourism business.

As can be seen in the examples given above, the applications of the new product development process in service businesses are more limited than in production businesses. In service enterprises, there is no such study on health institutions. The closest examples are the studies carried out for tourism businesses. In this study, it is aimed to exemplify the application of a sevqual-based QFD method in the new product development process and to present an example to future researchers by creating other matrices other than the quality house matrix in quality function deployment. For this purpose, servqual analysis was used to measure patient expectations. For the service delivery of the institution, Macabe's 4-stage QFD Method was used in the new product development process and 4 different sub-matrix examples, including the house of quality matrix, were presented. The process was shortened by using matrix applications in the QFD process instead of the steps in the New Product Development Process.

Some important results were obtained in this study on QFD. The data obtained as a result of the QFD application can be generalized and the following suggestions can be presented for the institution;

- The evaluations of the individuals who receive service from the Pediatric Health and Diseases Department of the health institution regarding medical services are closely related to technological and infrastructure issues. Improvements to be made in these matters will increase the level of patient satisfaction.
- Placing sufficient and correct personnel in the necessary service delivery processes affects the service delivery quality of the institution before patients and their relatives.
- The health institution should create an appointment system that works regularly by increasing the number of personnel and making various appointment system corrections.
- By placing the specialist health personnel in the necessary service delivery stages, the health institution can provide friendly service for patients and their relatives and sufficient examination times for each patient.

- Increasing in-service trainings, congress opportunities, telemedicine and home care services organized for health professionals within the health institution will increase the service quality. However, care must be taken that all these processes do not adversely affect the functioning of the appointment system within the organization and the examination times.
- In addition to providing medical services, which is the main field of activity of the health institution, additional efforts can be made to increase the performance of the institution, including the management of support services (food, cleaning, security, automation, parking services).
- Improvements should be made in some structural issues (breastfeeding rooms, children's playgrounds, waiting areas, children's blood collection unit, parent toilets, etc.) that are important for individuals receiving service within the Pediatric Health and Diseases Department in the health institution.

After these recommendations for the institution, researchers who will work on QFD can focus on the following issues and offer different perspectives in the future;

- In this study, a research based on perceived service quality on the basis of quality dimensions was conducted and it was tried to reach individuals who received service from all units of the Pediatric Health and Diseases Department. Researchers who want to work on QFD can reach individuals who receive service in the inpatient services of a certain department and conduct research on whether the perceived service quality differs statistically according to the length of stay of the patient.
- Researchers who are authorized within the institution and have strong knowledge about QFD can contribute to the academic literature by conducting larger matrix and complex studies without limiting themselves to a single department or unit.
- Researchers can conduct a QFD study on healthcare professionals who represent internal customers in healthcare organizations.
- This research was conducted in a public health institution. In future studies, researchers can include private sector health institutions in their research, so that a comparison can be made on the basis of the private and public sector and original results can be obtained. Or they can direct their work on two different public institutions.
- Researchers can integrate the QFD method with various process improvement tools and enable it to be used in research.

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REFERENCES

Akao, Y., & Mazur, G.H. (2003). The leading edge in QFD: Past, present and future. *International Journal of Quality & Reliability Management*, *20*(1), 20-35.

Akbaba, A. (2003). *Konaklama işletmelerinde kalite fonksiyon göçerimi* [Doctoral Dissertation], Dokuz Eylül Üniversitesi, İzmir.

Akbaba, A. (2005). Yeni ürün geliştirme sürecinde Kalite Fonksiyon Göçerimi (KFG): Turizm işletmeleri için KFG temelli bir ürün geliştirme süreci önerisi. *Selçuk Üniversitesi Karaman İktisadi ve İdari Bilimler Dergisi*, *2*(5), 38-59.

Alramazanoğlu, O.B., Kaya, S., & Gözlü, K. (2021). Bir devlet hastanesinde kalite maliyetlerinin PAF modeli ile incelenmesi. *Journal of Productivity, 3,* 91-104.

Asunakutlu, T. (2005). *Sağlık hizmetlerinde kalite*. T.C. Sağlık Bakanlığı.

Benner, M., Linnemann, A. R., Jongen, W. M. F., & Folstar, P. (2003). Quality Function Deployment (QFD) - Can it be used to develop food products?. *Food Quality and Preference*, *14*(2003), 327-339.

Can, G. F., Atalay, K. D., & Eraslan, E. (2017). Bulanık Kalite Fonksiyon Yayılımı (BKFY) temelli tasarım geliştirme yaklaşımı. *Journal of Turkish Operations Management, 1*(1), 51-65.

