



# Analysis of Web Browser Design Improvements based on Customer Voice using Quality Function Deployment

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**Abstract.** In the contemporary world, science and technology play a pivotal role in facilitating and enhancing product development quality, encompassing the phases of conceptualization, design, and even manufacturing. Furthermore, the development of a product necessitates consideration of evolving consumer preferences, competitive pressures, and the imperative to augment revenue streams. This research endeavors to discern and assess the tools employed in the product development process and their alternatives. Employing Quality Function Deployment (QFD), this study delineates product attributes predicated on customer demands, business performance, market trends, technical aspects, procedural requisites, and quality assurance processes. A quantitative research methodology was adopted to conduct this investigation. The application of QFD will elucidate the product characteristics that resonate with customer interests. The House of Quality (HOQ) translates these attributes into technical criteria. The aspirations and desires of consumers and prospective users must be taken into account when conceiving a product to ensure its desirability and profitability.

**Keywords:** Web Browser, Product, QFD, HOQ.

## 1 Introduction

Products play a pivotal role in the realm of business, constituting a pressing concern[1, 2]. They are meticulously crafted commodities designed to facilitate economic activity. The adaptability of products to the ever-evolving tastes and preferences of the market, consumers, and prospective users is paramount for their successful realization[3, 4]. The creation of a product is a multifaceted endeavor, far from a straightforward task[5]. Consideration of the aforementioned requisites is integral throughout the phases of design, development, and manufacturing. Invariably, there exist products that languish in the market, failing to gain traction and eventually ceasing production, while others flourish, enduring and evolving through successive iterations. Such contrasting outcomes are commonplace.

Among the array of digital and virtual goods prevailing in today's digital landscape, the "Web Browser" product serves as a quintessential example. Distinct from tangible entities that can be physically manipulated, these digital and virtual goods continue to be relevant and confer tangible benefits. In contemporary times, a web browser

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represents an indispensable digital commodity for countless internet users as they navigate the virtual expanse of the internet. Beyond aesthetic considerations, the widespread acceptance and utility of a web browser hinge on its ability to align with user expectations. Nonetheless, many web browsers fall by the wayside, either abandoned or never adopted. Empirical data underscores the ascendancy of Google Search over Yahoo Messenger, the dominance of Chrome over Mozilla Firefox, and the emergence of Microsoft Edge. The "web browser" e-commerce domain further witnesses fierce competition among entities like Bukalapak, Tokopedia, Shopee, Bhinneka, and others.

It is imperative to underscore the perpetual nature of the enhancement process in order to effectively cater to the demands of users and the dynamic marketplace. To endure, thrive, and secure the unwavering allegiance of users, a product must continually evolve, striking a delicate equilibrium between user needs and market dynamics. An arsenal of methodologies, including Quality Function Deployment (QFD), Servqual, and Quality Control Circle (QCC), can be enlisted to augment the research process and elevate the quality of a product[6–8]. This study opts for the QFD (Quality Function Deployment) framework due to its succinct alignment with the envisaged digital products, specifically web browsers designed primarily for digital use[9, 10]. In its pursuit to enhance the quality of "web browser" products through the QFD approach, this research aspires to unveil the characteristics underpinning the design quality process, particularly in the context of digital web browser products.

## **2 Material and Method**

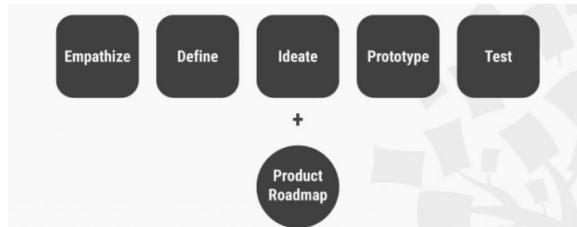
### **2.1 Product Design**

The process of product design entails several critical steps, including the identification of market opportunities, the precise definition of the problem at hand, the creation of optimal solutions, and the validation of these solutions through user engagement. Understanding the end-user, the individual for whom the product is being developed, is paramount to the success of the product design process. Product designers strive to address genuine issues faced by real individuals by combining empathy with a deep comprehension of their customers' routines, behaviors, frustrations, needs, and desires. The field of product design can be both challenging and demanding, often correlating higher compensation with greater responsibility and specialized expertise. Renowned designers and consultants can offer viable alternatives to ill-advised, barrier-inducing business strategies, such as User Experience (UX) local maxims.

