

DOKUZ EYLUL UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION
BUSINESS ADMINISTRATION PROGRAM
DOCTORAL THESIS
Doctor of Philosophy (PhD)

**DETERMINING CUSTOMER NEEDS AND
FUNCTIONAL REQUIREMENTS OF WEBSITES FOR
THE SECONDARY PACKAGING MACHINERY
MANUFACTURERS**

Çağın ARMAĞAN

Supervisor

Asst. Prof. Dr. Ferkan KAPLANSEREN

İZMİR – 2022

THESIS APPROVAL PAGE



DECLARATION

I hereby declare that this doctoral's thesis titled as “**Determining Customer Needs and Functional Requirements of Websites for the Secondary Packaging Machinery Manufacturers**” has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these with my honor.

17/07/2022

Çağın ARMAĞAN

ABSTRACT

Doctorate Thesis

Determining Customer Needs And Functional Requirements Of Websites For The Secondary Packaging Machinery Manufacturers

Çağın ARMAĞAN

Dokuz Eylul University

Social Science Institute

Department of Business Administration

Doctorate of Business Administration

The interaction between manufacturers of secondary packaging machines and their customers is changing with the digitalization of business processes. Well-defined and designed websites enable this interaction for production, presentation and exchange of information more effectively. Websites that are oriented towards the needs of customers play a crucial role in managing digital business processes.

The aim of this thesis is to design an efficient website for manufacturers of secondary packaging machines and to identify the needs and functional requirements of customers in order to improve service quality. For this purpose, in-depth interviews are conducted with company owners, purchasing and production employees of manufacturers and surveys are conducted among the participants and visitors of the international packaging trade fairs. Subsequently, the customer needs and functional requirements are determined with the Blitz Quality Function Deployment (QFD) and the order of importance of the customer needs is revealed with the Analytical Hierarchy Process (AHP). A prototype website is then developed that meets these customer needs.

The results show that "Communication", "Content" with the other antecedents "Accurate Information" and "Up-to-date Information" are the most important customer needs for the design quality of secondary packaging machinery manufacturers' websites. The websites that address these needs will

improve the interaction between manufacturers and customers to ensure that digital business processes are executed effectively.

Keywords: Blitz QFD, Packaging Machinery Website, Customer Needs



ÖZET

Doktora Tezi

İkincil Ambalaj Makineleri İmalatçıları Websiteleri için Müşteri İhtiyaçları ve Fonksiyonel Gereksinimlerinin Belirlenmesi

Çağan ARMAĞAN

Dokuz Eylül Üniversitesi

Sosyal Bilimler Enstitüsü

İngilizce İşletme Anabilim Dalı

İngilizce İşletme Yönetimi Doktora Programı

İkincil ambalaj makineleri imalatçılarının müşterileri ile etkileşimleri, dijitalleşen iş süreçlerine bağlı olarak değişmektedir. İyi tanımlanmış ve tasarlanmış web siteleri, bu etkileşimde ihtiyaç duyulan bilginin üretilmesini, sunulmasını ve paylaşılmasını daha etkin hale getirmektedir. Müşteri ihtiyaçlarına odaklanarak hazırlanan web siteleri, dijital iş süreçlerinin yönetilmesinde kolaylaştırıcı bir rol oynamaktadır.

Bu tezin amacı, ikincil paketleme makinesi imalatçı websitelerinin etkin bir şekilde tasarlanması ve hizmet kalitelerinin artırılabilmesi için müşteri ihtiyaçları ile fonksiyonel gereksinimlerinin belirlenmesidir. Bu çalışmanın gerçekleştirilebilmesi için ikincil ambalaj makineleri imalatçı firmalarının firma sahipleri, satın alma çalışanları ve üretim personeli ile derinlemesine görüşmeler yapılmış ve uluslararası ambalaj fuarları katılımcıları ve ziyaretçileri ile anketler yapılmıştır. Blitz Kalite Fonksiyon Göçerimi (KFG) ile sektördeki müşteri ihtiyaçları ve fonksiyonel gereksinimleri belirlenmiş ve analitik hiyerarşi süreci ile müşteri ihtiyaçları önem sırası belirlenmiştir. Sonuç olarak, amaca yönelik müşteri ihtiyaçlarının karşılandığı web site prototipi hazırlanmıştır.

Bu çalışma, iletişim, içerik, doğru ve güncel bilgi faktörlerinin ikincil paketleme makinesi imalatçı web sitelerinin tasarım kalitesinde öne çıkan müşteri ihtiyaçları olduğunu göstermiştir. Bu ihtiyaçları gözönünde bulunduran web siteleri imalatçı ve müşteri etkileşimini artırarak dijital iş süreçlerinin etkin şekilde yürütülmesini sağlayacaktır.

Anahtar Kelimeler: Blitz KFG, Ambalaj Makineleri Web sitesi, Müşteri İhtiyaçları



**DETERMINING CUSTOMER NEEDS AND FUNCTIONAL
REQUIREMENTS OF WEBSITES FOR THE SECONDARY PACKAGING
MACHINERY MANUFACTURERS**

CONTENTS

THESIS APPROVAL PAGE	ii
DECLARATION	iii
ABSTRACT	iv
ÖZET	vi
ABBREVIATIONS	xi
LIST OF TABLES	xiii
LIST OF FIGURES	xvi
INTRODUCTION	1

CHAPTER ONE

OVERVIEW OF PACKAGING AND PACKAGING MACHINERY

1.1. PACKAGING INDUSTRY	4
1.1.1. History of Packaging	4
1.1.2. Packaging Materials	7
1.1.3. Benefits of Packaging	9
1.1.4. The Packaging Types	11
1.1.4.1. Primary Packaging	12
1.1.4.2. Secondary Packaging	13
1.1.4.3. Tertiary Packaging	14
1.1.5. Packaging Functions	14
1.1.5.1. Logistical Function	15
1.2. THE PACKAGING MACHINERY INDUSTRY	17
1.2.1. Principles of Packaging Machinery Industry	17
1.2.2. Advantages and Disadvantages of Packaging Machinery	19
1.2.3. Family of Machines	21

CHAPTER TWO

QFD AND WEBSITE DESIGN

2.1.FUNDAMENTALS OF QFD	24
2.1.1. Definition & Scope of QFD	25
2.1.2. History of QFD	28
2.1.3. Benefits & Limitations of QFD	31
2.1.4. The 7 QFD Management and Planning Tools	33
2.2. WEBSITE DESIGN FOR PACKAGING MACHINERY INDUSTRY	35
2.2.1. The Evolution of E-Commerce and Website Design	35
2.2.2. Fundamentals of Website Design	36
2.2.3. Website Classification	37
2.3. QFD STUDIES ON E-COMMERCE	38

CHAPTER THREE

RESEARCH METHODOLOGY FOR SECONDARY PACKAGING MACHINERY WEBSITE DEVELOPMENT

3.1. STUDY	42
3.1.1. Objectives Of The Study	42
3.1.2. Data Sampling	43
3.1.3. Data Collection Method	44
3.1.4. Data Analysis	46
3.1.5. Limitations	54
3.2. RESULTS OF THE QFD ANALYSIS	54
3.2.1. Level 1: Identify The Goal Stage	54
3.2.1.1. Project Goal	54
3.2.1.2. Customer Segment	57
3.2.2. Level 2: Research Stage	59
3.2.2.1. Semi-structured Interviews	59
3.2.2.2. Go to Gemba	65
3.2.2.3. Depth Interviews	70

3.2.2.4. Results: Demographics of the Participants	72
3.2.3. Level 3: Situation Analysis Stage	75
3.2.3.1. Customer Process Model	76
3.2.3.2. Customer Voice Table	77
3.2.3.3. Customer Context Table	86
3.2.3.4. Affinity Diagram	87
3.2.4. Level 4: Goal Analysis Stage	89
3.2.4.1. Analytical Hierarchy Process	89
3.2.4.2. Maximum Value Table of QFD	96
3.2.4.3. Quality Planning Table	105
3.2.4.4. Customer Need – Functional Requirement Matrix (Modern House of Quality)	107
3.2.4.5. Design Planning Table	109
3.2.5. Level 5: Explain Stage	110
3.2.5.1. Website Design with Customer Needs and Functional Requirements	110
3.2.5.2. Cost Analysis	115

CHAPTER FOUR

PROTOTYPE OF SECONDARY PACKAGING MACHINERY WEBSITE

4.1. GENERAL WEBSITE DESIGN FOR SECONDARY PACKAGING MACHINERY	118
4.2. PROTOTYPE WEBSITE ANALYTICS AND A COMPARISON	125
CONCLUSION	135
BIBLIOGRAPHY	137

ABBREVIATIONS

AHP	Analytical Hierarchy Process
API	Application Program Interface
B2B	Business to Business
B2C	Business to Customer
CAGR	Compound Annual Growth
CCT	Customer Context Table
CE	European Conformity
CN	Customer Needs
CVT	Customer Voice Table
CQFD	Continuous Quality Function Deployment
Dpi	Dots per inch
DFD	Data Flow Diagram
DPT	Design Planning Table
EC	Electronic Commerce
EPS	Expanded Polystyrene
E-SQ	Electronic Service Quality
eQ	Electronic Quality
FR	Functional Requirements
GPMT	Global Packaging Machinery Trends
HCI	Human-Computer Interface
HD	High Definition
HDPE	High Density Polyethylene
HIPS	High Impact Polystyrene
HoQ	House of Quality
IS	Information Systems
IT	Information Technology
KFG	Kalite Fonksiyon Göçerimi
LDPE	Low-Density Polyethylene
LLDPE	Linear Low-Density Polyethylene
MMP	Minimally Merchandisable Product

MVP	Minimally Viable Product
MVT	Maximum Value Table
OECD	Organization for Economic Co-operation and Development
PDPC	Process Decision Program Chart
PE	Polyethylene
PET	Polyethylene Terephthalate
PETG	Polyethylene Terephthalate Glycol
PM	Packaging Machinery
PMA	Packaging Manufacturers Association
POF	Polyolefin
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl Chloride
PVdC	Polyvinylidene Chloride
QFD	Quality Function Deployment
QPT	Quality Planning Table
RSS	Really Simple Syndication
R&D	Research and Development
SEO	Search Engine Optimization
SSL	Secure Sockets Layer
SPM	Secondary Packaging Machinery
TRIZ	Theory of Inventive Problem Solving
TUIK	Turkish Statistical Institute
TQM	Total Quality Management
VoC	Voice of Customer
VR	Virtual Reality
WebQ	Website Service Quality
WWW	World Wide Web

LIST OF TABLES

Table 1: Applications of Plastics	p. 9
Table 2: Definition of Packaging Types	p. 11
Table 3: Overview of Packaging Functions	p. 15
Table 4: Advantages of Packaging Machinery	p. 20
Table 5: Disadvantages of Packaging Machinery	p. 21
Table 6: Packaging Types of Machines	p. 22
Table 7: Family of Machines	p. 22
Table 8: ISO 16355 Compliance	p. 31
Table 9: Classical QFD vs Modern QFD	p. 31
Table 10: Website Quality Dimensions	p. 39
Table 11: Data Collection	p. 45
Table 12: Data Analysis	p. 47
Table 13: Maximum Value Table	p. 51
Table 14: The Measurement Used in Kano Survey	p. 52
Table 15: Project Goal Table	p. 55
Table 16: Customer Segment Table	p. 58
Table 17: Packaging Company Profil	p. 60
Table 18: Profile of Interviewees	p. 61
Table 19: Age Categories	p. 61
Table 20: Education Levels	p. 62
Table 21: Determining Questions and Dimensions After Interviews	p. 62
Table 22: Dimension Content Analysis	p. 64
Table 23: Example of Gemba Visit Log	p. 66
Table 24: Example of Gemba Visit Table	p. 67
Table 25: Customer List of Gemba Visits	p. 67
Table 26: Customer Profiles of Gemba Visits	p. 69
Table 27: Observations	p. 70
Table 28: Depth Interviews	p. 71
Table 29: Company Profile	p. 72
Table 30: Manufacturer Company Interviewees' Profiles	p. 73

Table 31: Job Titles	p. 74
Table 32: Gender Categories	p. 74
Table 33: Age Categories	p. 74
Table 34: Education Levels	p. 74
Table 35: Experience Levels	p. 75
Table 36: Content Analysis	p. 85
Table 37: Customer Context Table	p. 86
Table 38: Customer Needs Affinity Diagram	p. 88
Table 39: Example of Scale Conversion	p. 91
Table 40: Pairwise Evaluation of Respondent 17 and 18 in Survey Scale	p. 92
Table 41: Pairwise Evaluation of Respondent 17 and 18 in Original Scale	p. 93
Table 42: Inconsistency Rate and Accurate Ratio-scale Priorities	p. 93
Table 43: Customer Needs Hierarchy Diagram with Priorities (Website Content)	p.94
Table 44: Customer Needs Hierarchy Diagram with Priorities (Communication)	p.95
Table 45: Customer Needs Hierarchy Diagram with Priorities (Usage)	p. 95
Table 46: QFD Customer Needs Priority	p. 96
Table 47: MVT in the order of Importance	p. 97
Table 48: Website Design Modules and Tasks of MVT	p. 98
Table 49: Quality Planning Table	p.106
Table 50: Customer Need – Functional Requirement Matrix	p.108
Table 51: Design Planning Table	p.109
Table 52: List of Assumptions and their Explanation	p.115
Table 53: Costs of the Project	p.116
Table 54: General Criterias for a Secondary Packaging Machine Website	p.119
Table 55: Website Substructure Design Criteria for SPM Website	p.123
Table 56: CNs and Website Design Modules	p.124
Table 57: Website X and Competitor Website Z Visitor Insights	p.126
Table 58: Visitor Information of the Company X/Z	p.127
Table 59: Visitor Locations of the Company X and Z	p.128
Table 60: Visitor Change of the Website after Prototype	p.129
Table 61: Device Category	p.129
Table 62: Operating System	p.130

Table 63: Browsers	p.131
Table 64: Website Visit Time Interval	p.131
Table 65: Screen Resolution	p.132
Table 66: Page Visits	p.132
Table 67: Visitor Acquisition Channel	p.133



LIST OF FIGURES

Figure 1: History of Packaging	p . 6
Figure 2: The Levels of Packaging System	p. 12
Figure 3: Delivery Ecosystem for Products	p. 15
Figure 4: What is the QFD Problem?	p. 26
Figure 5: What is the QFD solution?	p. 27
Figure 6: A Design Approach to Quality	p. 28
Figure 7: Development of QFD	p. 29
Figure 8: Classifications of Global Websites	p. 37
Figure 9: Fishbone Diagram of PG	p. 56
Figure 10: Semantic and Situation Analysis	p. 65
Figure 11: Customer Process Model	p. 76
Figure 12: Live Chat Design	p.111
Figure 13: Machine Park Simulation on Solidworks	p.112
Figure 14: Shout-out Example as an Up-to-date Information	p.113
Figure 15: Mobile Website Overview	p.114
Figure 16: Representation of the Each Cost Component Over the Total Cost	p.117
Figure 17: Mainpage	p.119
Figure 18: Colors and Backgrounds	p.120
Figure 19: Typography	p.120
Figure 20: Product Page	p.121
Figure 21: Advance Search Tool	p.122
Figure 22: Product Categorization	p.122
Figure 23: Visitors of the Company X	p.127
Figure 24: Customer's Website Visit Tree	p.133

INTRODUCTION

Technological developments in the 2000s have led to transform the packaging machinery industry and sector company's organizational departments such as accounting, finance, sales, production, human resources, management, and marketing. Because internet business has no time or geographic restrictions (Kuo and Cheng-Wu, 2009: 253). In the 2020s, the sectoral technology approach of companies is becoming a primary interest instead of the general technology vision for sustainable growth. According to Levitt (1960: 45), sustainable growth depends on comprehensively defining the business and carefully identifying customers' needs. Therefore, the design of a packaging company's website was critical to transforming traditional business processes into digital ones in the context of changing customer needs.

The packaging history began with natural materials such as leaves or epoxy resin from trees in Egypt. It is estimated that packaging made of glass and wood was used as early as 5000 years ago in Mesopotamia and Egypt (Twede, 2012: 257). However, packaging machines were invented after the II. world war connected with the demands of mass production, which began in the USA in 1974 with the barcode and barcode readers. Soon after, in 1979, an English inventor, Michael Aldrich, developed the idea of online shopping with teleshopping. The PM sector interacts with e-commerce, especially the marketing and sales side on digital conversion websites. While studies in various sectors show that companies should consider website design, the packaging machinery (PM) sector focused on production and patents.

Among these developments, secondary packaging machinery has a rapid growth rate of approximately 5% in the next ten years (GVR, 2021). The customer's expectations of a packaging company's website have not yet been described in the literature. In this case, most packaging companies rely on external support as they lack the salient principles of the digital world. Packaging machinery website designs are usually created with contracts in digital marketing consultancies. The packaging companys' marketing and sales activities on electronic platforms are mainly based on general website design criteria. The primary purpose of website-based digital transformation is to increase the service quality with an effective website design is a regular aim of the thesis. These are the questions that need to be answered to achieve

this goal. (Q1): to explore and determine customers' needs for secondary packaging machine (SPM) manufacturers' websites, (Q2): to identify Functional Requirements for SPM manufacturers' websites, and (Q3): to design a website that meets customers' needs and functional requirements.

A kind of unique prototype for the secondary packaging machinery manufacturers was developed in this thesis by using the Blitz QFD. Trust is a fundamental concept in the web service quality literature and a topic that has been repeatedly addressed in the internet business. Therefore, Researchers have focused on the quality of e-services and their impact on attitudes towards the website (Wolfenbarger and Gilly, 2003: 183). The functional and technical quality of e-services on internet shopping sites is one of the most critical factors determining user satisfaction (Chinomona and Sandada, 2014: 331).

The QFD is based on qualitative research through interviews and Gemba visits and is combined with a quantitative method to identify the most critical customer needs with AHP. It translates the spoken and unspoken customer requirements into the internal language of the company, its engineers, and designers (Barutcu, 2006: 44). There are few empirical studies over packaging machinery sector despite the increasing number of published research papers with QFD on company websites. Under the Quality Function Deployment (QFD) concept, it will be critical for website design to understand customer needs accurately, translate them into action, and consider technology and customer needs. In this sense, the QFD method offers a different perspective that focuses on a few critical customers needs to identify trust over the website.

The research methods were conducted in five stages: Pre-study with semi-structured interviews and surveys, the Blitz QFD methodology, cost analysis as downstream deployment, website analytics and a comparison to provide digital services. The research participants are sector leaders in the various manufacturing industries in Turkey's Aegean, Marmara, and Central Anatolia regions joint-stock companies, and limited liability companies, which account for the majority of Turkey's exports. Interviews were conducted to identify customer needs in order to determine functional requirements. First, experts were selected for semi-structured interviews, and customer expectations were determined without the order of importance. The

importance of these expectations was refined by applying the survey method to expert professionals at the Interpack exhibition. In this way, the survey provided the framework for the in-depth interviews. Then in-depth interviews are conducted with fifteen experts, twenty-four managers and employees, a total of ten experts, thirteen Gemba visits, and an observation report. The results are listed in order of importance by thirty professional staff in the sector using the AHP method. Finally, six experts conducted a KANO analysis of the results in one session with a focus group meeting, defined the functional requirements, and designed a prototype website. As Mizuno and Akao (1990: 65) describe, QFD analysis must be complemented by design and cost analysis for production in an accurate quality system. A cost analysis is conducted as a downstream application to understand the investment cost for the next ten years' projection. Finally, the web analytics of the prototype website is monitored and compared with those of competitors to understand the improvements. In addition, QFD is to be applied in teamwork, but the limited human and capital resources were a limitation for this work. Another limitation of the work is the geographical limitation of the study samples and interviewees.

