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APPLICATION OF QFD MODEL FOR AUTOMOBILE AFTER SALE SERVICE QUALITY IMPROVEMENT (CASE STUDY: BUSHEHR SAIPA AGENCIES)

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ABSTRACT

The main objective of this paper, through implementing the Quality function deployment (QFD), is to improve the quality of automotive after-sales services. The statistical population of the survey is all of the Saipa's agencies in Bushehr city. Data acquisition tool used in this study was a standard Likert-scale-associated questionnaire. In this study, five hypotheses were used to determine the impact of client needs, design requirements, quality characteristics of the used tools, key operational processes, and production needs on after-sales-services quality improvement of Saipa's representatives in Bushehr city. Furthermore; the three-stage function development model is used to determine weights and prioritize operational requirements. According to the results, all of the hypotheses are associated with significance level less than .05. On the other hand, adjusting the after-sales-related services' standards to the latest international standards services, providing the operators with required training, developing procedures and work instructions (maintenance, inspection, equipment control, etc.), and updating the information of reputable suppliers are ranked first to fourth respectively.

Keywords: *Quality Function Deployment (QFD), After-Sales Service, Automotive Industry*

INTRODUCTION

Recently, advances in technology and science and new technology development have brought about some competitive conditions to the extent that quality is the most important factor in global competition. So, global competition and customer's requirements of higher quality have provided the companies with the insight that high-quality services are the key to a winning competition.

Quality function deployment, being among the new methods of Quality Engineering, focusing on customers' requirements, makes sure that products' quality is greatly increased at the early stages. In other words, the basic philosophy of applying QFD is to consider and use customers' quality demands in different developmental or service stages. Hence, all the features and specifications of products design are set according to the views of the "customer" and "consumer" so that the role of experts in the design of new products and services is not more than a "translator" who, using QFD method, converts, in a considerable quantitative, the customer's demands to the design data (Ashnaee, 2001).

Theoretical Aspect of Research

Quality function deployment is a system through which the customers' needs are converted to decent product or service (Walker, 2002). According to the definition stated by Yuji Akao, founder of QFD method, QFD translates customers' needs and expectations for a specific product, determining the product characteristics (Akao, 1997). Considering (Thakkar *et al.*, 2006), QFD is a customer-oriented design process through which the questions of "what" and "how" are replied according to customers' needs (industry and community). In this technique, the quality is divided into operational, technical, manageable, and tangible aspects so that the customers' needs and requirements are met in the given deadline. According to Han *et al.*, (2001), the tangible purposes of applying QFD are as follow: lower costs, eliminating the frequent changes in technology, identifying the critical aspects, determining the upcoming production processes, a significant decrease of the time devoted to product development and resources optimization, adjusting the design and planning quality, better Selection in hope of competitive

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products, new product development, analysis of market's qualitative data, identifying the control points, reducing design changes, reducing development costs, and increasing market share.

QFD was first used in ship building industry (Nishimura, 1972) and electronics (Akao, 1972). Furthermore; it is used in other industries such as automotive, electronics, and software. QFD became widespread rapidly in many manufacturing industries among which the important ones are as follow: (1) transport and communications, (2) electronics and electrical equipment, (3) software systems, (4) production systems, (5) research training, and (6) service.

Table 1: The Acceptable Range of QFD Techniques Application in the Services Field (Chan and Wu, 2002)

Areas of Service	Resources
Administration	(Hofmeister, 1992)
Banking	(Riffelmacher, 1991)
	(Ko and Lee, 2000)
Contracting Process	(Bersbach and Wahl; 1990)
	(Hybert, 1996)
FoodDistribution	(Samuel and Hines, 1999)
Wholesale	(Keenan, 1996)
	(Lin and Fite, 1995)
Retail	(Nagendra <i>et al.</i> , 2000)
	(Trappey <i>et al.</i> , 1996)
Public Sectors	(Curry, 1999)
	(Curry <i>et al.</i> , 1998)
	(Ellis, 1998)
	(Hallberg, 1999)
Mortgage	(McLaurin and Bell, 1991, 1993)
Hotels	(Dube <i>et al.</i> , 1999)
	(Stuart and Stephen, 1996)

In 2008, according to a research by (Carnevalli *et al.*, 2008) some of the recent QFD applications were evaluated and classified among which the most important ones are as follow (table 2):