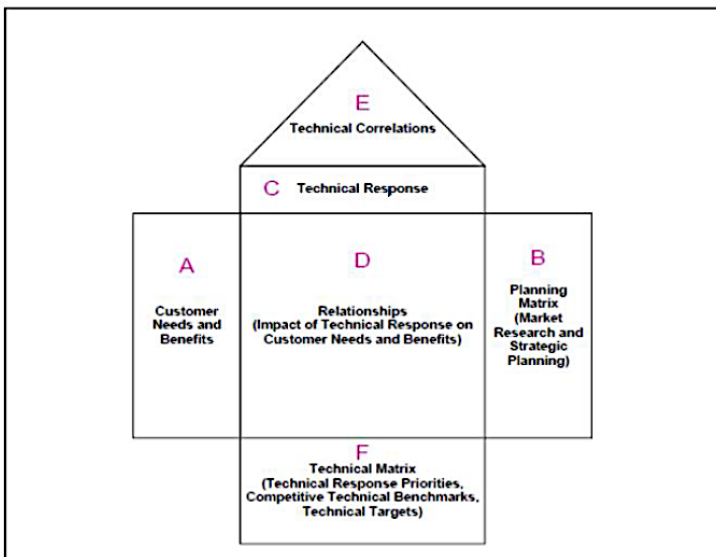
### **2.2 Quality Function Deployment (QFD)**

Quality Function Deployment (QFD), a concept originating from the practices of Japanese industry, was initially introduced by Yoji Akao, a professor of management engineering at Tamagawa University[11]. The Mitsubishi Company pioneered QFD at the Kobe Shipyard in 1972, with Toyota adopting it in 1978, followed by other enterprises in subsequent years. The primary objective of QFD is to involve

customers as early as possible in the product development process, under the premise that even a flawless product may not satisfy buyers. As previously mentioned regarding quality, superior or perfect products do not always align with consumer needs[12].



**Fig. 1.** The Steps of Product Design Based on Customers Voice



**Fig. 2.** House of Quality

Using the QFD technique, businesses can anticipate and prioritize customer requirements and desires while incorporating these needs and wants into the goods and services they provide[13, 14]. The QFD process comprises four stages: Product Planning (House of Quality), Design Deployment, Manufacturing Planning, and Production Planning[15]. These stages encompass the collection of the Voice of Customer, the preparation of a quality house (House of Quality), and the subsequent analysis and implementation phase. Each of these stages can be treated as individual projects, with initial planning and preparation.

### **1. Collection of Voice of Customers (Voice of Customer)**

This phase involves conducting surveys to gather customer feedback, which demands both time and attentive listening. Customer feedback must be articulated as attributes of a product or service for the QFD process [16, 17]. These attributes or requirements represent potential benefits that customers could derive from the product or service. Each attribute includes quantitative information regarding its relative importance to customers and how well similar products perform in terms of customer satisfaction based on that attribute. Typically, the numerical data associated with these aspects is referred to as quantitative data, while the attributes themselves are considered qualitative customer data.

### **2. Developing a House of Quality**

The creation of a product planning matrix, commonly referred to as the House of Quality (depicted in Figure 1 and 2), serves as the initial step in implementing the Quality Function Deployment approach for designing products and services.

### **3. Conjoint Analysis**

Conjoint Analysis, a multivariate analytical technique established in the 17th century, enables the determination of the most preferred combination or composition of product attributes—both existing and new—according to consumer preferences. This study involves soliciting customer evaluations of attribute trade-offs. It seeks to answer questions such as: How much of a customer's preference for one attribute is willing to be sacrificed for another? Conversely, if customers consider relinquishing one attribute in exchange for another, which attribute takes precedence? Conjoint analysis subsequently provides a numerical assessment of the utility and relative significance of each attribute in relation to others. This is achieved through customer choices or psychological factors. These values can then inform the selection of product features.