This thesis is structured as five chapters: The first chapter reviews previous studies on packaging and packaging machines, and the second chapter defines electronic service quality and the Blitz QFD. The third chapter explains the research method, followed by the results and findings as fourth chapter. In the fifth chapter, the prototype website and a comparison are presented. Lastly, the conclusion and implications are explained.

CHAPTER ONE

OVERVIEW OF PACKAGING AND PACKAGING MACHINERY

A brief history of the packaging industry is explained in this chapter. Then, packaging materials are listed, primarily focused on plastic materials. Afterward, the packaging benefits are described, and packaging types are listed: primary, secondary, and tertiary packaging. This thesis mainly focuses on secondary packaging. Moreover, the chapter ends by listing packaging functions, where only the logistical function is explained in detail as a customer segment.

1.1. PACKAGING INDUSTRY

1.1.1. History of Packaging

According to the Science History Institute (2020), plastics are materials, either synthetic or naturally existing, that may be produced when soft and then hardened to get the given shape.

Plastic is the core material for the packaging market. The existence of humankind in the mother's womb and carriage of the baby for nine months is known as the first package in the history of humankind. From a different point of view, our body is the package of our soul during our lives. However, the packaging term is used commercially and academically in this thesis.

Packaging science is the art and technology of enclosing or protecting products for distribution, storage, sale, and use (Saghir, 2002: 38). Packaging can be explained as a coordinated system of preparing goods for transport, warehousing, logistics, sales, and end-use. In Soroka's research (as cited in Bledsoe and Rasco, 2018: 74), packaging provides protection, preservation, transportation, information, and sales. In many countries, it is fully included in government, business, institutional, industrial, and personal use.

Packaging history has begun with natural materials such as leaves or epoxy of trees, as shown in Figure 1. The first packages were natural materials available at the time: baskets of reeds, wineskins, wooden boxes, pottery vases, ceramic amphorae,

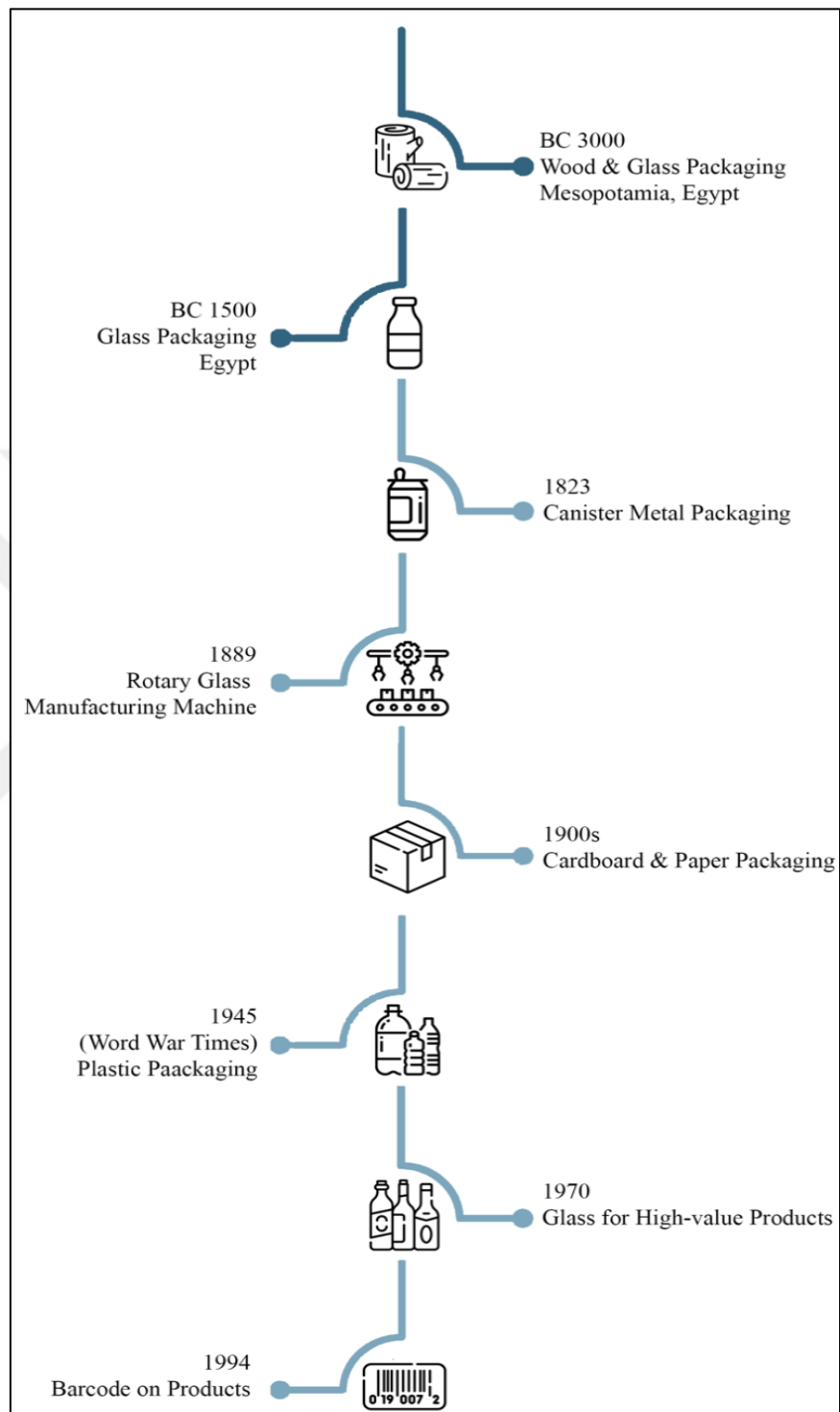
barrels, woven bags, etc. Mass production of the packaging products was later done with weaved materials and pots. Applied materials have been used to form packages: for instance, old glass and bronze vessels. It is estimated that glass and wood packages started being used 5000 years ago in Mesopotamia and Egypt (Twede, 2012: 257). The research of old packages is an essential aspect of archaeology.

According to the Packaging Manufacturer Association (PMA), glass packaging was first used in 1500 BC in Egypt. Glass material was first seen to be used as a pot, which was being mixed with melted limestone, soda, sand, silicate, and applied into glass packaging, around 1200 BC. The development of glass packaging was improved mainly by the "automated rotary glass manufacture machine" in 1889, in which most of the glass packaging was produced and patented (PMA, 2013). After the 1970s, glass packaging began to be used in high-value products' protection and has a wide range of usages today.

Peter Durand applied the patent for the first metal packaging made from sheet metal "canister" in 1823. However, paper and cardboard have become valuable packaging materials in the 1900s (PMA, 2013). Afterward, during World War 2, plastic materials serial production began with the war conditions, and plastic materials, such as polyethylene, became very easy to find on the market. In the following years, plastic has been developed as a cost-effective and environmentally friendly material with developing technology and production methods. Therefore, According to Grand View Research (2021) plastic materials has seized approximately 60% of the packaging market nowadays.

Packaging development in the 20th century included Bakelite closures on bottles, transparent cellophane overwraps, and panels on cartons. These inventions have increased the efficiency of processing and food safety. Several materials such as aluminum and several types of plastic were invented, and they were incorporated into packages to improve performance and functionality (Brody and Marsh, 1997: 28).

Figure 1: History of Packaging



Source: Adapted from PMA, 2013

For the modern era, as Morton (1994) explains:

A historic moment came at 08.01 am on 26 June 1974 when Clyde Dawson, director of research and development for Marsh Supermarkets, bought a 10-pack of Wrigley's Chewing Gum in his company's store in Troy, Ohio. The first purchase made in the first store to be fully equipped with scanners which could read the new Uniform Product Codes (UPC). The UPCs, or barcodes, the patterns of black and white lines painted on the packaging of the grocery industry in the United States, and a transformation brought about by the use of UPC" (p. 108).

As a result, the report notes a growing need to increase our understanding of adaptation strategies to encourage companies that are prepared to accommodate new conditions, including being prepared to withstand also respond to packaging and packaging machine markets that open a new modern era for packaging history. The modern era is moving forward with robotic technology and the integration of packaging machines for packaging lines.

1.1.2. Packaging Materials

According to All4pack (2016: 4), there are several core packaging materials for the packaging machinery sector, such as paper and board, wood, rigid plastics.

- **Paper and Board:** In recent years, paper and board packaging have been used chiefly in electronic commerce. E-commerce places emphasis on packaging to maximize the customer experience. Therefore, packaging in e-commerce needs to be simple to open and reseal.
- **Wood Packaging:** Wood packaging is mainly based on pallets and crates, primarily industrial packaging. Following the global logistics industry's maturing, the production of pallets has reached 73.6 million (11% increase compared to 2014), in which more than 91% of these pallets are being made from wood.
- **Rigid Plastics:** Rigid plastic is a highly protective material for products suitable for recycling. Rigid plastic packaging includes cups, bottles, pots and cans, and closures. Furthermore, it is a material that can be applied to any packaging-related application. In this sector, PET remains the leader for being lightweight.
- **Flexible Plastics:** According to the Flexible Packaging Association (2020), flexible packaging is any packet or part of a packet whose form can be readily changed.

Familiar examples of flexible packaging are bags and pouches, which are environmentally friendly.

According to the Flexible Packaging Association (2020) understanding, flexible packaging has some advantages compared to rigid plastics with its versatility, custom qualities, efficiency in conserving resources, and sustainability:

- Lightweight and straightforward to open, carry, store, and reseal
- Extend the shelf life of products, especially foods
- Less energy to manufacture and transport
- Less waste for pollution
- Innovation
- Widely extendible into diverse product categories
- Maintains and indicates freshness
- Offers consumer conveniences
- Provides reclosure and dispensing options
- Is easily transported and stored
- Creates shelf appeal
- Enables the visibility of contents
- Provides an efficient product to package ratios
- Uses low energy
- Creates fewer emissions
- Creates less waste in the First Place

As shown in Table 1, there are multiple types of raw materials such as PET, PVC, HDPE, PP, etc. They have different processing requirements as heat and various usage areas.

Table 1: Applications of Plastics

Plastic	Product Code (SPI)	Use	Heat (°C)	Source
Polietilen Tereftalat	PET	Drink bottles, detergent bottles, clear film for packaging, carpet fibers	70	Siddique et al, (2008: 1837)
Polyvinyl Chloride	PVC	Packaging for food, textile, medical materials, drink bottles	60	Zare (2017)
High Density Polyethylene	HDPE	Detergent bottles, mobile components, agricultural pipes, compost bins pallets, toys	50	Rahimi and Garcia (2017:2); Siddique et al, (2008: 1837)
Polypropylene	PP	Compost bins, strapping straps	80	Hopewell et al, (2009:2118); Siddique et al, (2008: 1837)
Low Density Polyethylene	LDPE	Bottle, plastic tubes, food packaging	40	Rahimi and Garcia (2017: 2); Achilias et. al, (2009: 451)
Others	OTHER	Containers		

Flexible packaging can be composed of film, plastic, paper, or foil. Some of the flexible packagings are full-body shrink band, PVC (Polyvinyl Chloride Film), PETG (Polyethylene Terephthalate Glycol) film, Polyolefin Shrink (POF) films. Herran and Wofford (1990) invented a flexible stretch/shrink film on 10/04/1987, patent number US4927708. They declare that a multi-layered thermoplastic polyolefin film having an improved combination of physical characteristics is disclosed. In particular, the multi-layered film evidences an improved combination of abuse resistance, elongation, and flexibility.

1.1.3. Benefits of Packaging

It is clear that packaging is the protector of the products. Packaging protects and covers the products from physical impacts such as hitting, wetting, and bruising. Packaging provides the products to reach the consumer in the most economical conditions possible and creates ease of storage (Dominic, 2011: 46).

It is important to note that packaging informs the customer of all the product's features, and it is the "tongue" of the product as silent marketing. Therefore, another critical role of packaging is to provide consumers the ease of choice and usage with

the information it holds. The weight, price, production date, use-by date, ingredients, name of the producer company, and usage details written on the package provide significant convenience to the seller and the consumer.

According to Bix et.al. (2004: 9), packaging has several objectives:

- **Physical Protection:** It offers three different types of protection: protection from human interaction, protection of the product from the biological environment, and protection from external influences.
- **Barrier Protection:** When packaging the products, a barrier against oxygen, water vapor, dust is generally required. Permeation is a critical factor in packaging design. Some packagings include desiccants oxygen absorbers to extend shelf life. Some food packages also have modified atmospheres or controlled atmospheres (Lee et.al., 2008: 418).
- **Containment or Agglomeration:** Small products are typically grouped in a package for storage and selling efficiency. For instance, a single box of 1,000 pencils requires less physical handling than 1,000 single pencils. Liquids, powders, and granule materials need containment.
- **Information Transmission:** Packages and labels indicate how the packaging or product is used, transported, recycled, or disposed. Some types of information are required in pharmaceuticals, food, medical and chemical products, and government legislation.
- **Marketing:** Packaging is one of the critical factors of the marketing mix. It is a silent seller for the products, communicating with the customer before and after the sale.
- **Security:** Packaging plays an essential role in decreasing the risks of product damage during their transportation. Besides, products may encounter burglary, confusion, and an interception during their travels. Radio Frequency Info (RFID) and inkjet coding systems prevent these problems. The integrated RFID technology can track the package up to the buyer and the end-user.
- **Convenience:** Packages can have attributes that add convenience in shipping, distribution, handling, stacking, display, sale, opening, reclosing, operating, dispensing, reusing, recycling, and ease of disposal.
- **Quantity control:** Single serving or single dosage packaging has an exact amount of content to control supply. Therefore, packaging also controls the inventory.

1.1.4. The Packaging Types

As seen in Table 2, packaging types may be classified as primary, secondary, or tertiary, reflecting the levels of packaging (Saghir, 2004: 7). Since this thesis is focused on packaging machines, it will be appropriate to classify the products that come into direct physical contact with the packaging and do not contact with the packaging. This idea's most suitable categorization method will be the primary and secondary packaging approach. Also, tertiary packaging will be categorized as another approach because of its use. Other approaches can be named transport packaging, transit packaging distribution channel packaging, etc.

Table 2: Definition of Packaging Types

Packaging Type	Definition
Primary packaging, consumer packaging or sales packaging	Packaging which is in contact with product. The packaging that the consumer usually takes home and sell the product silently.
Secondary packaging	Secondary packaging is designed to contain several primary packages
Tertiary packaging	Used when a number of primary or secondary packages assembled on a pallet or roll container.
Group packaging	Packaging which is conceived to facilitate protection, display, handling and/or transport of a number of primary packages
Transport packaging, industrial stabilization, or distribution packaging	Packaging which is conceived to facilitate handling, transport and storage of a number of primary packages in order to provide efficient production and distribution as well as prevent physical handling and transport damage
Display packaging	Same as group packaging, quite often with an emphasis on display features
Retail packaging	Same as group packaging with a special emphasis on the design to fit in retail
Used Packaging	Packaging/packaging material remaining after the removal of the product it contained

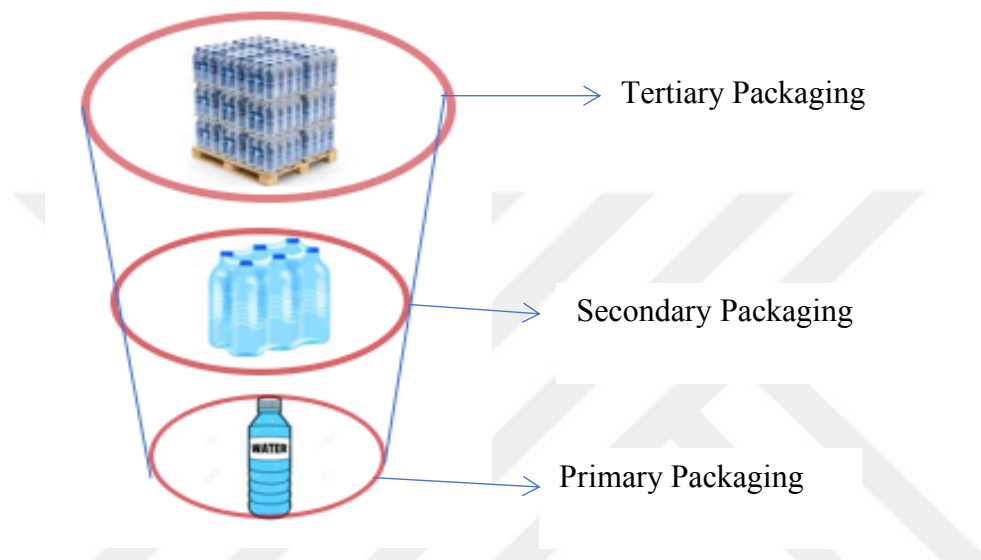
Source: Saghir, 2004: 7

- Primary packaging is the type that first envelops the product and holds it. This situation usually refers to the smallest unit of distribution or use and it is the package in direct touch with the contents.
- Secondary packaging is functionally separated from the primary packaging and may prevent pilferage or primary group packages.

- Tertiary or transit packaging is suitable for bulk packages, store storage, and delivery shipping. The most used form is a palletized unit load that packs into containers.

The packaging type approach provides us with an understanding of product interdependence, as shown in Figure 2.

Figure 2: The Levels of Packaging System



Source: Adapted from Saghir, 2004: 7

These categories sometimes can be arbitrary. For instance, depending on the use, a shrink wrap can be primary packaging when applied directly to the packaging product, secondary packaging when used to group smaller packages, or tertiary packaging when used to facilitate different types of distribution, such as to affix several cartons on a pallet.

1.1.4.1. Primary Packaging

Primary packaging is the latest part of packaging between the outcome and the end-user. It is like the wrapper on a package of biscuits or the bottle that holds the beverage. It means to remain on the package until the end-user obtains the product. The package is usually not withdrawn until ownership before the product is utilized. Other samples include the package around a batch of paper pins, the bottle that keeps medicine pills, etc.

Primary packaging explanations should emphasize both utility and appearance. The utility is essential because it may directly impact the end user's ability to use the product if the packaging is defective. In the issue of food products, users will always be forced to throw away products with inadequate primary packaging. In the case of non-perishable products, inadequate primary packaging can still result in the loss or damage of the product, affecting the user's ability to utilize the product.

If the primary packaging is inferior quality, it will undoubtedly and eventually affect the performance of the business. Clients are pushed to search the market to determine if the same product exists on the market without the loss or damage of the product, which is caused by insufficient primary packaging. For this reason, it is critical to make sure that primary packaging solutions include a quality requirement.

Aside from protecting the product until the end-user, primary packaging serves another significant role. Primary packages offer the most suitable spots to place the logo, slogan, and other information that will help to identify and distinguish the brand. Marketing by using the primary packaging as a place to display the logo, slogan, and information about the product is both familiar and extremely useful: consider the efforts of soda manufacturers. It is common to see the product's brand and promotional materials for other products printed on soda cans. By utilizing ad space where the consumer's eye is sure not to fail, soda manufacturers have tapped into a lucrative marketing opportunity by using primary packaging as a billboard.

1.1.4.2. Secondary Packaging

Secondary packaging is the packaging that retains together the individual units of a good. Unlike the primary packaging, it is not designed to hold the goods but a group of goods together. It means to deliver mass quantities of the good to the point of sale or end-user with reduced shipping cost. Secondary packaging may be subtracted from the commodity without varying the qualities or characteristics of the product.