Cartin, T. J. (1993). *Principles and practices of TQM*. ASQC.

Cohen, L. (1995). *Quality Function Deployment: How to make QFD work for you*. Massachusetts, Addison-Wesley Publishing Company Inc.

Costa, A. I. A., Dekker, M., & Jongen, W. M. F. (2001). Quality Function Deployment in the food industry: A review. *Trends in Food Science & Technology, 11*(9-10), 306-314.

Curcic, S., & Milunovic, S. (2007). Product development using Quality Function Deployment (QFD). *International Journal for Quality Research, 1*(3), 243-247.

Dehe, B., & Bamford, D. (2017). Quality Function Deployment and operational design decisions. A healthcare infrastructure development case study. *Production Planning & Control, 28*(14), 1177-1192.

Delice, E.K., & Güngör, Z. (2009). A new mixed integer linear programming model for product development using Quality Function Deployment. *Computers & Industrial Engineering, 57*(3), 906-912.

Devebakan, N. (2001). *Sağlık işletmelerinde kalite ve algılanan hizmet kalitesinin ölçülmesi* [Master's Thesis], Dokuz Eylül Üniversitesi, İzmir.

Guinta, L. R., & Praizler, N. C. (1993). *Manual de QFD*. LTC.

İlhan, A. (2018). *Yeni ürün geliştirme sürecinde müşteri odaklı yaklaşım ve pazar araştırması: Sakarya ili mobilya sektöründe örnek bir uygulama* [Master's Thesis], Düzce Üniversitesi, Düzce.

Juran, J.M. (1999). *How to think about quality, Juran's quality handbook*. McGraw-Hill.

Karahan, A. (2019). Bulanık kalite fonksiyon göçerimi ile bir üniversite hastanesinde hizmet kalitesinin geliştirilmesi [Doctoral Dissertation], Hacettepe Üniversitesi, Ankara.

Kaya, S. (2003). Sağlık hizmetlerinde kalite yönetimi çeşitli ülkelerdeki uygulamalara genel bir bakış. *Hacettepe Sağlık İdaresi Dergisi, 6*, 57-70.

Kaya, S. (2005). *Sağlık hizmetlerinde sürekli kalite iyileştirme*. Pelikan Yayıncılık.

Kolarik, W. J. (1995). *Creating quality: Concepts, systems, strategies and tools*. McGraw Hill.

Kriewall, T. J., & Widin, G. P. (1991). *An application of quality function deployment to medical device develepment, case studies in medical ınstrument design*. The Institute of Electrical and Electronics Engineers Inc.

Kurtulmuşoğlu, F. B., Pakdil, F., & Atalay, K. D. (2016). Quality improvement strategies of highway business service based on a fuzzy quality function deployment approach. *Transportmetrica A: Transport Science, 12*(2), 175-202.

Lazer, W., & Layton, R. A. (1999). *Contemporary hospitality marketing: A service management approach.* The Educational Institute of the American Hotel & Motel Association.

Lee, A.H.I., & Lin, C.Y. (2011). An integrated fuzzy QFD framework for new product development. *Flexible Services and Manufacturing Journal*, *23*, 26-47.

Lockamy, A., & Khurana, A. (1995). Quality Function Deployment: Total Quality Management for new product design. *International Journal of Quality & Reliability Management, 12*(6), 73-84.

Mears, P. (1995). *Quality improvement tools & techniques*. McGraw Hill.

Mucuk, İ. (2000). *Pazarlama ilkeleri*. Türkmen Kitapevi.

Nallıoğlu, J. (2014). *Otomatik medikal saklama depolarının müşterinin sesi yoluyla optimizasyonu* [Master's Thesis], Dokuz Eylül Üniversitesi, İzmir.

Radharamanan, R., & Godoy, L.P. (1996). Quality Function Deployment as applied to a health care system. *Computers & Industrial Engineering, 31*(1), 443-446.

Shahin, A. (2005). *Quality function deployment: A comprehensive review*. Department of Management University of Isfahan.

Shillito, M. L. (1994). *Advanced QFD: Linking technology to market and company needs*. John Wiley & Sons.

Shiu, M. L. (1978). *Quality strategy for research and development*. John Wiley& Sons.

Unal, A.K., & Toraman, A. (2022). Bibliometric analysis of graduate dissertations written based on Quality Function Deployment (QFD) method: An overview of health management profile. *Journal of Internatianal Health Sciences and Management, 8*(15), 22-31.

Yenginol, F. (2008). Neden kalite fonksiyon göçerimi?. *Dokuz Eylül Üniversitesi İşletme Fakültesi Dergisi, 9*(1), 7-15.