## **3 The Result**

### **3.1 Data Collection and Quality Assessment**

The study concentrated on the evaluation of Web Browser products employed in e-commerce. Data collection for the quality assessment was carried out in conjunction with previous research on UI, UX, and Usability within online e-commerce assessments. A total of 200 questionnaires were distributed to respondents, and 194 completed questionnaires were collected for analysis. The study employed an updated e-Servqual technique encompassing 10 quality dimensions to gauge the extent of e-commerce service quality. These dimensions are as follows:

1. Efficiency: Ease and speed of site access.
2. Fulfillment: Ability to complete all types of transactions as expected.
3. System Availability: Smooth functioning of all technical features.
4. Reliability: Assurance of system reliability and capability.

5. Web Design: Aesthetic aspects and design of the web, including menus and tools.
6. Privacy: Provision of confidentiality and comprehensive guarantees for personal data.
7. Security: Assurance of data security, transaction integrity, and protection against forgery and fraud.
8. Responsiveness: Prompt responses on the website.
9. Compensation: Level of compensation offered to customers in case of issues.
10. Contact: Availability of customer service via telephone or online support representatives.

Using the four service quadrants of the Importance-Performance Analysis (IPA) technique, the study aimed to identify areas in which service improvement is warranted from the customers' perspective. These quadrants are defined as follows:

- Quadrant I: Maintain current standards.
- Quadrant II: Focus on improvement efforts.
- Quadrant III: Low-priority areas.
- Quadrant IV: Potential areas of excessive investment.

**Table 1.** Gap Value of e-Servqual Quality Attributes based on user perceptions and expectations.

Dimension	Attribute	Expectation Value	Perception Value	Gap	
	Efficiency	5	4,07	3,73	-0,34
	Fulfillment	3	3,97	3,67	-0,30
	System Availability	4	4,20	4,03	-0,17
	Reliability	6	4,20	3,97	-0,23
	Web Design	5	4,17	3,83	-034
	Privacy	4	3,67	3,53	-0,14
	Security	5	3,83	3,57	-0,26
	Responsiveness	4	4,00	3,53	-0,47
	Compensation	2	3,87	3,43	-0,44
	Contact	2	4,13	4,00	-0,13

### 3.2 Quality Enhancement through QFD

Quality Function Deployment (QFD) was employed as a method to enhance the quality of e-commerce services[18]. QFD serves as a tool to translate customer feedback into product and service improvements through a structured sequence of activities. In this study, the House of Quality (HOQ) QFD matrix was utilized as a design framework for enhancing the quality of e-commerce services[19–21].

### 3.3 Service Quality Evaluation

Based on the computation of gap values for each quality attribute, the Modified e-Servqual Method was employed to assess service quality. Notably, all attribute gap values were negative, indicating a deficiency in the quality of e-commerce services.

## 4 Discussion

The study utilized the webqual approach to analyze data pertaining to 10 product quality parameters for a web browser. The results, as presented in Table 1, indicate that consumers have provided positive evaluations for UI and UX, with average perceived values exceeding 3.0. However, it is noteworthy that virtually all current quality criteria for web browser products exhibit a negative difference from the expected or anticipated values. This suggests that while the predicted values for Servqual parameters are high and surpass actual field values, the practical performance of the product in the field remains satisfactory.

Among the dimensions, responsiveness and compensation exhibit the largest disparities, with values of -0.47 and -0.44, respectively. These findings underscore the need for significant improvements or enhancements in these two dimensions. Swift and accurate responses to user requests or commands on web browser features and menus may be the key areas for enhancement, alongside faster order processing times to address compensation-related issues.

## 5 Conclusion

In conclusion, this study has shed light on the critical aspects of enhancing web browser products based on customer feedback. The evaluation of ten distinct factors, each with its own set of attributes, has revealed significant gaps between customer expectations and the actual performance of e-commerce services. The findings underscore the urgent need for improvement in areas such as responsiveness and compensation, where disparities were most pronounced.

Moving forward, it is imperative for businesses operating in the e-commerce sector to address these shortcomings systematically. Employing methodologies like Quality Function Deployment (QFD) and Importance-Performance Analysis (IPA) can provide valuable insights and serve as effective tools for prioritizing enhancements.

The gap analysis conducted in this study serves as a valuable benchmark for future endeavors aimed at elevating the quality of e-commerce services. By heeding the voice of the customer and aligning product design and service delivery accordingly, businesses can bridge these gaps and ultimately offer a more satisfactory online shopping experience. As the digital landscape continues to evolve, continual improvement will be instrumental in ensuring the continued success and competitiveness of e-commerce platforms.

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