An illustration of secondary packaging would be the shrink film that carries a six-pack of cans together or the cardboard box that keeps a case of bottles together.

Other samples would be boxes containing smaller batteries or an enormous box of items intended for separate sale.

Secondary packaging should be rigid enough to protect the item and comfortable enough to open that employees engaged in restocking can access the product without damaging it.

Secondary packaging facilitates the transportation of a good from the manufacturer to the end-user economically. Nevertheless, it is frequently not seen by the leading recipient of the product. Therefore, the desired attributes in secondary packaging are more of utility than aesthetics or marketing.

1.1.4.3. Tertiary Packaging

Tertiary packaging involves the palletizing process of the product before shipment or the change of barcode, packaging or label on the pallet or final product in transit products.

These machines are shrink machines, strapping machines, pallet stretching machines, carton banding machines, nylon welding machines and packaging lines. Some of these also serve as primary and tertiary packaging machines, and this thesis is focused on the use of secondary packaging machines.

1.1.5. Packaging Functions

Beyond its fundamental benefits of protecting, containing, and preserving the product (as mentioned in chapter 1.1.3), the functions of packaging are manifold and complex, and the definition here can be related to three main categories: logistics, marketing, and environment. Jönson (2000) categorize the essential packaging functions in Table 3.

Table 3: Overview of Packaging Functions

Logistical Function	Facilitate stabilization Protect both product and the environment Provide information about conditions and locations
Marketing Function	Graphic design, format Legislative demands and marketing Customer requirements/consumer convenience for end use as well as distribution
Environmental Function/aspect	Recovery/Recycling Dematerialisation One-way vs. reusable package Toxicity

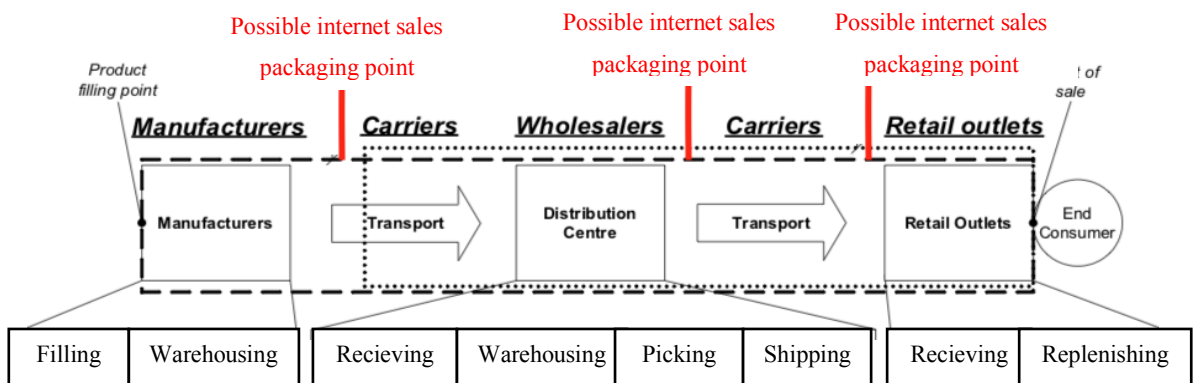
Source: Jönson, 2000

This thesis is focusing on the marketing function of the secondary packaging machinery industry. Logistical function determines the customer segment of the QFD.

1.1.5.1. Logistical Function

Although the packaging is known to have a significant impact on the efficiency of logistics systems (Lockamy, 1995: 51; Twede, 2005: 296), and activities such as production, distribution, storage, and handling throughout the supply chain, many packaging-dependent costs are often ignored. Packaging delivery transactions directly affect the delivery time and cost for the end-users (Lockamy, 1995: 54).

Figure 3: Delivery Ecosystem for Products



Source: Modified from Saghir, 2004: 16

The model associated with the delivery ecosystem of the products is shown in Figure 3. It is essential to know the possible packaging steps related to the packaging types and machines. For instance, a manufacturer mainly needs to use primary packaging machines. The need for secondary packaging machines for the manufacturer depends on the buyer's requirements. The wholesalers can use either primary and secondary packaging machines or none. A retail store usually provides the final product if there is no need to change any packaging. However, exceptions are considerable in the packaging market. In today's commercial life, manufacturers, distribution centers, retail outlets, and carriers have packaging machines in line with their needs. However, manufacturers are dominating the market with numerous machines requirements.

As identified by Saghir (2004: 19), producing forms are relatively rigid and rotate around high product quantity and balanced capital purchases in packaging machinery, process equipment, etc. The beginning move of the packaging logistics journey throughout the retail supply chain starts at the packaging and filling machine, and packaging logistics meet the primary packaging in this stage. Product and primary packaging are considered as unified and inseparable from that point to retail stores.

It is important to note that for the producer, the versatility and effectiveness of the packaging line are critical, in which sealing, labeling, filling, and primary packaging machines are used.

Primary packaging knowledge is directed towards consumers, while secondary and tertiary packaging information is used inside the retail supply chain.

A distribution center is a storage or other specialized building, often with refrigeration or air conditioning, which is kept with products to be redistributed to retailers, wholesalers, or directly to the consumers. Secondary and tertiary packaging is handled in the distribution center. The packaging logistics manners at the distribution center are receiving, warehousing, order picking, handling of used packaging materials, and shipping (Saghir, 2004: 20). Labor cost is expensive at this stage, and most of the application is being handled by workers. The activities in this process are unloading, applying labels, and controlling the received products. Retail outlets contain all types of packaging systems. The type of business, size, location, and retail concept held directly, affects the packaging. However, in today's internet

shopping, goods are usually added to the stocks by producing the final product in the final packaging form.

It is clear that internet business strictly depends on carriers, which is vital part of the packaging life-cycle. These transportation activities interact mainly with tertiary packaging, i.e., pallets and roll cags for bulk orders. Transport unit adaptability is considered the most essential factor in inefficiency, and stackability is another critical factor affecting transport costs. Pallet adaptation directly impacts volume and loading space efficiency in the transport vehicle (Saghir, 2004: 24). The weight and height of the tertiary packaging are two limiting factors with restrictions directly affecting the transport efficiency and the cost.

1.2. THE PACKAGING MACHINERY INDUSTRY

Packaging machinery aids in packaging products before they are dispatched for storage and distribution networks. The primary applications of packaging machinery are in a wide range of industries of food and drink, healthcare, cosmetics, and other goods, as well as a range of industrial sectors where the packaging has become critical, with its usage increasing broadly in line with the global economy (Roy, 2017). Packaging machinery (PM) is used for a wide variety of functions that includes canning; filling and forming, bagging, packaging, unpacking, bottling, sealing, and lidding; inspection and check weighing, wrapping, shrinking, and heat sealing; case forming, labeling, and encoding; palletizing and depalletizing, and related applications (Interpack, 2016).

In this part, an overview of the packaging machinery industry is explained, followed by a listing of the advantages and disadvantages of the packaging machinery. Afterward, the packaging machinery matrix is illustrated, and the chapter is concluded by the breakdown of the family of machines.

1.2.1. Principles of Packaging Machinery Industry

The packaging machinery manufacturing industry is an influential business, and the packaging machinery sector is slightly different from other machinery sectors.

In the sector, manufacturing is made as a part of the production/filling of another manufacturer. Considering both the product range and the type of packaging, a variety of packaging machines are available. While the machines are manufactured to a certain standard, they are varied with special modifications to the packages to be filled. The most accurate packaging machine must be ordered by determining the criteria and standards of the product and packaging well. When we consider the options of glass, plastic, metal, and paper/cardboard packaging materials and the labeling, packaging, and palletizing needed after filling, it would not be wrong to say that it is not easy to generalize in the packaging machinery sector.

Mainly, there are two types of packaging machines; automatic and manual. There is an increasing demand for automatic machines in the packaging industry, as they can improve the efficiency of manufacturing procedures and make the process easier and faster (Bix et.al., 2004: 11). Therefore, to increase exports and pre-export production, we need to produce the most economical product in every sector (Arıkan, 2011: 42). In order to increase the production volume and produce value-added products in the most economical and quality way possible, automation is needed in production. The automation of packaging machines, semi-automatic machines, fully automatic machines, and packaging lines utilize a wide range of benefits to the companies.

Although the packaging machine industry is critical part in production, researchers often mention packaging chain stages in their research but ignore packaging machines. Only specific studies in the food and beverage sector are part of the literature on a packaging machine, but they are constrained and product-specific. For this reason, the patent application articles are in the literature, but rather than an in-depth investigation, information is only given on the patent, production of machinery, or machine parts.

Moreover, commercial enterprises, start-ups, and even factories consider packaging machines as the last step in the new product design phase. For instance, retail is a significant consumer of different packaging machines (Saghir, 2004: 14). Therefore, the final product produced with thousands of difficulties has to wait for machine terminals to get on the market. Besides, there is a little research in identifying the nature and dynamics of the choice of packaging machinery, which includes an

assessment of technological capabilities, labor requirements, employee safety, maintainability, serviceability, reliability, capability to integrate into the packaging line, capital cost, floor space, flexibility, energy requirements, ergonomics, return on investment and quality of outgoing packages. It is critical to realize the importance of the packaging machine during the design process of raw material.

The packaging machinery sector has experienced an annual growth rate of about 5% over the last two decades and a transaction value estimated to reach \$50 billion in 2020 (Cinchane, 2021). This growth will continue to maturity approximately with 5% in the next ten years (GVR, 2021). Plastic packaging machines use plastic raw materials and plastic products during the packaging process, and this situation further deepens the size of packaging machines within the packaging sector. According to Allied market research (Cinchane, 2021), the packaging machinery market in 2020 was valued at about a \$50 billion increase at a CAGR of 4.7% to reach around \$70 million by 2030.

The demand for packaging machinery is driven primarily by the increasing consumer goods demand, increasing adoption of robotic packaging machines, and the development of energy-efficient machines. Modern automated packaging machines are applied in various packaging stages and ensure that the stages are reduced in minutes rather than hours compared to the older versions. The other critical factor driving the market for packaging machinery is the increasing demand for packaging robots from several end-user industries. Packaging machines play an essential role in ensuring product safety throughout the supply chain.

1.2.2. Advantages and Disadvantages of Packaging Machinery

It is essential to note that the benefits of packaging machinery listed in this chapter are identified from numerous researches and companies (Redpack Co. 2017, Ribble-Pack Co. 2018, Saghir 2004: 19) to find out the collective benefits for packaging machinery automation. These exploratory studies examine the perceptions of manufacturers, customers, and workers, who directly benefit from the packaging machines towards business impact and development. As a result, the exploratory studies consider the packaging machine manufacturer the highest beneficiary, and the

following is the customer. Table 4 summarizes the findings from various interviews and beneficiaries.

Due to the limitations of the academic literature in this sector, these benefits provide helpful information for companies and academic literature. Specifically, the findings suggest that packaging machinery benefits should be maintained by company perceptions, qualitative research over companies, and individual experiences of professionals.

Table 4: Advantages of Packaging Machinery

Beneficiary	Redpack Co. (2017)	Ribble-Pack Co. (2018)	Saghir (2004)	Interviews
Manufacturers	- Labor charge - Cost-effective - Improve efficiency - Versatility - Save time, Money, and space	- Productivity - Lower cost - Meticulous quality - Reduced wastage - Specialized packaging	- Use of natural forces - Heavy and delicate work - Faster work - More accurate work - Strain on	- Reduce expenses - Improve efficiency - Reduce workforce - Increase standardization of final product - Productivity
Workers	- Better working conditions	- Safer working conditions	- Cheap goods	- Cleaner and safer workplace
Customers	- Promote brand awareness and loyalty - Excellent durability - Recyclable packaging	- Efficiency	- Mobility of labor - More employment - Disagreeable jobs	- Cleaner and safer products - Custom packaging - Marketing power

Source: Redpack Co. 2017, Ribble-Pack Co. 2018, Saghir 2004: 19

On the other hand the disadvantages of the packaging machinery are monotony, dependence, over-specialization, class conflict and unemployment, which are explained in Table 5.

Table 5: Disadvantages of Packaging Machinery

Disadvantages	Explanation
Monotony	Packaging machinery has made the employee's work monotonous and irksome. The employee has nothing to do except performing a few mechanical operations day in and day out, increasing nervous strain.
Dependence	Packaging machinery has increased our dependence on others. A minor flaw would conclude in the supply of the necessities such as water and electricity being cut off at any time. This situation may mean not only the inconvenience but the severe dislocation of ordinary life.
Over-specialization	An employee has a narrow sphere of work, and he knows nothing else. This specialization increases the risk of unemployment and cramps the worker physically.
Class Conflict	The use of machinery is responsible for class conflict—the capitalist on one side and the laborers are on the other—the class-conflict results in the disruption of social harmony.
Unemployment	Machinery creates unemployment simply because one machine can take the place of several men. However, the situation is not so simple to explain to employees, and it is only eliminating some of the work and upgrading some of the worker's jobs.

Source: Redpack Co. 2017, Ribble-Pack Co. 2018, Ozarma, 2018

When the advantages and disadvantages of packaging machines are considered together, the most critical situation is the acceleration of production, the reduction of costs, and the professional appearance of the products.

1.2.3. Family of Machines

According to the literature, it is feasible to categorize the family of machines by considering the packaging types (see chapter 1.1.4.). This categorization is necessary and critical for the researchers. It is important to mention that the categorization in this thesis, which can be seen in Table 6, refers to various market researches as AMR, GVR, etc.

Table 6: Packaging Types of Machines

Packaging Types	Machine Category
Primary	FFS (Form, Fill, Seal) Machines Wrapping Machines
Secondary	Cartoning Machines FFS (Form, Fill, Seal) Machines Wrapping Machines Palletizing Machines
Tertiary	Palletizing Machines Wrapping Machines

Source: Created by Combining Adaptations of Figure 2 from (Saghir, 2004) and (Ozarma, 2018)

Moreover, this thesis focuses on the manufacturer customer segment by taking into consideration of the logistical function of secondary packaging machines, which are cartooning machines, FFS (Form, seal, and fill) machines, wrapping machines, strapping machines, and palletizing machines.

Table 7: Family of Machines

Cartoning Machines	Carton Sealers	Hand Operated Sealers
		Semi-Automatic Carton Sealers
		Auto-flap Automatic Carton Sealers
	Carton Erectors	Fully Automatic Carton Erectors
FFS Machines	Shrink Machines	Manual Shrink Wrapping Machine
		Semi-Automatic Wrapping Machine
		Automatic L Sealer Wrapping Machine
		Semi-Automatic Tunnel Heat Shrink
		Automatic Tunnel Heat Shrink
	Naylon Welding Machines	Continous Band Sealer Machine
		Hand Impulse Sealers
		Heat Sealers
Wrapping Machines	Pallet Wrapping Machines	Hand Wrapping Tool
		Automatic Pallet Wrapping Machines
		Semi-Automatic Wrapping Machines
		Fully Automatic Wrapping Machines
	Strapping Machines	Hand-operated Strapping Tools
		Battery-operated Strapping Tools
		Semi-Automatic Strapping Machine
		Fully Automatic Strapping Machine
		Automatic Pallet Strapping Machine

Source: Ozarma, 2018

As illustrated in Table 7, this thesis focuses on three main machine types to define the family of machines: cartoning, FFS, and wrapping machines. It is important to note that machine types generate the product portfolio of the secondary packaging machines in the thesis.



CHAPTER TWO

QFD AND WEBSITE DESIGN

This chapter of the thesis describe the history, benefits and scope of the QFD method which is the main theoretical framework of the thesis. Besides that, information was given about the website design criteria for packaging machines and samples were given from the studies carried out with QFD on e-commerce.

2.1. FUNDAMENTALS OF QFD

Nowadays, digital marketing and website insight analytics are a -must be- for companies. Internet stores are open 24/7 and support the sales & marketing visions within the firms' corporate structures, where the customer has an idea about the organizations and products. Internet business means no time or geographic limitations (Kuo and Cheng-Wu, 2009: 253).

Website design is a core part of the e-marketing strategy since the website design directly affects the customers' purchasing decisions to choose the products. As an impact, it is fundamental to understand the 'real' customer needs and transform them into action as a marketing strategy. True customer needs cannot be maintain from raw customer complaints, reviews, or comments only by counting their term frequencies. This derivation can be done by analysts by exploring the value for the customer (Ozdogoglu et. al. 2016: 2). At this point, QFD is one of the leading valuable and trustable tool for the beneficiaries.

Quality Function Deployment (QFD) is a design approach that understands the relationship between quality assurance and production, and it maintains quality assurance in the development of new products. The scope of this thesis is to determine the successful website design and marketing strategies for secondary packaging machinery manufacturers with the use of the Blitz QFD method.

2.1.1. Definition & Scope of QFD

According to the dictionary meaning, "Quality" is the standard of something as evaluated against other things of a similar kind; the degree of excellence of something. Furthermore, the dictionary meaning of "Function" is a relation or expression involving one or more variables. At last, "Deployment" is bringing resources into practical action. In other words, the QFD design process reveals different consumer requirements and transforms them into more effective product design on a functional area of use.

QFD is a powerful and flexible method for new product development and should be custom-tailored to the unique situations of a company and its products. (Mazur, 2018: 19). QFD addresses issues faced in a product, service, software, and process development. In order to create a long-term impact with QFD, it must address the critical problems facing the organization today and tomorrow. It is essential to identify the most critical challenges, purposes, and targets of an organization.

QFD is a simple method when suitably executed on a project. Most effective QFDs are nuanced, making the best use of the limited sources and helping an organization support its competitiveness. Every sector and business faces different opportunities and problems due to internal and external reasons, such as technology change, customer types, competitors, strategies, and management style differences. Therefore, a custom-tailored QFD process and tools to the organization's particular needs make long-term sustainability possible.

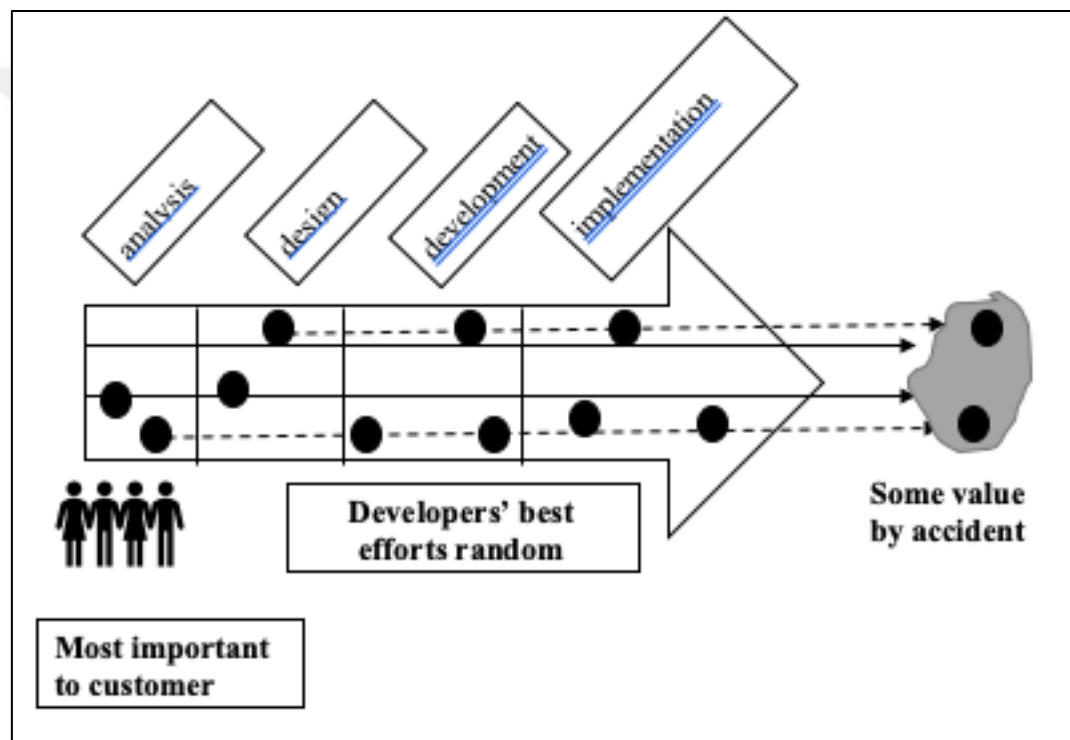
As identified by Dr. Shigeru Mizuno, who is the co-founder of QFD Institute: "Quality cannot be achieved if each division or department of the entire company is only working on improving its operations. The company wants to align the best efforts of its staff with what matters most to the customers." (Mazur, 2018: 5)

According to the principles of QFD, value is constrained by what is essential to the customer. It is most likely that traditional approaches have a weak customer center or cannot express it through the company. As shown in Figure 4, there is a strong possibility that different employees at different phases of market analysis, product design, manufacturing process development, and production implementation could have different interpretations of what is most critical. However, engineers in

traditional design and development organizations tend to focus on improvements. Thus, their maximum effort and long hours of work bring the real value to the customer.