Table 2: Application of QFD Technique in the Services Field (Carnevalli *et al.*, 2008)

Areas of Service	Resources
Ergonomic	(Nibbelke <i>et al.</i> , 2001)
Healthcare	(Dijkstra <i>et al.</i> , 2002)
Education	(Duffuaa <i>et al.</i> , 2003)
Ranking customer needs at spectator events	(Enri'quez <i>et al.</i> , 2004)
large-scale social system redesign	(Gerst, 2004)
Customer satisfaction in e-banking	(Gonza'lez <i>et al.</i> , 2004)
Cost Modeling	(Gonza'lez <i>et al.</i> , 2005)
Project Management	(Leprevost <i>et al.</i> , 2005)
Performance evaluation of information systems in the after-sales service	(Lin <i>et al.</i> , 2005)
Preventive Health Organization	(Omachonu <i>et al.</i> , 2005)
Strategic management of logistics service	(Bottani <i>et al.</i> , 2006)
supply chain management	(Gunasekaran <i>et al.</i> , 2006)
safety management in health care	(Moore, 2006)
maintenance engineering	(Pramod <i>et al.</i> , 2006)

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Although QFD is a customer-oriented quality management and product development technique, mainly used for products, QFD was gradually introduced to some other parts such as design and development of quality services. Chan and Wu (2002) (table 1) provided an acceptable range of applications of QFD techniques in different services including accounting, engineering services, health care-related services, information and library services, evaluation of real estates, and online bookstore.

As table 3 shows, there are many researches toward QFD empowerment in customers' expectations and needs fields especially in developed countries. So it could be simplified customer need ranking.

Table 3: QFD Researches in Customers' Expectations and Needs Fields

Author(s)	Topic	Result	Years
Pakdel	The use of Quality function deployment in analysis of quantity and quality of after-sales service	Customers' expectations were classified and shown that QFD Can be used to determine the factors that increase customers' satisfaction and loyalty in after-sales service	2012
Li and Sun	Identification of services items, using the concept QFD	Quality improvement of power electric services and thus customers' satisfaction as an applicable model	2012
Jian	Opportunity identification through QFD application networks in hope of converting customers' demands and needs into training regulations	Customers' needs and requirements were evaluated and classified and then the training regulations were used based on the house quality method	2009
Nader	The application of the QFD model in improvement of quality of services and increasing customers' satisfaction in Banking	Prioritizing customers' requirements and technical features to improve performance and enhance overall customers' satisfaction	2009
Abdul <i>et al.</i> ,	QFD approach to improve the quality of banking services	Identifying and setting the weight of expectations and demands of customers and ultimately improving the quality of customer service approach developed by the Bank, as well as operational guidelines for the effective promotion of banking services and customers' satisfaction.	2005

MATERIALS AND METHODS

Methodology

The sample was taken from the current customers of the Saipa's agencies. The local survey was done at after sales service points with a face-to-face method in the agencies' local customers. The sample size was determined as 384 to represent the population (more than 10,000 customers annually), with a 95% confidence level and a 5% error margin. In terms of reliability analysis, Cronbach's alpha was found to be 0.94 for questionnaire that was deemed adequate.

Since the proposed model in the research is related to after-sales services in automotive industry in Iran, the case study will be used. To obtain comprehensive information structure in this research, we are seeking to test the following hypotheses:

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H₁: Customers' needs have significantly effect on improvement of after-sales-services quality.

H₂: Design requirements have significantly effect on improvement of after-sales-services quality.

H₃: Quality characteristics of tools have significantly effect on improvement of after-sales-services quality.

H₄: Key operational processes have significantly effect on improvement of after-sales-services quality.

H₅: Production requirements have significantly effect on improvement of after-sales-services quality.

RESULTS AND DISCUSSION

Analysis of the Findings

Pearson correlation coefficient was used in order to test the research's hypotheses. As shown in table3, hypotheses are associated with significance level less than 0.05.