Furthermore, other needed improvements may not show up until the production time or after the product is in the field, leading to costly delays, rework, or redesign. This incoherent approach can reach a target, but it would be inefficient at all. QFD's primary purpose is to reach the core value of the business.

Figure 4: What is the QFD Problem?

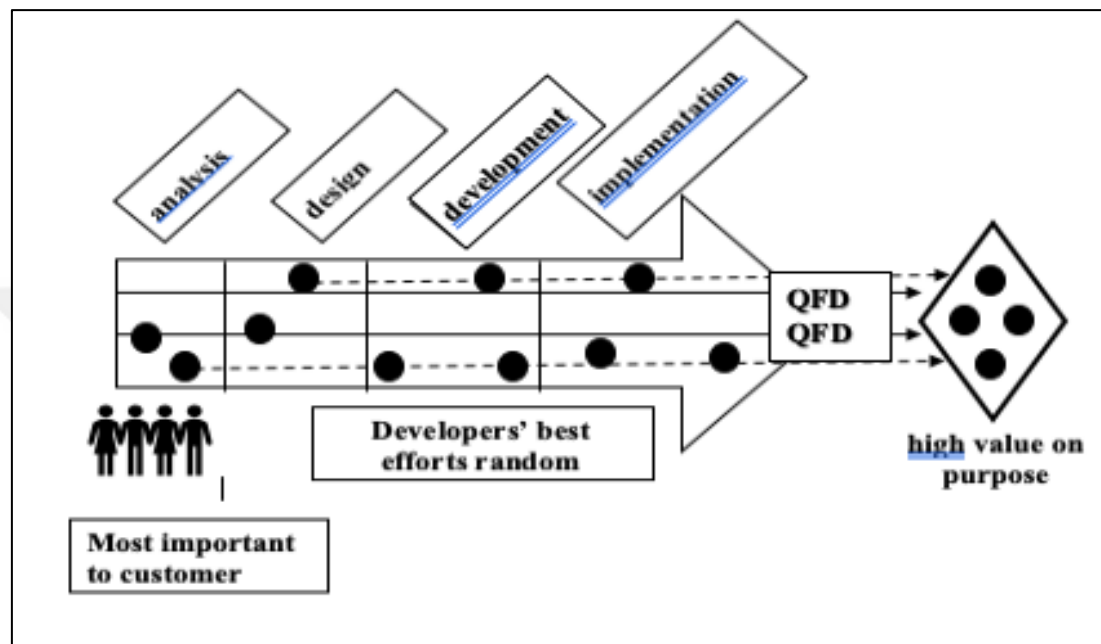


Source: Mazur, 2018:17

The human factor is probably one of the most critical research areas on QFD. As shown in Figure 5 below, there are several steps to determine QFD's fundamental principles such as analysis, design, development, and implementation. It is important to note that a product development process is a chain of activities, and the quality of the final product is constrained by the weakest link in the process (Mazur, 2018).

There are two driven related the goals: users and producers for the QFD. When these two purposes are met, the result will be a product design that meets the user's needs and customer's demands.

Figure 5: What is the QFD solution?

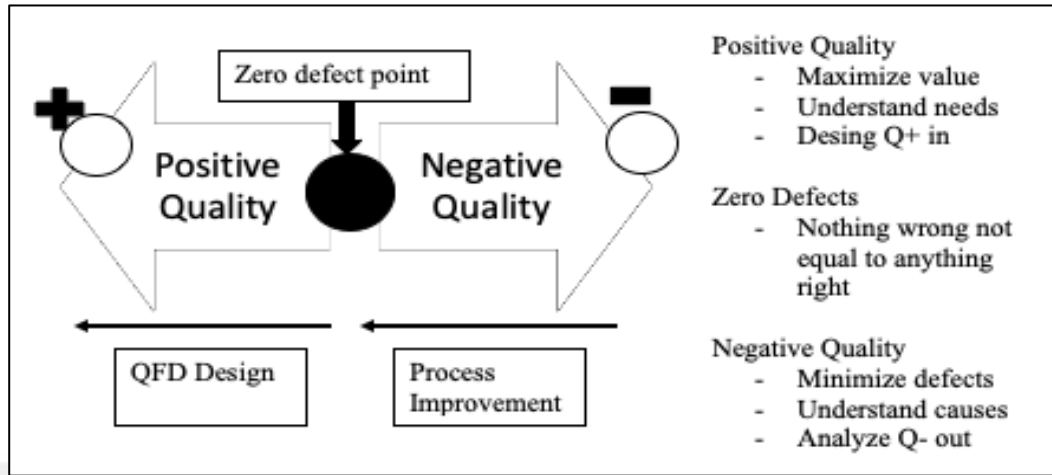


Source: Mazur, 2018:18

There is a definite possibility that focusing on fundamental customer needs will better designate resources to give the best customer value for a consistent approach. A sizable body of literature has appeared to explore the voice of the customer (VoC) to understand the consumer's exact needs. As an approach to the product development, QFD also gives critical importance to the collection and analysis of VoC to explore real customer needs (Kapucugil-Ikiz and Özdağoğlu, 2015).

In sum, QFD provides value over the spoken and unspoken needs of the customers and utilizes these needs in plans and operations for intelligence in organizations. Hence, QFD allows customers to prioritize their requirements, benchmark us against our competitors, and then direct us to optimize those aspects of our organization that will bring the most significant competitive advantage.

Figure 6: A Design Approach to Quality



Source: Mazur, 2018: 20

As it is shown in Figure 6, QFD has to maximize the value and understand the customer needs for a successful design but, at the same time, it has to minimize defects and understand causes to successful analyze.

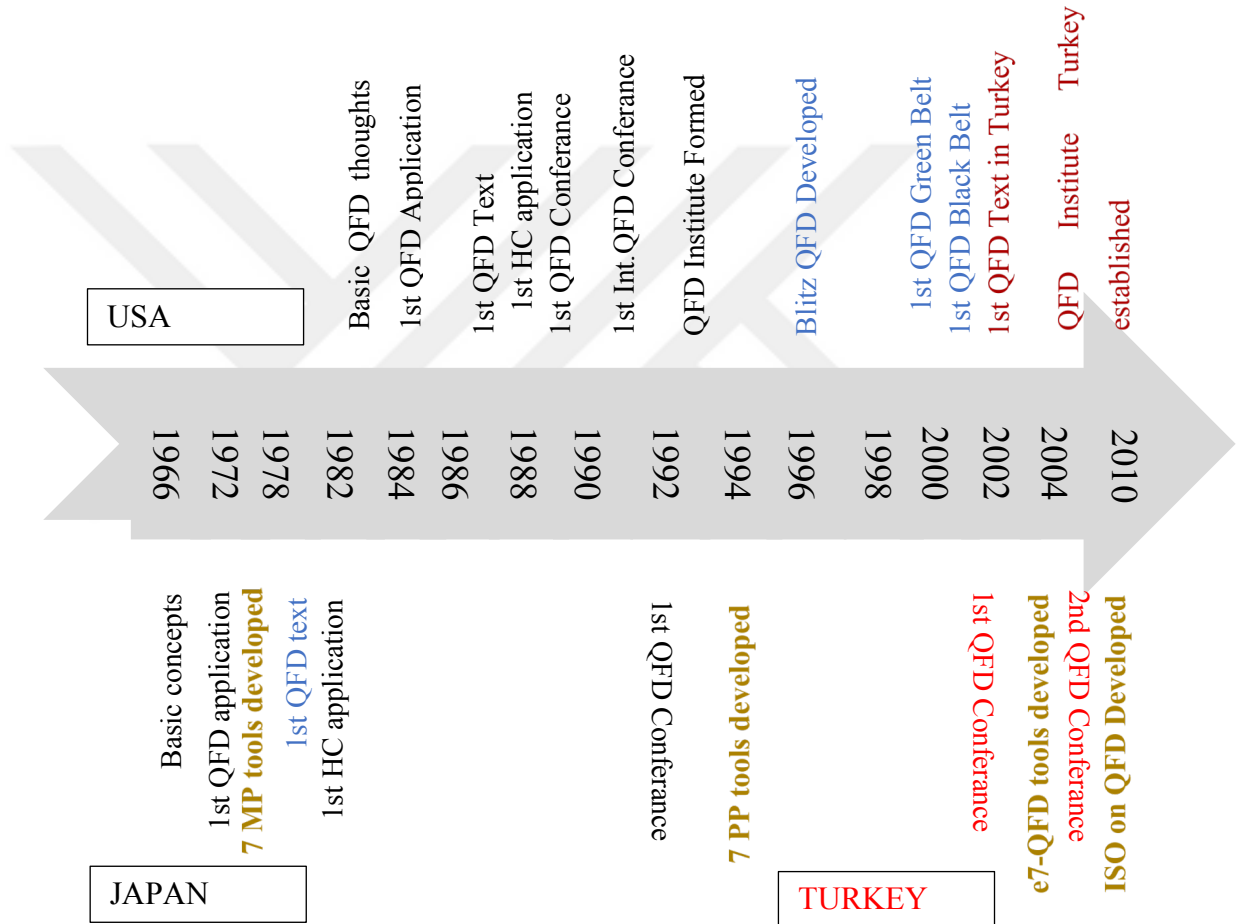
2.1.2. History of QFD

The two-fold purpose of QFD is to assure that customer needs are correctly deployed throughout the plan, manufacture, and transportation of a new product or even software and to improve the product development process itself (Akao and Mazur, 2003: 20). As shown in Figure 7, although some organizations are just getting started with QFD, the method has a long history. The first case study was by Bridgestone Tire in Japan in 1966. However, the basis of the current QFD-style matrices, initially referred to as Quality tables and matrices, were first proposed and used by Mitsubishi Heavy Industry's Kobe Shipyards to design supertankers. Mitsubishi Heavy Industry published a discussion of the Quality Table in a magazine article in May 1972. Afterward, QFD was brought to the United States in 1983 and has spread to almost every continent and industry.

The QFD Turkey Research Group has started to work on a variety of Quality Function Deployment since 2002. QFD Turkey was established in 2005 by Dokuz

Eylul University Faculty of Business Administration. The committee organized the 1st National symposium in 2005. The academic and business interest in the QFD issues and the level of awareness have increased in Turkey by hosting their 2nd National QFD symposium in 2008. QFD Turkey, far from the 2005 International Council of Quality Function Deployment (ICQFD), is carried out with representation continues its presence in the international arena.

Figure 7: Development of QFD



Source: Design by Author from QFD Institute History

The QFD institute was formed in June 1993 as a non-profit organization by Glenn H. Mazur, John Terninko, and Richard E. Zultner to advance the art and practice of Quality Function Deployment in North America. The QFD institute evolved the method and techniques and served them worldwide in the following years. QFD

Institute organizes symposiums, conferences, and courses and They have started to develop an international standard since 2009 by Glenn Mazur, which is calling as ISO 16355.

➤ **ISO 16355 Compliance**

The development of this new international standard, primarily for the QFD, is requested of the International Standards Organization Technical Committee (TC) 69 (applications of statistical methods) subcommittee (SC) 8. Its purpose is to standardize global best practices for QFD and robust design for applications beyond their initial use in the automobile components industry. It becomes necessary to address applications in finished goods, services, software, and information products and the internal business process in business-to-business (B2B) and business-to-consumer (B2C) sectors. The standard also considers the time, people, and money constraints modern businesses face by including smaller, more efficient tools – good news for those turned off by the overwhelming classical House of Quality (HoQ). Six Sigma professionals, including design for Six Sigma, Lean Sigma, and Design for Lean Sigma, will welcome the improved mathematics, the result of the statistical focus of TC69.

As seen in Table 8, the standard is divided into eight parts, which reflect the application of QFD throughout the product life cycle, from project strategy through commercialization and even retirements of the products.

QFD has significant development during the lean/six sigma era in the early 1990s. Then, the QFD institute began an individual research project to apply QFD after investigating North American companies and their implementations on QFD for many years. This approach improved the QFD perspective of the institute and maintained a new consideration over QFD, which is called QFD II or "Modern QFD." The modern QFD is based on the Six Sigma approach to design and improve the product.

Table 8: ISO 16355 Compliance

ISO 16355 Compliance	
Part 1:	General Framework
Part 2-3:	Acquire Voice of Customer (VoC)
Part 4:	VoC Analysis
Part 5:	Transform VoC into design
Part 6-7:	Optimization
Part 8:	Commercialization

Source: <https://www.iso.org/committee/585031/x/catalogue/>, 18.09.2020

A crucial part of Modern QFD is tailoring the QFD process to fit the organization's needs. This research also led to the development of the "Blitz QFD" approach. As classical and modern QFD differences are indicated in Table 9, the contemporary approach generates a fresh streamlined over new generation QFD. Modern technology keeps evolving on this simplicity without confusing tables and unnecessary efforts.

Table 9: Classical QFD vs Modern QFD

Classical QFD	The Blitz QFD
Canned QFD Process House of Quality only 4 Phase model Math optimized for an abacus Few big, laborious tools (mostly matrices) Focused on "comprehensiveness" Lip service to Voice of Customer concept	Tailored QFD Process Based on the Voice of the Company Math that is correct and valid, with software Many small focused tools (rarely matrices) Focused on speed and efficiency Voice of the customer as a central concept

Source: QFD Institute, 2021

This packaging machine business refers to the Blitz QFD approach in this thesis, which is based on Modern QFD, because of its helpful and straightforward planning and implementation of the structure.

2.1.3. Benefits & Limitations of QFD

It is possible to classify the benefits of QFD as concrete and discrete (Chan and Wu, 2005: 135). It is essential to note that these benefits come from different parts of the QFD. Different companies, even in the same industry, seeking different benefits, will use different parts of the QFD. That is why QFD needs to be tailored to fit the

organization. However, in general, the main benefit of the QFD process is that it encourages proactive product development instead of reactive product development.

The proactive quality benefits listed by Mazur (2018: 24) respectively on consideration of permanent updates are;

- (1) Better vision of competitors,
- (2) Shorter time to market,
- (3) Reduced engineering changes,
- (4) Better cross-function communication,
- (5) Cost reduction,
- (6) Strengthen concurrent engineering,
- (7) Improved teamwork,
- (8) Increased employee satisfaction,
- (9) Increased customer satisfaction and,
- (10) Increased quality and reliability.

Wolniak (2018: 16) defines the QFD benefits after a respective literature review in three categories; (1) Organizational, (2) Economic, and (3) Socio-psychologic. He mentions the organizational benefits as organizational structure, organizational teamwork, etc., cost reduction and revenue increase as an economic impact, employee morale, customer satisfaction and quality of communication, etc., as socio-organizational impact.

The practically observed benefits of using QFD in percentage are:

- Decrease technological changes by 30%-50%,
- Shortening of production cycles by 30%-50%,
- Reduction of start-up costs by 20%-60%,
- Less problem in the number of warranty claims by 20%-60%.

In sum, all benefits refer to less effort from human factors inside the organization, minimum cost for the product, and maximum revenue. It is possible to discuss the efficient use of minimum resources in this case.

QFD is a tool for making decisions about features and product performance. However, despite its benefits, some limitations make it inappropriate for some organizations.

Firstly, In the case of entire contents on matrices, there is a lack of usefulness on multi-matrix tables, and it can also cause difficulties in implementing numerous conclusions resulting from the analysis. Therefore, The Blitz QFD will simplify using matrix tables and design the number of tables.

Secondly, the method is mainly qualitative; it is often daring to classify them due to the uncertainty and blurred nature of the client's requirements. This situation may cause the thesis on the nature of QFD. Interviews transform the customer needs to get significant results.

Thirdly, the connection between customer and technical requirements can be difficult. However, this situation is not valid for this thesis due to the strictly connected planning and implementation area and professional employee resources with over seven years of experience.

Fourth, the QFD method is sometimes not suitable for all applications. For instance, there are only a small number of customers in the automotive industry. This situation was also possible for the packaging machine business, and it was challenging that all customer lists were open-source for thesis inventory. Lastly, customer needs can change fast in the internet age, and it can be challenging to adapt to these demands.

The clear advantages and disadvantages of the method depending on what specific version of the QFD method is to deal with because different versions of the QFD method may need different approaches in different sectors.

2.1.4. The 7 QFD Management and Planning Tools

The starting point of the QFD process is the customer whose needs are fuzzier than the technical requirements, and the seven management and planning tools use qualitative methods to analyze the VoC. Furthermore, it translates the process into requirements. These tools are used extensively in Quality Function Deployment (QFD). According to process improvement, that positively affects the revenue, providing proactive quality benefits.

According to Mazur (2018: 21), the 7 MP tools were the tools of traditional QFD. Despite that tools are traditional, it is widely used as a Blitz QFD tool after modifying or updating:

1. The Hierarchy (tree) diagram is used to structure of customer needs and is the foundation for analyzing missing and implied customer needs. It is also the basis for prioritization using the Analytic Hierarchy Process.
2. The Relations diagram represents the models for understanding complex situations. A Customer Process model using a Data Flow Diagram (DFD) will help us understand the customer's situation and the "jobs" they are trying to do. This diagram is part of capturing the VoC.
3. Matrices and tables are standard in QFD. There are several types of matrices and many distinctly different matrices in comprehensive QFD. In modern QFD, we use tables such as the Gemba visit to capture the customer's verbatims, tasks, and data the Customer Voice Table to understand the VoC. Plus, Maximum Value Table to plan how to deploy high-value needs. This situation includes deciding which matrices may be required by the project downstream.
4. The Affinity diagram developed in cultural anthropology surfaces cognitive structure. Used to organize customer needs to uncover how customers think about their needs structurally.
5. The Matrix Data Analysis chart represents a class of quantitative methods. As these are already in the Six Sigma toolset, Modern QFD uses the Analytic Hierarchy Process (AHP) for accurate ratio-scale prioritization of customer needs.
6. The Process Decision Program Chart (PDPC) represents tools from Reliability Engineering, such as the Failure Mode Effects Analysis (FMEA) table and the Fault Tree Analysis diagram. In modern QFD, FMEA is more beneficial for a new analysis of customers' processes; besides, it is actual and potential failure modes, which is a potential downstream deployment.
7. The Presence diagram is a modern Project Management tool that uses QFD to plan essential tasks from the Maximum Value Table (MVT) and in speed development for applying Critical Chain Project Management.

Considering the advantages and disadvantages of the QFD process may create a positive perception for organizations, customers, and employees. The qualitative and quantitative content of the QFD provides specific benefits to companies even the result is not proper because teamwork of employees and market research cause a comprehensive understanding of the firm in the market.

2.2. WEBSITE DESIGN FOR PACKAGING MACHINERY INDUSTRY

Many organizations and businesses in the packaging industry have a powerless website lacking in the digital world requirements. The e-business aims to design a better product, find an efficient way to deliver this product to the customer, and support after-sales (Ioannou et.al., 2004: 2). The company has to meet the changing customer needs constantly. Marketing approaches, prices, products and services, salesperson behaviors, characteristics, and layouts of stores are critical factors for a successful marketing strategy (Barutcu, 2006: 48). Website design is a core part of the e-marketing strategy, and the nature of the online platform design is associated with website design to facilitate the purchasing decision of customers.

2.2.1. The Evolution of E-Commerce and Website Design

The records of e-commerce can be discovered back to the 1960s with the growth of the Electronic Data Interchange, which makes data exchange possible through digital transfer without the need for human interaction. Soon after that, in 1979, an English inventor developed the idea of online shopping. Michael Aldrich combines a TV with a purchase processing network using a telephone line, supplying start to what he called teleshopping, or shopping at a range (Guevarra, 2018). This teleshopping operation was exchanged a year later as a B2B system.

In 1991, the World Wide Web (www) was founded by Tim Berners Lee and Robert Cailliau (Stickler, 2019), which the world's first-ever live website is: <http://info.cern.ch/hypertext/WWW/TheProject.html>. The first websites were solely text-based and necessitated a text-based browser in order to view them accurately. After the launch of JavaScript, web-safe colors and fonts became commonplace in this era, which was released to formulate dynamic content and animations. In 1993, with the release of Mosaic, users could see text and images displayed together on screen, and in the 2000s, designers realized the potential of locating a greater weight on navigational composition, which led to menus, navigation options, breadcrumbs, and sitemaps (Bonsor, 2020).

After the launch of the iPhone in 2007, users could scan the Internet at their convenience on their phones, and web designers started reminiscing about designing

mobile websites. The escalating trend of mobile web usage means the importance of explicit, mild websites with a described structure, which leads us to develop lead-driven web design. Lead-driven design is a data-guided approach to web design (Bonsor, 2020). It uses analytical data, user intent, and behavioral analysis to design web pages that generate qualified leads that convert into customers.

2.2.2. Fundamentals of Website Design

Scientific research about websites has changed from standard business to sector-specific business with the developing internet market. Besides the standard demand of the user who will buy goods and services in different sectors, they can have different requests based on the product. For instance, the customer who searched in the automotive sector website and the customer in the food and beverage sector may not expect the exact website design. The car buyer focuses on product details to see the car in different colors, while the other expects a different corporate approach to the logistics of the product.

It is clear that the Internet and e-commerce are developing, and this reality is changing the approaches to determine critical factors of successful website design (Flavian et.al., 2009:3). As indicated, the adaptation of e-commerce has various factors that are critical determinants of purchasing over the Internet. Human-Computer Interaction (HCI) states concepts and methods from computer science, design, and psychology to design interfaces that are accessible, comfortable to use, and efficient. All approaches maintain a variety of perceptions. In general terms and the context of electronic commerce, a successful website “attracts customers, makes them feel the platform is trustworthy, dependable, and reliable, and generates customer satisfaction (Liu and Arnett, 2000: 24).

Moreover, there are several methods to measure service quality, and Quality Function Deployment (QFD) is one of them.

2.2.3. Website Classification

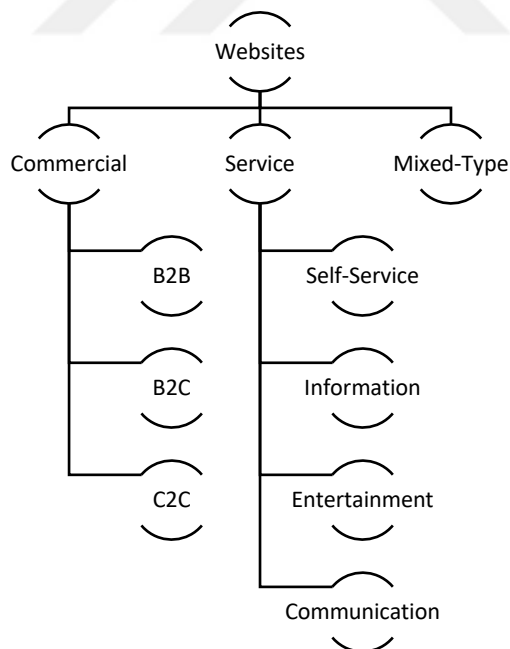
Hasan and Abuelrub (2006: 12) classified the websites most significantly into four categories as:

- Business to Business (B2B),
- Business to Consumer (B2C),
- Consumer to Business (C2B),
- Consumer to Consumer (C2C).

According to Cebi (2013: 1031), global websites can be classified as:

- Commercial type websites
- Service type websites
- Mixed type websites, which include trade and service in it.

Figure 8: Classifications of Global Websites



Source: Cebi, 2013: 1031

As reflected in Figure 8, it is clear that a secondary packaging machinery manufacturer website can be classified as a Business to Consumer (B2C) and a commercial website in this thesis.

2.3. QFD STUDIES ON E-COMMERCE

The development of information technologies, especially the internet, will support the implementation of the e-commerce system in selling packaging machines related to customer needs. Researchers can use some studies over Quality Function Deployment to determine website design quality dimensions and attributes. Unique studies use different techniques and methods to reach precise customer needs. Each sector has different characteristics; therefore, the studies maintain different customer voices. Indeed, It is essential to note that the purpose of these studies is to increase sales and reduce costs with the help of the internet.

According to Atikah (2018: 690), Quality Function Deployment (QFD) analysis is implemented to recognize the customer's need for the website design and requirements to match the customer's needs. The result of Atikah's website study is planned already per the customer's needs, based on the test result of the software.

Barutcu (2006: 48) proposed an integrative model of six international standards to evaluate the software quality of "ISO/IEC 9126" via QFD. Software quality can occur in many different forms. According to this standard software, quality is evaluated by six standards:

- Functionality (suitability, accuracy, interoperability, compliance, security),
- Reliability (maturity, fault tolerance, recoverability),
- Usability (understandability, learnability, operability),
- Efficiency (time behavior, resource behavior),
- Maintainability (analyzability, changeability, stability, testability),
- Portability (adaptability, installability, conformance),
- Replaceability

The study confirms that QFD can impact software and e-store design in many ways to increase e-customer satisfaction and improve e-store design quality.

As Shaikh et.al. (2001: 317) identified, customer needs are the most influential variables in explaining the QFD systematic. This systematic's 3-step approach is developed to maintain the requirements of e-commerce:

1. The current situation of representative businesses in the public and private sectors is explored.
2. The customer voice of businesses is determined.
3. Mathematical models are developed to solve specific e-commerce problems.

Jinling et.al. (2009: 418) developed a quality requirement model of e-commerce customers to identify customer needs of QFD. This study's main contribution is to construct an e-commerce website quality model based on the users' quality requirement and tools listed in Table 10.

Table 10: Website Quality Dimensions

First Dimension	Second Dimension	Third Dimension
Easy to Use	Applicable Information	Information with appropriate details
		Appropriate format of information
		Easy to understand information
	Navigation	Easy to find
		Easy to locate
		Easy to return
Reliability	Accuracy	Accurate Information
		Timely Information
		Rational Price
	Authority	Third Party Products Estimation
Responsiveness	Response	Website Speciality
		Responsive in Time
	Feedback	Timely Delivery
Assurance	Credibility	Easy to Feedback
		Good Reputation
	Safety	Keep Words
		Safe Transaction
		Privacy Protection
Good Experience	Aesthetics	Safe Payment
		Vision Attractive
		Format Design
	Individuation	Style Design
		Community Communication
		Customized products (Customization Recommendation)

Source: Jinling et al., 2009: 421

E-commerce is the tool of the research process in this thesis. By Quality Function Deployment, the users' demands are transformed into the quality requirement of the e-commerce website.

According to Su and Lin (2007: 563), the increase in service quality to improve customer satisfaction has been widely cited over the past few decades. However, a creative and systematic method of reaching higher customer satisfaction regarding service quality is rarely discussed. In this study, a systematic model based on the QFD method is declared to generate creative solutions for service quality improvement. First, this study examines the determinants of service quality based on a comprehensive qualitative study in electronic commerce. Secondly, the correlation between the imprecise requirements from customers and the determinants of service quality is analyzed with AHP to identify the critical dimensions of customer satisfaction.

Herzwurm & Schockert (2003: 50) distinguish between classic QFD in manufacturing industries and software-specific QFD models to identify CQFD, which means continuous QFD. This study indicates that QFD is suitable for planning electronic business applications.

Many types of research investigate the business-to-customer (B2C) electronic commerce services from a quality management perspective. The study proposes a novel quality management approach based on human factors engineering to manage e-commerce service quality and operate related to customer needs (Zuo et.al., 2013:1).

1. Screen credible quality requirements are determined by integrating Kano's model, including B2C website service quality.
2. Quality characteristics are introduced related to the image words and credible customer voice. Refining characteristics deduce the weights of the quality characteristics through a house of quality reconstruction and mapping customer requirements to characteristics.
3. Quality characteristics maintain quantitative output with importance and grades.

Kuo and Cheng-Wu's (2009) paper on website interface design discusses improving customer satisfaction and the shopping experience. First, it is essential to understand the customer quality requirements on an e-commerce website and then meet these requirements through a suitable website interface design. A B2C shopping

website is an example in this study. Quality function deployment (QFD) understands of customer quality needs, elements, and relationship.

It is essential to understand that this thesis contains a Blitz QFD research to implement a commercial packaging machinery website by determining the customer needs. Therefore, in the direction of this aim of the thesis, the expectation is to find an interface design with ease of use and maintain service quality over the shopping experience for packaging machinery customers. Increased service quality may lead to the adaptation of digital transformation. In addition, the mobile website has been considered with the website design study.



CHAPTER THREE

RESEARCH METHODOLOGY FOR SECONDARY PACKAGING MACHINERY WEBSITE DEVELOPMENT

In this chapter of the thesis, the research methodology is explained in detail. Data access, collection and processing methods and stages of QFD are explained, and emerging customer needs and functional requirements are presented with cost.

3.1. STUDY

This study has titles related to the research model, population and sample, data collection technique, data analysis, and interpretation. The prototype website design of the secondary packaging machinery manufacturers is a type of unique product. Logistics is the fundamental function of this field of study, and the packaging machine need of food and beverage manufacturers is an original concept of this thesis. This study combined qualitative and quantitative methods to explore secondary packaging machinery manufacturers' customer needs and functional requirements. These analyses explain how the prototype website meets the customer's needs, what kind of digital services it recommends, and how it improves service quality.

In the previous chapters, the packaging and packaging machinery industry is explained in the first chapter, and QFD literature is illustrated, which is the second chapter of the thesis. This chapter describes the study's objective, then illustrates why the Blitz QFD methodology is appropriate for this study. In the following chapter, the prototype is described.

3.1.1. Objectives of the Study

Packaging machinery is one of the most critical parts of the supply chain, but it is also the last thing in today's manufacturing companies' planning process. As more and more companies adopt modern production methods, the importance of packaging machines is also growing, as is the number of users. Therefore, it is vital to understand the customer's secondary packaging needs to survive as a machine manufacturer.

This thesis aims to explore customer needs and identify functional requirements to design a website for secondary packaging machine manufacturers. A comprehensive literature review and exploratory analysis were conducted in search of answers to the below questions. A theoretical framework was created based on an extensive literature review in this context.

Several research objectives are addressed to reach the aim of this thesis:

(Q1): To explore and determine customers' needs for secondary packaging machine (SPM) manufacturers' websites

(Q2): To identify Functional Requirements for SPM manufacturers' websites.

(Q3): To design a website that meets customers' needs and functional requirements.

Customer-oriented needs were identified over the interviews, gemba visits, surveys and focus groups. There are trust issues in the machinery sector and manufacturers who want to buy packaging machines were tend to have face-to-face communication. Therefore, it is important to overcome these obstacles with the website design.

In order to answer these research objectives, this study explore the attitudes on secondary packaging machine user's data to meet their needs to improve service quality with convenient digital services.

3.1.2. Data Sampling

The sample of this research consists of producers and users of secondary packaging machinery and materials in Turkey and in the world. Since it is not possible to reach the whole population and it will cause problems in terms of working time and budget, judgmental sampling method has been applied.

Another sample of the research consists of secondary packaging machinery manufacturers living in Central Anatolia, Aegean and Marmara regions in Turkey, employees of food and beverage companies that purchase these machines, and operators and repairers of these machines.

the pre-research was conducted in the form of a survey with the participants of the Interpack 2017 Germany fair. Participants of the AHP survey were selected among the companies that have been operating in the packaging machinery sector in Turkey for

several years and are among the leading companies in the import and export of the sector. Two different focus groups were formed to identify functional needs and design the planning table. While working with a group of professionals working in the sector for many years to determine the functional needs, a meeting was held with the employees of a single company for the design planning table. When the research data reached the saturation point and the data reached a satisfactory level, the interviews and visits were terminated.

Within the scope of the selected sample, the prototype website created within the framework of customer needs factors was chosen as an example and its relationship with digital services was investigated based on the user research group. Necessary permissions and ethical approvals were obtained from the companies.

3.1.3. Data Collection Method

The thesis conducted over 95 hours of interviews and discussions with various stakeholders, manufacturers, retail outlets and distribution centers to translate CNs into product-independent customer needs. The researcher has reviewed several product literature, industry releases, exhibition reports, annual reports, and other such documents of key industry participants to better understand the market and competitive intelligence. The researcher also reviewed official industry journals, trade association releases, and government websites to generate high-value industry insights. Also, there are over ten international exhibitions worldwide, which the researcher has attended or visited during the thesis period (China, Germany, Turkey, and Ukraine).

It is essential to mention the research sections and data collection methods in Table 11. There are three main categories to investigate data in this thesis. First, the preliminary study discovered the primary customer needs for secondary packaging machinery with semi-structured depth interviews. These CNs were determined by sector leader participants who determine the importance levels of factors in the Interpack exhibition in Germany. This situation also created the opportunity to understand the demographic information such as education, experience, and perception differences between the Turkish and International packaging markets.

Although there are differences between national and international sector components, the emerging customer needs are similar because the internet has no borders.

Table 11: Data Collection

Research Questions	Method	Data Collection
Q1	Pre-Study	Semi-structured interviews Survey
Q1 and Q2	The Blitz QFD	Depth-interviews Observation Gemba visits Focus Groups
	Downstream Deployments	Exhibitions Focus-group Market Search
Q3	Web Development	Findings of the study Literature
	Prototyping	Google Analytics

Blitz QFD methods are applied to prototype website design for secondary packaging machine manufacturers to identify customer needs and relevant functional requirements. This method is defined by the QFD Institute as a customer-oriented and modern method. Blitz QFD methods systematically identify CNs and FRs through content analysis of interviews over audio recordings and gemba visits to provide in-depth understanding of operators and workers' needs in the work environment. QFD is a great tool to discover a strategy, product or service related to various perceptions such as machine operator, machine worker, carriers, retailers and suppliers.

In addition, the focus group evaluated the Analytical Hierarchy Process (AHP) chart at the Eurasia 2020 fair to understand the outcome of the Blitz QFD. Quality Function Deployment is a quality system that aims to ensure customer satisfaction by providing value to the customer efficiently (Mazur, 2016: 36). This feature, which has a meaningful integrity with the feature of modern business understanding based on customer requests and needs, is one of the main reasons for using QFD. In addition, the QFD method is a systematic research process that enables the planned digital business processes to be determined with a systematic approach.

The stages followed for this purpose are:

1. Identify the Goal Stage: Determining the purpose of the project.

2. Research Stage: Ranking and identifying key customer needs through multiple channels; semi-structured interviews, Gemba visits, in-depth interviews and surveys.
3. Situation Analysis Stage: Includes Customer Context Chart, Customer Process Model, Customer Voice Chart, and Affinity Chart. In these analyzes, customers organize their needs to reveal hidden, unspoken needs in the hierarchy tree.
4. Goal Analysis Stage: AHP, Quality Planning Table, Maximum Value Table, Functional Needs Matrix (CN-FR Matrix), Design Planning Table and Cost Distribution Table are used for evaluation.
5. Explain Stage: A successful website prototype was created for secondary packaging machine manufacturers and insights were tracked to compare with competitors' insights.

The cost analysis identified the assets of the QFD research and sustained the ten-year projection. The total cost of a ten-year investment had to be calculated over current Turkish market prices for products and services. Based on the MVT and cost analysis of digital services assets, a prototype website was designed, mostly with free versions of digital services. Prototype website cost includes website annual fee, domain and hosting cost, and e-bulletin subscription cost. Finally, the prototype website analyzes were recorded over five years and the predictions were compared with competitors during this targeted period. The results show that website design significantly affects visitor numbers and profitability, referring to improved service quality.

3.1.4. Data Analysis

This thesis analyzes the data for the QFD stages to follow as a systematic approach in Table 12. There are five stages to examine, as mentioned below. It is important to note that this part of the thesis consists of the Blitz QFD methodology.

Content analysis and data coding of the semi-structured interviews identified the customer needs of the CVT. Besides, the FRs of the thesis is explored and identified in this sense by descriptive data.

Related to extended research AHP and KANO were used as a quantitative method to determine the importance levels of the CN-FR matrix to meet customer

needs. The focus group and survey participants evaluated the process over face-to-face meetings and online survey forms.

Table 12: Data Analysis

Research Questions	Method	Data Collection	Data Analysis
Q1	Pre-Study	Semi-structured interviews Survey	- Content Analysis - Data Coding - Descriptive Statistics - Classification
Q1 and Q2	The Blitz QFD	Depth-interviews Observation Gemba visits Focus Groups	- AHP - KANO Analysis
	Downstream Deployments	Exhibitions Focus-group	Cost Analysis
Q3	Web Development	Findings of the study Literature	Document Analysis
	Prototyping	Google Analytics	

The focus group evaluated the DPT and AHP tables to understand the result of the Blitz QFD. Additionally, the visitor insights of the prototype website were evaluated for web development by document analysis.

3.1.4.1. Identify the Goal Stage

The first level in the research is to report the project purpose and customer segment in depth. This level should be organized in the following order:

1. An explanation of project goal
2. Determination of the specific customer segment related to the literature

It is vital to understand that this level of the QFD is like determining the ship's route before the departure from the harbor. It is essential to know where to go and how to reach the target, even if the conditions change.

The Project Goal Table helps to identify the success of the project. The headlines to be filled are goal statement, how measured, current level, target level, when, and who judges the success. After filling up the table, the critical project goal should be identified.

It is critical to understand which specific types of customers/stakeholders will help most to achieve the project goals, objectives, or deliverables since the success requires someone external to the product, service, or process which have to satisfy to be successful (Mazur, 2018: 45). Product design's purpose is usability, functionality, and appearance issues need to be understood. Indeed, the Customer segment table of QFD is a usable tool to analyze this situation.

Project goals identified in the previous stage should be written in the 'Project Goal' column in table. 'Customer Segment' is the market segment, demographic, or the stakeholders related to the project goal. The 'Who' column describes who uses the product/service/process, who else could use it, and who might use it in the future. The 'What' column demonstrates the use of the product/service/process. 'Where' explains where the product/service/process is used. Similarly, the other columns explain when, why, and how the product/service/process is used, respectively.