Table 4: Results of Hypotheses Tests

Hypothesis	Variable	r	R ²	Sig.	Result
1	Customer's needs and after-sales services quality improvement	.32	.10	.000	accepted
2	Design requirements and after-sales-services quality improvement	.39	.15	.000	accepted
3	Qualitative characteristics of tools and after-sales-services quality improvement	.46	.21	.000	accepted
4	All operational processes and after-sales-service quality improvement	.38	.14	.000	accepted
5	Production requirements and after-sales-service quality improvement	.41	.17	.000	accepted

Results Obtained from QFD Implementation are as Follow:

1) Analysis of Customers' Needs and Expectations:

Within the research, the useful features to improve the quality of after-sales services, in other words, customers' needs and expectations were identified and then prioritized according to the absolute weight of QFD model. The first top twenty two factors are as follow:

1)Staff's behavior, 2) decent capacity to receive the automobiles in the representative ,3)representative's vehicle acceptance and troubleshooting speed,4) staff's willingness to listen and record the customers' requests,5)repair quality,6) protecting inside-the-vehicle properties of the person,7)providing customers with the required spare tools,8) sufficient number of highly-skilled employees,9)willingness to pay the received money back if one is not satisfied with the repair,10)quality of the changed tools,11) in time delivery of the repaired car,12)clean appearance of the repair garage,13)costs and expenditure,14)getting the car from home and delivering it to the repair garage,15)intact cars' physical appearance,16)24 hours reception availability,17)existence of an ATM machine,18) on phone consulting availability before taking the car to the repair garage,19) providing the customers with cold water and decent chairs,20) providing customers with enough information to use the cars,21) staff's proper uniform,22) and enough car park space.

2) Analysis of the Characteristics of Services

After consulting the professionals and experts in the field of after-sales services and QFD team, technical requirements to achieve the expectations and demands were prepared according to the customers' requirements and the total weight of QFD model and then prioritized, determining the following as the first top sixteen factors: 1) Adequate and effective recruitment, 2) staff training, adoption of strategies and administrative requirements, 3) accurate customers guide, 4) supplier evaluation and using parts from reputable suppliers, 5) eliminated or reduced service fee, 6) systematizing the applications registration and objections, 7) making the received services certificated, 8) enough place to park the car, 9) having a

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system to give turn to the customers, 10) creating enough space in the representative, 11) telephone or textual communication after repairs, 12) regular cleaning of the representative, 13) existence of an ATM machine, 14) installation of information brochures panels, 15) providing a unified staff uniforms, 16) there are cold water facilities and decent chairs.

3) Analysis of the key parameters of the process

After identifying the key parameters of the process, these demands were prioritized based on the absolute weight calculations of QFD, determining the first top ones as follow: 1) decent representative space according to the standards, 2) trouble diagnosis systems and providing practical solutions to promote the improvement of existing systems, 3) promoting cooperation and motivation, 4) staff preparation, 5) creating mechanisms in hope of representatives' needs assessment and evaluation, 6) quick and appropriate response to customers' complaints and suggestions, 7) creating a requests management system, 8) identifying potential suppliers to improve, 9) monitoring and supervising the performance of suppliers, 10) establishing a laboratory in the field of Metrology and calibration, 11) electrical, mechanical and metallurgical, and polymer chemistry.

4) Analysis the Result of Operational Requirements

After verifying the operational requirements, the demands are prioritized according to the absolute weight calculations of QFD, determining the first top ones as follow: 1) preparation of after-sales-services-related standards according to the latest international standards, 2) providing operators' training requirements, 3) preparation of procedures and work instructions, 4) updating the information of the reputable suppliers, 5) evaluation and rating the after-sales-services representatives, 6) increasing the number of computer terminals for managing and responding to requests, 7) suppliers training, 8) providing technical and operational specifications of parts and equipment, 9) laboratory setting, 10) mapping components, tools, equipment, and materials.

Conclusion

According to the findings, we can say that all of the hypotheses are accepted. In other words, it can be claimed that the independent variables (customers' needs, design requirements, tools' quality characteristics, key operational processes, production requirements) of QFD process are related to the dependent ones (after-sales-services quality improvement) directly and positively. On the other hands, considering the study of customers' demands, service features, key process parameters, and their conversion into the practical requirements with the use of the table of the house, the results show that the consistent application of QFD method in this study has put the four priority areas for immediate attention as follow: 1) preparation of after-sales-services-related standards according to the latest international standards 2) providing operators' training requirements 3) preparation of procedures and work instructions (maintenance and repair, evaluation, equipment control, etc.) 4) updating the information of reputable suppliers. It seems that the translated practical requirements are the solution to provide high quality operational services and programs in after-sales-services representatives.

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