After filling up the table accordingly, the key customer segment for the project should be identified. There are several questions to identify key customers from different perspectives for a successful decision.

1. Can you satisfy all the customers with one product?
2. Do you have to satisfy them more than a competitor?
3. Could your competitor be in a different industry?
4. A subset of your market? Value chain? B2B or B2C?

It is essential to answer these questions as specific as possible. It is impossible to make all the customers happy, but a generalization is possible.

3.1.4.2. Research Stage

This second part is organized by semi-structured interviews, depth interviews, observations, and gemba visits.

A funnel-type semi-structured interview is a contact where the interviewer does not precisely follow a formalized list of questions. They ask for more open-ended questions, allowing for a discussion with the interviewee rather than a straightforward question and survey format.

"Go to Gemba" is a unique tool for basic QFD to gather the "voice of customer" information at the actual place where the customer is trying to do their jobs. The workplace is where the solutions, problems, opportunities exist, so a QFD project team needs to go and see the customer. It is critical to understand the customer's type and their situation carefully. It is essential to announce that wrong VoC will not create a solution to assure satisfaction.

Gemba helps us to learn what is not known. The process is divided into three steps, and specific tools and procedures are used for each step:

1. Organize the Gemba visit: It includes preparing a Gemba visit checklist to see what should be known before the visit. 'Who goes' demonstrates the selected team members going to the Gemba visit. 'What to prepare' identifies what should be prepared in advance, like pieces of equipment and gifts. 'Where,' 'When' and 'Why' explains the location to go to, the time of departure, and the activities to be investigated, respectively. Moreover, 'How' explains the equipment, tools, skills, and analysis prepared before the visit.
2. Execute the Gemba Visit: The Gemba visits are conducted according to Gemba visit table. (Table 24)
3. Record the data: It is essential to record all the data and processes for the QFD team.

In-depth interviews focus on the critical problems of interviewees on their operation. It is possible to say that the interviewees are also invited to discuss any other factors.

3.1.4.3. Situation Analysis Stage

After defining Project Goals, the third level describes the situation analysis in parts of the QFD for each critical customer segment. This part of the QFD includes customer process model, customer voice table, customer context table and affinity diagram.

The Customer Process Model explain the steps of the customer behaviours during the duty. It is maintained by the QFD team, which also includes sector professionals. Each participant describes own process steps from demand accuracy to the after-sales level. Then, the team makes a collective decision over the process.

The Customer Voice Table translates the customer's phrases into valuable data. The customers' tasks, situations, problems, and needs are identified, then the solution is explained accordingly as functional and design requirements.

Customer Context Table refers to the customer's hidden requirements which is observed by the QFD team. Documentation of observation and interviews, capturing the verbatims, and any available data from each stage of the customer is analyzed not to find out where they are now, but where they can be in the future (Mazur, 2018: 81).

Respectively, the columns represent who, what, where, when, why, and how the customer could be doing the process.

The Affinity diagram organizes the customers' needs to uncover how customers think about their needs structurally. The affinity diagram shows the structure of the customer's requirements. The needs are organized and grouped as primary, secondary, and tertiary needs.

3.1.4.4. Goal Analysis Stage

The fourth level includes Analytic Hierarchy Process (AHP), Maximum Value Table (MVT), Quality Planning Table, Customer Need-Functional Requirement Matrix, Design Planning Table, and Cost Deployment Table.

AHP helps customers prioritize their needs; therefore, the QFD team know where to focus on the efforts. It comes from the customer hierarchy diagram combined with the customer context table.

If the Customer Value Table is the "*heart*" of the QFD, the Maximum Value Table is the "*brain*" of the QFD analysis. As shown in Table 13, MVT is used to plan how to create value for the customers. However, the value depends on the development process, and the sides should be sure about the definition of each column in order to lead to a better understanding of tasks at the end.

Table 13: Maximum Value Table

Customer			Analysis		Design
			Functional Requirements		Design Requirement
Task	Problem	Needs	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...

Source: QFDI, 2017

MVT needs to be considered in two main parts, which are as customer analysis side and solution analysis side. The explanations of the columns are as the following:

- Task: Refers to the Customer Process model and defines what the customer is trying to do for the related need.
- Problems: Customer observes and determines the negative situation.
- Needs: The real benefits of customer required. It is positively stated and solution independent.
- Characteristics & Capabilities: It is related to the functional requirements, which refers to solutions for the need or "do" capabilities.
- Components: It explains the tasks or services to reach the product.
- Reliability: It is related to durability, life, failure modes, defects, etc.
- Maintainability: It contains maintenance, installation, etc.
- Usability: It mentions the ergonomics and ease of use to determine how well the design must work.
- Manufacturing Technology: It provides information about the technology the project manager needs for the product.
- Project Items: It is a planning chart of the manufacturing that explains the costs for the production, not in detail.
- Organizational Items: It is about the problems, opportunities, politics, morale of the organization and also mentioning about the staff of the organization.

The Maximum Value Table takes vital customer needs and guides them to the various dimensions of the design that must be aligned end-to-end to ensure quality and customer value (Mazur, 2012: 9).

Quality Planning Table (QPT) is a tool of QFD to consider the magnitude of customer problems, satisfaction, and competition. It is helpful to adjust customer need priorities to competitive factors from the customer perspective. It is critical to emphasize that organization, project, or competitive issues need to mention the competitive issues earlier. (Mazur, 2018: 103).

Several parts of the table include the current situation of need, hoping for a situation on behalf of the customer, and evaluating competitiveness factors. Plus, Kano determines the customer perception in case of realization of the quality planning. Kano model surveys can also help maintain target values for different market segments and product generations. QPT can be used with the Maximum Value Table, House of Quality, or Design Planning Table.

It is important to note that Kano categories can be predicted based on the difference in satisfaction between current and hoped-for performance levels, as explained in Table 14.

Table 14: The Measurement Used in Kano Survey

Performance Level	Selling Point	Kano
Very satisfied	Major	Exciting
Satisfied	Minor	Desired
Neutral	None	Expected
Dissatisfied		Indifferent
Very dissatisfied		Reverse
		Sceptical

Source: Mazur, 2018

The Customer Need (CN) and Functional Requirement (FR) matrix is also called as “Modern House of Quality” of the QFD. The House of Quality is a matrix comparing in detail just two columns from the Maximum Value Table (Mazur, 2018: 110). It is possible to explore each interaction of chosen vital customer needs, usually top four needs and their functional requirements, within a comprehensive matrix.

Customer Need (CN) and Functional Requirement (FR) matrix are developed with adjusted Customer Need weights from the Quality Planning Table into Functional

Requirements weights. This situation assists the improvement team in assigning their assets with significant customer value and competitive advantage.

Design Planning Table (DPT) is an optional matrix, which is a technical benchmarking of competition on FRs, and the purpose of the matrix is to set design targets to beat the competition (Mazur, 2016: 140).

DPT has several adjustments to explain in depth. There are four main sections in the matrix. In the first section, technical performance evaluation can be made on current and competitive products and indicate the target values related to the competitive threat, strategy, etc. The second section asks the respondent to judge technology to meet the target. There are three levels of judgment (major, minor, none) to evaluate in this section, the same as the technical advantage part, which is leveraging the technology for other products. In the fourth section, the Kano category evaluates the need based on customer interviews, Gemba, etc., to determine customer satisfaction levels of agreement (exciting, desired, expected, indifferent, reverse) with a list of needs to the investigation.

$$\text{Present Value of Costs} = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_T}{(1+r)^t}$$

Cost Analysis is conducted to calculate all the related costs of the project during its lifecycle, which occur throughout time. Concerning the essential rule of the economy that “a dollar today is worth more than a dollar tomorrow” due to the inflation and its buying capacity, the time value of the money should be considered while calculating the costs. Therefore, future values have to be discounted to the present value, and the discount rate has to be used for this purpose. If the costs received in any year in the future are expressed as C_t , where t stands for the year, and the project life is T years, the present value of the costs is the sum of all the annual costs that are discounted by the appropriate discount rate (r).

3.1.4.5. Explain Stage

The Blitz QFD results are kindly explained in this part of the thesis. Customer needs and Functional requirements declared to build a prototype website. It is essential to note that prototype website insights were recorded via Google Analytics for four years and the data transformed to the marketing knowledge to understand the customer after comparison with competitor analytics. Thus, this knowledge helps to determine specific QFD results at the end.

3.1.5. Limitations

Limitations of this research include the entrance access for employees' workplaces in companies and factories related to business privacy. The research is limited by the Turkish secondary packaging machine manufacturers, users, and locations, and this research can enhance with manufacturers of different countries. Another limitation is the budget and time pressure to complete the thesis.

3.2. RESULTS OF THE QFD ANALYSIS

This part of the study describes the results of the five QFD steps which are explained on previous part of the thesis.

3.2.1. Level 1: Identify the Goal Stage

3.2.1.1. Project Goal

The aspects of packaging machinery relevant to this research are identified mainly from the literature review of previously explained plastic and packaging sector sections: secondary packaging machinery type and logistical function.

This study's packaging part adopted Saghir (2004: 7) packaging types, and function as a theoretical baseline. The reason for adopting this framework is that it includes value-based reasons which dominate today's packaging and internet world.

However, it is critical to note that the thesis determines a value-based specific goal for a specific industry and comprises the entire sector.

Based on the above criteria, a QFD project goal table (Table 15) is developed, which the project goals are:

1. Designing a leading website for secondary packaging machines,
2. Satisfying customer needs with the website,
3. Facilitating online purchase decisions, and
4. Improving interaction with potential and existing customers to reduce marketing activity costs.

Before conducting the preliminary test, predefined project goals and customer segments were brainstormed by sector experts (team) who wanted to reduce the costs and increase the company's revenue. Fortunately, during the preliminary test, predefined project goals and customer segments were matched closely by the customer requirements. The needs are upgraded after the meetings. The company's critical success can be measured by survival, an activity couple that increases revenue and reduces costs.

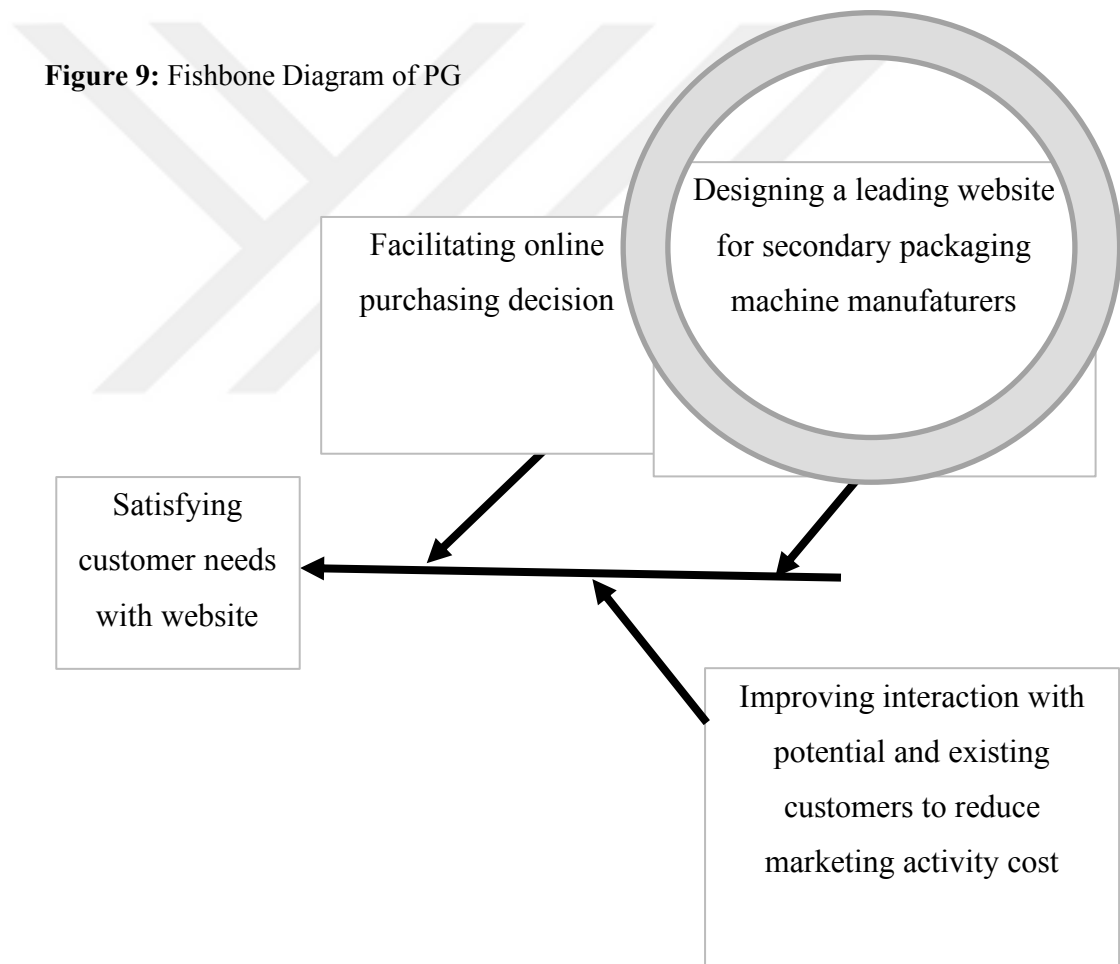
Table 15: Project Goal Table

#	Goal Statement	How measured?	Current Level	Target Level	By when?	Who judges the success?
PG1	Designing leading website for secondary packaging machines	Search engine's organic results	1 st , 2 nd , 3 rd pages of search engine	Organic search result's 1 st page	In 3 years	Marketing department
PG2	Satisfy customer needs by webpage design for secondary packaging machines	AHP	Unknown	5 likert 4	In 1 year	Marketing department
PG3	Facilitating online purchase decision	Online business revenues (B2B, B2C, calls, live chat)	Max. USD 3.000	USD 100.000	In 5 years	Marketing and Account department
PG4	Improve interaction with potential & existing customers to reduce the marketing activities cost	Marketing expenses	USD 10.000	USD 10.000	In 5 years	Marketing and Account department

PG-1 (Project Goal), which is designing a website for secondary packaging machinery manufacturers is determined as the most critical issue for the project's

success. It is clear that online customers can easily reach the website and are already shopping for low-cost products below USD 1.000. Due to the high prices of packaging systems and complex machines as USD 100.000, it is critical to sell these products to customers online. This transaction depends on many different factors such as payment, branding, delivery, and product functions. However, there are specific design requirements for secondary packaging machine manufacturers' websites to sell the high-priced products on internet. Additionally, designing a leading website improves interaction with potential and existing customers to buy high-priced products online, which can create customer satisfaction. Figure 9 lists the relation of goals by using a fishbone diagram.

Figure 9: Fishbone Diagram of PG



The project goal of selling high-priced products online takes approximately five years for significant changes, and it is easy to measure the consequences by the account and marketing departments, which means revenue and visitor numbers.

3.2.1.2. Customer Segment

A customer segment is developed based on Saghir's (2004: 25) technical packaging lifecycle. As predefined in chapter one, the packaging begins in manufacturers' production, and then the product is transported to wholesalers and retail outlets by carriers. Secondary packaging machine manufacturers are the critical point for the success of the project goal and product lifecycle. So, the team identified a customer group of study: food and beverage manufacturers who call last minute for an urgent need of secondary packaging machine. The data collection method included focus groups, surveys, interviews, observations, and gemba visits for a B2C website.

Moreover, the customer segment table explores why, when, who, where, what, and what else questions for unspoken needs in better communication concept of QFD. Table 16 can augment the process of presenting customers by adding information related to their product, service, and process—the column headers are modified for each project's needs. Information comes from marketing data and team brainstorming. When the team is brainstorming, they work on each column and search for the connection of the data, which is the situation that creates new segments as face-to-face customers are affected by website quality requirements and search for the same attributes in face-to-face meetings.

Table 16: Customer Segment Table

Customer Segment	Who	What	Where	When	Why	How
Manufacturers	SPM manufacturers	Shrink machine, Carton sealer machine, Strapping machine, Pallet wrapping machine	Manufacturer webpage (Factories, Home office, Headquarters)	Before any packaging machine electronic platform design	Complete the order decision process & make payment, generate marketing behaviour & customer satisfaction	Company's internet platforms, webpage design for packaging machinery, Face to face customers marketing behaviour
Manufacturers	SPM manufacturers	Shrink machine, Carton sealer machine, Strapping machine, Pallet wrapping machine	Internet devices, (Office environment, Home, Mobile etc.)	Online purchasing decision, exhibitons, search engine keywords	To make profit of sales on machines, gather information and complete order process with own customer	Determining keywords, search engine's artificial intelligence recognition
Manufacturers	SPM manufacturers	Shrink machine, Carton sealer machine, Strapping machine, Pallet wrapping machine	Online platforms (B2B and B2C websites, company webpage), dark factories	Editing Ads	Increase the revenues, facilitate purchasing procedures (logistics, paper works etc.)	Design marketing promotions with customer voice, decide for the product model and combine the webpage elements on machine's information page
Manufacturers	SPM manufacturers	Shrink machine, Carton sealer machine, Strapping machine, Pallet wrapping machine	Production	Just after demand appears	Improve the company's marketing channels	Trust on form of adresses and payment systems

In addition, competition is another issue to consider during customer segmentation. A competitor may be from another industry, such as a web designer, mechanical engineer, or marketing specialist. They all would have different perceptions. So, it is essential to include them all in the team. Nevertheless, it is sometimes not possible for all teams. In this case, literature improves the approach to have different perspectives on the solution. Different approaches will help to enhance product structure.

This thesis combines the different perspectives of packaging machines and material manufacturers who are also working in IT, purchasing, CEO, marketing, operator, designer positions of the interviewed factories. The customer segment is interested in shrink, carton sealer, strapping, and pallet wrapping machines on B2C

platforms. It is important to facilitate purchasing procedures (logistics, paper works, purchasing process, etc.) for a secondary packaging machine producer to website design as marketing promotions with the VoC.

3.2.2. Level 2: Research Stage

This level reports the different characterizations of the researches. The part is organized by semi-structured interviews, depth interviews, observations, and Gemba visits.

3.2.2.1. Semi-structured Interviews

Quality Function Deployment (QFD) is a unique technique to deliver value to customers efficiently. In today's and tomorrow's world, listening and understanding customer needs have a crucial role in e-commerce, just as regular business life. However, the packaging industry's academic research usually focuses on industries with engineering perceptions on literature because the human factor and environmental factor as a client or manufacturer perception are in the second plan in machine business. This point of view restricts the scope of the articles and perceptions of products. Therefore, the QFD technique is a valuable tool to go beyond this in-depth perception and various interviewee impositions.

Selecting a semi-structured interview as a primary method is appropriate for principal reasons; firstly, this thesis wants to discover and include all critical factors that impact participants' purchase intention behavior in the buyer context, and secondly, a semi-structured interview has the potential to overcome the reduced response rates of a questionnaire survey (Austin, 1981: 329). In this context, survey methods could not help realize this goal, while interviews could. Besides, the original QFD structure recommends the usage.

Besides, semi-structured interviews are conducted to document Turkish secondary packaging manufacturers from different industries and departments, even in the same organizations. This situation provides diversity to QFD. Interviews may contribute to the empowerment of the oppressed (Kvale, 2006: 497). For instance, the

purchasing department of an automotive company believes they need a shrinking machine, while the operation employee believes that they need a machine with a critical extra function. It is vital to listen to the different parts of the organization to explore the actual needs. "An interview is a conversation that has a structure and a purpose. It goes beyond the spontaneous exchanges of views as in everyday conversation and becomes a careful questioning and listening approach to obtain thoroughly tested knowledge." (Kvale, 1996: 6)

It is also vital to facilitate comparability by ensuring that each participant answers all questions. The participant cannot get assistance from others during the response (Bailey, 1987: 2) since some blue-collar employees are refrained from expressing their fundamental ideas alongside their administrative superiors.

In previous topics covered, the interview questions addressed in this thesis are as the following:

1. Have you ever bought a packaging machine?
2. Do you search for packaging machines on the internet?
3. What are the customer expectations on the secondary packaging machinery website?
4. What are the dimensions and attributes of the customer's voice for secondary packaging machinery?
5. How are these dimensions related to customer needs and consumer purchase Intention?

As shown in Table 17, semi-structured in-depth interviews are conducted with four experts in the sector, and expectations are determined without the order of importance at the beginning for pre-study.

Table 17: Packaging Company Profil

Business Domain	Established	Headquarter
Machine Manufacturer	1999	Izmir / Turkey
Machine Manufacturer	1995	Istanbul / Turkey
Material Manufacturer	1983	Düzce / Turkey
Machine Manufacturer	2012	Sakarya / Turkey

As for participants, there are four interviewees, one Gemba visit, and an observation, which are chosen from machine manufacturers, material manufacturers, beneficiary workers, supplier workers, and observations of the sector leaders. Interview questions are funnel type, and each interview took approximately 30 minutes. They are all held face to face with sector leaders.

Table 18: Profile of Interviewees

Age	Job titles	Gender	Export	Location	Company Name	Degree	Meeting
60	General Manager	M	Yes	Izmir	A	High School	Face to face
34	CEO	M	Yes	Izmir	A	Master	Face to face
55	General Manager	M	Yes	Istanbul	B	High School	Face to face
47	CEO	M	Yes	Sakarya	C	Master	Face to face
61	General Manager	M	Yes	Düzce	D	High School	Face to face
48	CEO	M	Yes	Düzce	D	Bachelor	Face to face

As listed in Table 17 and Table 18, two interviewees work in Izmir while one works in Istanbul, another in Sakarya, and the rest in Düzce. All interviewees had international business experience, and interviews were face-to-face.

Table 19: Age Categories

Group	30-50	50-70
Machine Manufacturer	2	2
Material Manufacturer	1	1

As for the gender of the interviewees seen in Table 18, all of them are male. Three of the manufacturers are under 50 years old, and the rest are over 50, the owners of the companies as in Table 19.

According to Table 20, educational statistics are shown that most of the company owners hold high school degrees. However, they tend to work with higher education levels, either material manufacturing or machine manufacturing. Also, family businesses are significantly dominating the sector.

Table 20: Education Levels

Group	High School	Bachelor	Master
Machine Manufacturer	2	-	1
Material Manufacturer	1	1	-

It is critical to note that pre-study interviews are pre-planned to guide the depth-interviews. As the result of the interviews shown in Table 21, the respondents have determined these factors as initial expectations:

Table 21: Determining Questions and Dimensions After Interviews

Questions	Dimensions
After-sales services	Service Quality
Tools to accelerate and facilitate access to the information searched	Ease of use
Rich data presentation and content	User friendly
High design quality	Website Aesthetics
Brand recognition	Reliability
Trust on payment systems	Security/ Privacy
Price on product	Payment
Social media usage	Responsiveness
Live web assistant	Interactive features

- **Service Quality:** One of the most critical factors that have a significant impact on trust in packaging machinery online business is explained by interviewee B:

"As if they were hastily stuffed and there is no detail. We do the following; I call from the contact information before buying, and I try to understand if the people in the meeting are corporate or not and if this purchase is going to be made by removing something from this conversation."

- **Security/Privacy:** Interviewee C explained that trust in payment systems as:
"It is 100% plus something. When you see it play in the decision-making phase, you are a little more relaxed. When you see the security code it calls 3d security, you are confident."

- **User-friendly:** High and precious media resource mentioned by another interviewee D:

"We watched the video first, and we found normal visual things, then we determined the machine that we were focusing on the most, and we watched the videos and decided to buy it."

- **Ease of use:** Interviewee A, who cared about the ease of use, has declared his opinion as:

"Photo quality, video quality, let me know about the company, but the main thing is the easy loading of the site. Ultimately, a site that does not open or long waiting reception makes it impossible."

Another respondent made a similar comment on that:

"In addition, companies seeking products should be easily found on the website, and orientation and links should work correctly."

- **Website design:** Another interviewee, C, mentioned the importance of an attractive design and design quality. For example:

"A site with a stunning look at the first opening can help me to spend some more time on the website."

- **Reliability:** Another two of the respondents D commented on reliability:

"Is the company involved in the visual and written press? If there is a company of familiar brands, we also pay attention to it. We can not shop at every site because we provide credit card information."

The second section asks respondents to assess their level of agreement (1 = strongly disagree; 5 = strongly agree) during the Interpack 2017 International Fair, held every three years in Germany. The survey is conducted with the executives of 46 international companies from all around the world. The average level of education of the managers participating in the research is master, and the average experience in the sector is 12 years. The order of significance obtained from this survey is examined with SPSS 21, and the most important criteria are listed in Table 22, where content analysis determines the most critical dimensions of the survey from the potential

customer point of view. Considering the "strongly agree" and "agree" results of the participants, the order of customer needs was determined according to the degree of importance.

According to these results, while the importance of after-sales service for the machinery industry stands out, detailed and rich information flow has emerged as the most critical need. High visual material quality is listed after the tools that will create ease in searching and accessing information. In addition, the reliability of payment systems and brand awareness have been determined as reassuring factors for the customer.

Table 22: Dimension Content Analysis

Dimensions	Category	Strongly Agree (%)	Agree (%)	Codes
After-sales services	Out- website	62.2	37.8	1. Delivery on time 2. Technical service 3. Live tracking information
Rich data presentation and content	In-website	73.3	22.2	1. References 2. Virtual assistance 3. Video quality 4. Picture quality
High design quality	In-website	53.3	35.6	1. Website load promptly on time 2. Impressive website design 3. Clear menu options
Brand recognition	Out-website	26.7	57.8	1. Corporate image 2. Association membership 3. Competitors recommendation
Tools to accelerate and facilitate access to Information searched	In-website	57.8	26.7	1. Mobil website 2. Map to location 3. Whatsapp 4. Technical details of the product
Trust on payment systems	In-website	22.7	40.9	1. Pay at the door 2. Virtual wallets 3. Bank co-operation with website 4. B2b payment

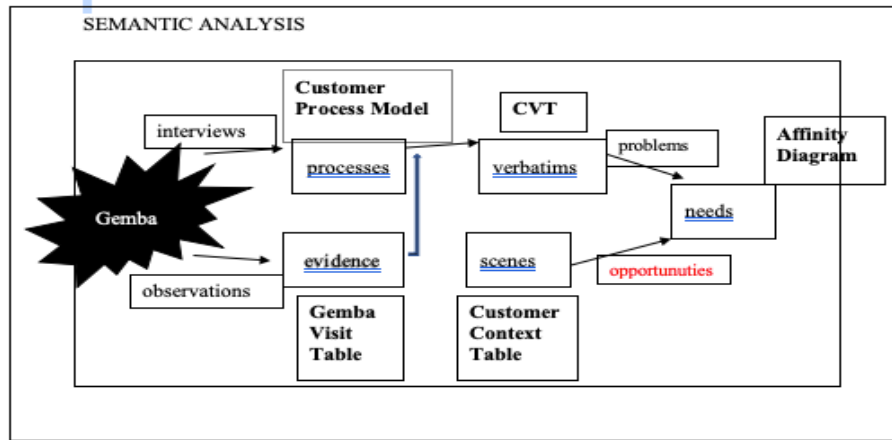
It is important to note that semi-structured interviews over national companies refer to the national criteria and questions, but the survey is applied to international companies. That situation aims to enhance the Turkish national market perspective and push them on International thinking. Plus, it has referred to online customer needs in general concept. However, the primary purpose is to design a prototype website in an early thesis stage to provide statistical evidence of the benefits.

3.2.2.2. Go to Gemba

In this part of the research, the Blitz QFD implementation is prepared using the QFD methodology on the website design of secondary packaging machinery manufacturers in Turkey. After the plastics and packaging industry literature research, semi-structured questions determined the depth-interview questions, and in-depth interviews were done at Interpack 2017.

This part of the thesis conducts in-depth interviews, Gemba visits, and observations of leading Turkish secondary packaging machine manufacturer companies from several industries such as agriculture, food, automotive, steel, and iron. The purpose is to explore the customer needs in the secondary packaging machinery industry and understand how primary customer expectations on digital services affect customer satisfaction and purchase intention.

Figure 10: Semantic and Situation Analysis



Source: Mazur, 2012

As shown in Figure 10, the customer needs to find out and then determine the dimensions with problem and opportunity scenes for the customer voice table (CVT). Although the phrase "voice of the customer" is widely used, most people do not recognize this as a QFD method. It is not only listening to the customer and recording what they say about the product or service, and it means analyzing what they do and why they do it, as addressed in the situation analysis.

The QFD team must go to the workplace to get the right VoC while doing their regular job. Gemba helps us to learn what is not known. The process is divided into three steps, and specific tools and procedures are used for each step:

1. Organize the Gemba visit: As shown in Table 23, the questions of who, where, what, when, why, and how are determined. It was essential to present the interviewee and bring a voice recorder and camera for respectful situations. Observation, interview, and checklist were methods to understand the customer.

Table 23: Example of Gemba Visit Log

Customer Segment	Who Goes	What to prepare	Where to go	When to go	Why go	How (methods)
Manufacturer	C.A.	Delight, VoC Recorder, Visit log paper, Camera	B.A.	September '19	Investigate Online purchasing Criteria	Observation, Interview, Checklist

2. Execute the Gemba Visit: It is vital to be there on time. Because it is already a kind of situation customer is not enthusiastic about.
3. Record data is logged: As can be observed in Table 24, Gemba visit table is a unique tool to teach lessons for the QFD teams. Each step or a smile may have different meanings. It is vital to examine these data. It is an effective way to understand customer profiles and learn how to behave them.

Table 24: Example of Gemba Visit Table

Interviewee: G.Ş. Contact info: xxxxxx@xxx.com.tr				Interviewer(s):		Cagan ARMAGAN
				Date and Time:		1.09.2019
				Place:		Manisa
Step , Task	Process Step, Tasks	Observations	Verbatims	Document, Data	Team Notes	Clarified Items
T1	Technical details on the website	They tend shopping over brand recognition	Technical details on the website (manual etc.)	Corporation website appearance	They like to work with the companies which they work before	They stick on companies in their portfolio
T2		Retaining customer				

Plus, The Gemba visit log provides information for the team even after a long period of time. Table 25 is the customer list of Gemba visits, which is only proceeded in the actual workplace of the customers.

Table 25: Customer List of Gemba Visits

Project:					
Key Project Goal:					
Key Customer Segment:					
GV	Customer	Location	Date/Duration	Gemba team	Lessons Learned to Improve Our Gemba Visit Techniques
GV 1	M.M.	Company technical service	1.10.2018-	Ç.A.	Must be in active work time
GV 2	İ.A.	Company meeting room	14.06.2018	Ç.A.	More listen, less asking as a seller
GV 3	G.A.	Company meeting room	20.09.2018	Ç.A.	Need to ask deep questions

GV 4	T.K.A.	Marketing department room	14.06.2018	Ç.A.	Increased explanation skill
GV 5	H.G.	Technical service	14.06.2018	Ç.A.	Must ask the same question with different ways
GV 6	D.İ.	Company meeting room	14.06.2018	Ç.A.	New duties create a desire to learn and explain for people
GV 7	Z.A.	Production center	29.08.2019	Ç.A.	Inspiring to talk to nearby machines
GV 8	S.Ç.	Purchasing manager room	27.08.2019	Ç.A.	Who likes to delay, getting cheating easier
GV 9	G.Ş.	Purchasing manager room	1.09.2019	Ç.A.	Some customers just get quotation because they need to make decisions with brand commitment
GV 10	T.A.	Repair and service manager room	3.09.2019	Ç.A.	Loyal customers tend to improve business with detaily communication channels
GV 11	O.B.	Factory production line	5.09.2019	Ç.A.	Gemba visits are an opportunity to do new business
GV 12	M.B.	Factory production line	4.09.2019	Ç.A.	Machine users have a different perception and good to know
GV 13	S.S.	Company meeting room	27.08.2019	Ç.A.	Customer need to listen by you permanently
GV 14	Ü.A.	Factory meeting room	5.07.2019	Ç.A.	Delivery of the spare parts are unique

This study conducts in-depth face-to-face interviews with ten experts from ten different companies, one observation, and 13 Gemba visits with nine different companies (commandite, corporate, limited) located in Turkey. The research is conducted with manufacturers who produce in Izmir. Customer profiles of Gemba

visits are listed in Table 26. Meetings for information flow have reached saturation point by taking similar responses, and a meeting was terminated.

Table 26: Customer Profiles of Gemba Visits

Interviews						
No	Gender	Interviewee	Company Type	Established	Degree	Job Title
1	M	Z.A.	Corporate	1952	Master	Factory Manager
2	M	H.G.	Limited	1999	Primary	Technical Manager
3	F	G.A.	Limited	1999	Bachelor	Purchasing Specialist
4	M	S.Ç.	Limited	2010	Bachelor	Purchasing Specialist
5	M	S.S.	Limited	2008	Bachelor	Technical Manager
6	M	M.M.	Limited	1999	Bachelor	Technical Manager
7	M	G.Ş.	Corporate	1969	Master	Technical Manager
8	F	D.İ.	Limited	1999	High School	Marketing & Sales Specialist
9	M	İ.A.	Limited	1999	High School	General Manager
10	M	Ü.A.	Corporate	2001	Bachelor	Purchasing Specialist
11	M	O.B.	Corporate	2001	High School	Operator
12	M	M.B.	Corporate	1986	Master	Operator
13	M	T.K.A.	Limited	1999	Bachelor	Marketing & Sales Specialist

Due to the QFD methodology, participants interviewed are chosen to work in positions of general manager, purchasing manager, and technical manager in Gemba visits. As can be seen in Table 27, there is only one observation in the thesis, who works as a packaging manager of a sports equipment producer company and exporting to all around the world. Education levels are mostly bachelor and high school, and the companies are mainly established before the 2000s. This situation reminds the increasing capacity of surviving companies in years.

Table 27: Observations

Observations						
N o.	Gender	Interviewee	Company Type	Established	Degree	Job Title
1	M	T.A.	Limited	1999	High School	Packaging Manager

It is the purpose of preliminary interviews to examine the customer process model, and it was a proper investigation of what customers say, do, and why to analyze their jobs. It is important to note that the thesis author made all interviews, Gemba visits, and observation's interviewer after long travels, meetings, and efforts in three years.

3.2.2.3. Depth Interviews

There were three main sessions in each depth-interview such as (1) Session 1 was for warming up the interviewees by talking about their job context. (2) Session 2 was for collecting demographic information, company history, including the participant's length of tenure in the company, the current machine's country of origin, and educational level, and (3) this session three is focused on the critical problems of interviewees on their operation. It is not difficult to say that the interviewees were also invited to discuss any other factors. One may suggest that various information technologies fundamentally alter the purchasing of packaging machinery, and the

participants intend to discuss a new approach. This situation creates an opportunity to lead and talk about electronic service quality factors.

Ten interviews lasted from 15 minutes to 60 minutes, with an average of 30 minutes. The interviews are conducted in Aegean, Marmara, and Middle Anatolia via face-to-face and audio-record. All of the observations, Gemba visits, and interviews were in the Turkish language with Turkish participants, as reflected in Table 28.

It took approximately five hours to transcribe and code each of the interviews from original audio to a written document and around 50 hours in total. After transcribing, the interviews, observations, and Gemba visits are translated into English. It is confirmed that the transcription did catch what the interviewees said accurately.

Table 28: Depth Interviews

Interviews						
No.	Gender	Interviewee	Company Type	Established	Degree	Job Title
1	M	T.T.	Corporate	1986	Bachelor	Purchasing Specialist
2	M	O.T.	Corporate	1979	High School	Technical Manager
3	M	U.T.	Commandite	1963	Bachelor	Purchasing Specialist
4	M	M.O.	Corporate	1994	Bachelor	Purchasing Specialist
5	M	M.K.	Corporate	1997	High School	Technical Manager
6	M	D.B.	Limited	1983	Bachelor	Factory Manager
7	M	A.B.	Limited	1983	High School	General Manager
8	M	T.Ç.	Limited	1995	High School	General Manager
9	M	T.C.K.	Limited	2012	Ph.D.	General Manager
10	M	S.K.	Corporate	1994	Bachelor	Factory Manager

The thesis used a priori coding approach. According to Boyatzis (1998: 29), codes are identified in three stages, such as (1) the code label and name, (2) the

definition of the theme, and (3) a description of how to know when they occur. This approach is an inductive method.

All transcripts were read and coded line by line in the prior coding process due to the start list of codes. According to Miles and Huberman (1994: 58), the theory is an essential source for constructing codes: "One method—the one we prefer—is that of creating a 'smart list' of codes before fieldwork. That list includes from the conceptual framework, list of research questions, hypotheses, problem areas, and vital variables that the author reflects into the study."

This depth-interview stage explores initial expectations of the secondary packaging machinery sector about the website's digital services and how customer expectations change due to the digital transformation level on the website concept. The research method is determined as the data collection with content analysis followed by the AHP process to prioritize the needs

3.2.2.4. Results: Demographics of the Participants

As presented in Table 29, this thesis is conducted on employees of twenty-four different companies. All of them are Turkish companies operating in Ceramic, Automotive, Textile, Packaging, Steel&Iron, Technology, Agriculture, Food manufacturing sectors in eight different cities of Turkey.

Table 29: Company Profile

Interviewee	Limited	Corporate	Commandite
24	13	10	1

To maintain confidentiality, the company names are represented as A, B, C, D, E, F, G, H, I, J, K, L, M, and N. Company A, B, and C Gemba visits and company An observation helps to maintain specific Customer Process Model (CPM) and critical concept of the process as a pre-study at the beginning. Afterward, interviews provide a depth analysis in the following stages. It is possible to view the face-to-face interview list in Table 30 below, in which the last interview is an observation.

Table 30: Manufacturer Company Interviewees' Profiles

No.	Interviewee	Company	Sector	Date	Location	Exp.
1	M.B.	D	Automotive	01.08.19	İzmir	8
2	O.B.	B	Packaging	05.09.19	İzmir	23
3	Z.A.	E	Food	29.08.19	Eskişehir	7
4	H.G.	A	Packaging	14.06.18	İzmir	2
5	G.A.	A	Packaging	20.09.18	İzmir	4
6	S.Ç.	C	Agriculture	02.08.19	Manisa	2
7	M.K.	G	Ceramic	03.09.19	Manisa	18
8	S.S.	N	Technology	27.08.19	Izmir	11
9	M.M.	A	Packaging	01.10.18	Izmir	12
10	T.K.A.	A	Packaging	21.09.18	Izmir	3
11	G.Ş.	M	Steel&Iron	01.09.19	Manisa	4
12	D.İ.	A	Packaging	14.06.18	Izmir	2
13	İ.A.	A	Packaging	14.06.18	Izmir	35
14	S.K.	L	Packaging	19.09.18	Izmir	13
15	M.O.	L	Packaging	19.09.18	Izmir	2
16	T.Ç.	K	Packaging	09.09.17	İstanbul	20
17	D.B.	J	Packaging	09.09.17	Düzce	15
18	A.B.	J	Packaging	09.09.17	Düzce	30
19	T.T.	D	Packaging	17.08.18	İzmir	7
20	T.C.K.	I	Packaging	20.04.18	Sakarya	8
21	Ü.D.	H	Ceramic	05.07.19	Afyon	23
22	R.B.	H	Ceramic	05.07.19	Afyon	6
23	U.T.	F	Textile	03.09.19	Manisa	12
24	T.A.	A	Packaging	15.09.17	İzmir	15

There are only limited and incorporated companies on interview lists from eight different sectors, which are estimated to make more than USD 250.000 turnover annually. It is possible to say that some of the companies are leading Turkish companies in their business, whose experience is between 2-35 years in the packaging sector. As shown in Table 31, all companies import and export the products to all around the world. All of the interviewees are working in the purchasing department except for the Gemba visits. As for the participants of the Gemba visits, they mainly have job titles as a technician or operator and all the workers are working in a manufacturer factory.

Table 31: Job Titles

Interviewee	Purchasing	Marketing & Sales	Operator	Technical Manager	Factory Manager	General Manager
24	6	2	2	6	4	4

Table 32 demonstrates the gender of the participants, in which they are primarily male. It is essential to mention the male dominance in the manufacturing sector. The interviewees' age profile is presented in Table 33.

Table 32: Gender Categories

Interviewee	Male (M)	Female (F)
24	22	2

The data shows that, on average, the interviewee's age is mid-age, which means experience required to get the positions of leading Turkish companies. The company owners are usually over fifty, which refers to the mind of Turkish employers to promote a worker as an executive job position that demands experience.

Table 33: Age Categories

Interviewee	20-50	50-70
24	16	8

The participant's educational level is a bachelor's degree on average, while only two master and one Ph.D. degrees, as presented in Table 34.

Table 34: Education Levels

Interviewee	Primary School	High School	Bachelor	Master	Ph.D.	Mean
24	1	8	11	3	1	Bachelor

As seen in Table 35, the data determines that an interviewee's experience level in the sector is 11.75 years on average. It is essential to note that a worker estimates to be a professional in a sector after around seven years and more.

Table 35: Experience Levels

Interviewee	0-10	11-20	20-above	Mean
24	12	7	5	11.75

Interviewee's of the study can be declared as professional, well-educated, and experienced employees in the packaging sector.

In previous topics and semi-structural interview results covered, the funnel type depth-interview questions that are addressed in this thesis are presented below:

1. What do you consider when purchasing a packaging machine over the internet?
2. How do you find the use of today's internet technology in the sector when making a purchase decision?
3. What is the effect of technology on sales and marketing for packaging machinery?
4. Which payment system makes the customer feel safe when shopping online?
5. What factors do you consider as an obstacle to the increase the trade? How can we increase opportunities with information technologies?
6. Where will internet technologies go topically in the future of the packaging industry? ERP? Virtual Reality?

In this thesis, due to professionals' limited time, I use the customer process model to understand customer behaviors before and after purchasing, which means the process is divided into seven steps after going to gemba.

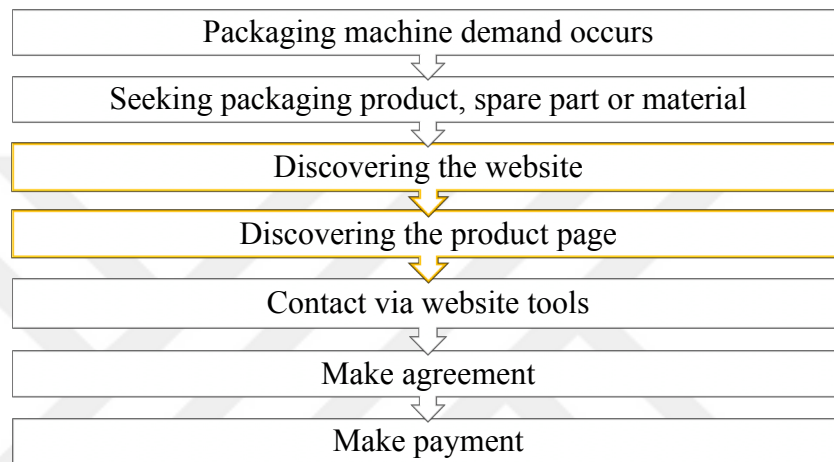
3.2.3. Level 3: Situation Analysis Stage

It is critical to note that the chapter of the thesis describes the situation analysis in parts of the QFD for each critical customer segment after defining project goals.

3.2.3.1. Customer Process Model

Each participant describes his own process steps from the packaging machine demand accuracy to the after-sales level. Then, the QFD team makes a collective decision over the process. There are seven process steps as below, in Figure 11.

Figure 11: Customer Process Model



The customer process model's first step is a packaging machine demand for this thesis, and this demand can be rejected or accepted by the management. Also, in light of the previous research, the repair, maintenance, and purchasing departments can directly order from the references they were satisfied with the purchasing earlier. The second step is about seeking a packaging machine product on the internet search engines related to the occurred demand. In this case, the website needs to be on the first three pages of the search engine or recommended directly by a satisfied customer. It is easy to measure these online customer behaviors via internet analytic tools and visitor statistics. Satisfaction can measure with qualified clicks, which means decreasing clicks but increasing the demand by professional customers.

The third step requires a gemba visit. The customer chooses the domain and explores the website. If things go right, the customer keeps on discovering the products; otherwise, low-quality materials or not existing products may cause a dislike, and customers leave the website. This situation is equal to leaving a customer from an

actual shop. On the other hand, satisfaction can be measured with direct contact with the customer in this step. Live chat is a unique tool for this purpose.

The most critical step is discovering the product page by the customer. The product content needs to cover customer needs, which is the aim of the thesis. If everything goes right from the customers' point of view, they ask for direct orders, contact, or demonstration. The negative result is a short leave of the customer from the website. It is vital to emphasize that these packaging products are not suitable for online purchases due to high costs and credit card limits. However, It is possible to facilitate the purchasing decision of the customer.

Finally, contact, agreement, and payment steps are followed, respectively. The lack of information is the most significant disadvantage of the sellers, such as missing contact info, no payment phase, etc. Another common purpose is to determine the details of each process step in this thesis.

3.2.3.2. Customer Voice Table

A total of 10 interviews, 13 Gemba visits, and one observation addressing these issues are developed to guide The Blitz QFD. The interviewee's true feelings and opinions are demonstrated clearly in face-to-face private meetings. However, some respondents can not reflect their true feelings and tend to control explanations in their open offices. Group orientations and brainstorming enhance information resources. Therefore, the meetings are stopped when answers get stuck in a natural frame.

After the interviews and Gemba visits, respondents determine their initial expectations and needs as:

- I want to access the information of new generation products. / Content – Updated information

Interviewees explain one of the most critical factors of updated information in packaging machinery online business:

"I need industry 4.0 integrated products (smart-PLC). "User-company contacts over machine supports my decision (PLC screen)."

"I am planning on the operation of the integrated machines on a single control screen (ERP, MRP, etc.)."

Smart-PLC machines may provide instant data for internet-connected devices. So, a central web interface transforms the data into information or knowledge by ERP systems. Another respondent mentions using TX Karsten ERP software to control from the one central screen. It is possible to process this data to create marketing information. For instance, a machine can deliver the machine material supply requirement to the material seller or user before it is over. This situation requires software and maybe integrated by artificial intelligence to process big data to knowledge.

- I prefer to use a website appearing on very initial pages of organic results without ads. / Usage – Fast access

Five of the respondents have mentioned that internet search engines are a valuable tool after the demand occurs. Nevertheless, there are several issues to take into consideration as a designer.

"I do not go more than 2-3 pages of search engine results to determine the alternatives."

"I search the product on search engines right after my purchase intention."

Firstly, the user is searching in the top ten pages of search engines. However, this is rarely happening. They usually visit only three pages of the search engine to contact. SEO (Search Engine Optimization) is a must-be settlement for a website. Also, SEO can be applied by a marketing advisor. Google Adwords is a popular application to commercialize the products on Google search.

Another respondent commented on a different perception, such as:

"I just skip the ads and focus on organic results."

"I think that organic results are corporate companies."

Organic search results determine by the Google ranking system, and there are numerous components to calculate the rank to be visible on the top pages of Google. The company needs to supply a reliable and remarkable service or products that users can confirm in the organic search list. Otherwise, commercial AdWords are visible on top, which payment is needed for. The packaging machinery customers mostly ignore the commercial ads and tend to click on organic search results. This situation persuades them to work with a corporate company.

- I can learn the functional features of products. / Content – Detailed information

An interviewee who cared about the information quality declared his opinion:

"I can view the technical specifications section."

The purpose of all respondents is to view all technical specifications such as power supply, dimensions, material use, etc.

"My purpose will match with machine operating."

Another respondent commented on viewing manufacturing phase pictures in manufacturing plants on the product page, and they need to be in high definition visual materials.

"I am confident that the manufacturing plant is Professional."

- It is essential to view the related product information with the searched product. / Usage – Easy search

One respondent expected to view the other related product to his search and compare it with different product types.

"I can view different product types of the manufacturer."

- Getting periodic newsletters affects my purchasing decision. / Communication – Informing tools

Receiving periodic newsletters is essential to learn about the new products, events, etc., and to be able to keep up with the updates of the sector.

"I want to receive information about the new products."

"I want to be notified about the events."

"Shout-outs are important for me."

- I want to access sector-based events on the website / Content – Updated information.

One respondent underlined the importance of participating in the events by stating that:

"We find our suppliers by participating in national and international fairs."

Therefore, it is vital for the customer to know and place and participate information of the events on the website.

- I need to be able to calculate the shipping cost before the payment. / Usage – Ease of use

Customers want to know the total cost when making an online purchase, but specifically to see the shipping cost separately.

"It is imperative for me to know the shipping cost."

- I need to search the products with product codes. / Usage – Easy search

For an easy and fast search, the customer needs to search the product that he wants to buy with the product code.

"First, I decide what to buy, and then I head to the internet. I search from the search engines."

"I should be able to easily find the machine I am looking for with the in-site search engine."

- I want to get quick answers to common issues on the website. / Communication – Informing tools

Customers need to follow all the purchasing statuses online and receive instant order information. Therefore, they must find and receive quick answers when dealing with a problem. An interviewee mentioned the need for quick answers:

"Unanswered e-mails and missed phone calls are a big problem for me and affect my purchasing decision."

- I want to navigate on sector-based categorized products' menu. / Usage – Easy search

Three of the respondents commented on the importance of easy navigating menu:

"I want to find what I am looking for easily."

"I would like to see easily defined links."

"I would like to see the menu categorization simple."

Easy navigation is vital for a packaging website. Primarily, it is essential to classify the same kind of machines solely on the main page for packaging machinery.

- I can explore products through visual materials and text / Content – Rich information.

Another three of the respondents commented on the look and feel:

"I want to discover high definition pictures."

"I want to discover HD videos."

"I can get an idea of the backgrounds of pictures and videos."

High definition pictures and videos are necessary, and the background of the pictures need to reflect the manufacturing plant, which provides competitive advantage:

"We watched the video first, and we found normal visual things, then we determined the machine that we were focusing on the most, and we watched the videos and decided to buy it."

- I want to have a short loading time of pages. / Usage – Fast access

Some of the interviewees made comments about website page loading time. It can be at different connection speeds due to different locations. It is essential to optimize, test, and monitor website main page loading time as a customer.

"I can surf on fast-loading websites."

"When I click on the domain, I need to view the website as soon as possible."

- I can get up-to-date information about the products. / Content – Updated information

An interviewee who cared about the ease of use declared his opinion:

"I am confident with up-to-date content."

Another respondent made a similar comment on that:

"In addition, companies seeking products should be easily found on the website, and orientation and links should work correctly and accurately."

- I am confident to know the brands of product parts. / Content – Detailed information

An interview mentioned the importance of knowing the brand of the parts of a product and spare parts to be sure about the product quality in total.

- I need to know the collaborated local producers. / Content – Company information

Another interviewee stated the importance of locally made products and spare parts. It is critical to reach the manufacturer instead of a trader for the customer decision process.

"I consider that locally made machine parts are more important than price."

"I want to contact with headspring of manufacturers."

- Knowing the professional experience of the manufacturer company of the website increases my trust. / Content – Company information

Another two of the respondent commented on reliability. It is essential to build a corporate image by reflecting the previous project's visual and informative materials on the website's "Corporate" section.

"My purpose is long-term co-operation."

"I consider reliable brand names."

At this point, quality certifications have a significant impact on reliability for customer perception.

"I am confident by the corporate image of the manufacturer."

"I recognize the corporate image by quality certification."

Besides, the written press mentions the product or company on the search engine; the client tends to trust payment.

"Is the company involved in the visual and written press? If there is a company of familiar brands, we also pay attention to it. We can not shop at every site because we provide credit card information."

- Reviews and comments about the product and company affect my purchasing decision / Content – Company information.

It is clear that customers consider Google reviews on the product searching process, and the interactivity impacts purchasing decisions. A respondent declared that a great brand name as the most used product positively affects purchasing decisions.

"I can buy the mostly using machine brand in my sector."

Another respondent said:

"I read Social Media comments on the product searching process."

"I want to read online comments about the company over electronic platforms."

- I can get all website content in an alternative language / Communication – Flexibilities to communicate.

A few interviewees consider an alternative language as a native speaker. Nevertheless, they think about a foreign language that creates an international trader perception. However, it is not necessary. An interviewee stated that:

"I need a language option for easy contact."

It is important to note that an interviewee wants a different language, especially English, which is a pivotal determinant to reach new markets as an importer and exporter concept.

- The website includes alternative contact options / Communication – Flexibilities to communicate.

It is clear that an easy-to-remember direct customer support phone number is critical. It may enhance social media tools such as live chat, video chat, live-stream

applications. Another interviewee mentioned the importance of social media in connecting people.

"Social media shortening the purchasing decision steps."

This situation decreases the purchasing decision steps for a customer.

- I feel safe myself through taking online assistance from a real salesperson / Communication – Live interaction.

The customers are usually under time pressure and need to use the time efficiently. The customer is undoubtedly told that they need an actual contact person before payment for sure. Virtual assistants will be the unique website tool of marketing professionals to deliver information.

"Not responding to e-mail or calls hurts my trust."

"I need to contact my manufacturer promptly."

"Live assistance over a website is an advantage."

- I prefer to have content-sharing channels. / Usage – Ease of use

Customers demand to contact and deliver the information to third persons with one click away.

"I can share product details directly on the platform via sharing icons."

"I can share product details over social media on the product page easily."

Besides, the interviewees tend to contact to learn location mostly. So, it is always a good idea to enhance location sharing tools and icons.

- Secure payment options improve my trust to buy online / Usage – Ease of use.

It is critical to emphasize that secure payment is the most critical need for the customer in the packaging machinery business due to over-credit card limit prices of the secondary packaging machines. Relatively, it is possible to categorize the products as below USD 1.000 and over USD 1.000 products in this concept. However, the customer considers making payment after receiving the products over USD 1.000, but the manufacturer needs to deliver the product after the payment where there is a conflict on the purchasing process. It is essential to make the customer feel comfortable with the payment process to increase sales online.

"I feel safe by security & privacy certifications of the website."

First of all, the customer tends to control security and privacy certifications of the website such as SSL certificate and then, they check the co-operated banks of the company on the website.

"I want to trust bank co-operation on payment."

"I trust the manufacturer, which is a significant bank partnership, more."

Secondly, large-scale business organizations, also recommended for all kinds of business, are preparing project charts to determine production phases of manufacturing products, including the payment phase. The customer needs to view the product before payment; indeed, as respondents said:

"I follow the MS project milestones to payment."

"I want to buy without price consideration if I see a world-class network to technical support and spare part supply."

Thirdly, they prefer to buy from a reliable brand. They make payment at the door, or a confirmation need universal conventional pool payment system is preferable, accessible on B2B auction websites. However, virtual money technology points to the solution for improved trust.

"The door payment system improves my trust."

"I can trust the universal pool payment system (B2B, B2C, C2C, etc.)."

"I can consider BTC payment."

- Taking clear instructions about/on using products on the website is very important. / Content – Detailed information.

An interviewee stated:

"I feel empowered to have clear instructions about the use of the machines."

Another participant demands the instructional manual on the product page to operate the machine independently.

"I want to know how to operate the machine on my own."

It is a technical specification to explain the technical substructure and the proper use of the machine after purchasing on the website.

- I can send and receive instant messages through the website. / Communication – Live interaction

An interviewee mentioned the importance of live interaction:

"Live assistance over a website is an advantage."

- I can get notifications about the existing & new products. / Communication – Informing tools

The term "*existing product*" is the product owned by the user, which impacts the knowledge shared between the company and the buyer. A respondent said:

"I pay attention to our technician's reports about the upgrades of the machine."

It is essential to notice that new product features, materials, or integrated tools to machine notification facilitate purchasing decisions and improve customer satisfaction. It may help develop a professional seller impression over the customer via newsletters, memberships, or shout-out applications.

Content analysis determines the most critical dimensions of the survey from the potential customer point of view, as in Table 36.

Table 36: Content Analysis

Needs	Coding	Dimension
Accessing the information on new generation products.	2x	Website content – Updated information
Up to date information about the products.	12x	
Accessing information about events (Exhibitions, fairs, conference, symposium etc.)		
Learning functional features of products.	26x	Website content – Detailed information
Taking clear instructions about/on use of products.		
Knowing the brands of product parts.		
Discovering the products with high definition (HD) videos.	36x	Website content – Rich information
Exploring the products with photos.	36x	
Understanding the products with text.		
Being informed about the professional experience of the company.	22x	Website Content – Company information
Accessing customer reviews and comments about company.	13x	
Being informed about collaborated local producers.	19x	
Taking online assistance from a real sales person.	27x	Communication – Getting live interaction
Sending and receiving instant messages through website	8x	
Getting periodic newsletters.		Communication – Informing tools
Getting quick answers for common issues (i.e. FAQ, E-mail).	11x	
Getting notifications about products.	2x	
Having choices for the language (no language barrier).	2x	Communication – Having flexibilities to communicate
Choosing from alternative contact options	28x	
Having well-known secure payment options.	19x	Usage – Ease of use
To be able to calculate the shipping cost.		
Having content sharing channels.		
Site accessed in very initial results in Organic SEO.	12x	Usage – Fast access to the page
Having short loading time of pages.	18x	
Navigating on sector based categorized products' menu.	32x	Usage – Easy search
Searching the products with product code.		

These needs are determined after the transformation of verbatims into needs. However, there can still be some current needs not declared by the customer but may be observed by the QFD team. These kinds of needs are explored on the customer context table.

3.2.3.3. Customer Context Table

It is essential to notice that CCT is not a case of existing products. It is critical to explore customers' scenes to discover new features, as in Table 37.

Table 37: Customer Context Table

No	Who	What	Where	When	Why	How	New Needs?
CC1	Secondary packaging machine manufacturer	A commercial of a shrink tunnel with disinfectant part	Google Adwords	During & after Covid-19	More hygiene of packages	With a disinfectant lamp	A shrink tunnel with disinfectant lamb commercial on Google Adwords
CC2	Food & Beverage Sector	A commercial specific to food & beverage sector	Social Media	In 2022	Reliability / Brand recognition	Stamp on the packages as "disinfected"	I want to view a machine for food & beverage with disinfectant function on web
CC3	Teritary packaging machine manufacturer	Pallet wrapping machine with disinfectant part	Website	In 2021	Hygiene for pallets	Spray disinfectant	I can use a pallet wrapping machine with disinfectant part

Due to the Covid-19 pandemic, opportunities and problems have changed for many companies worldwide. The collapse of well-known habits of humanity brought attention to a more hygienic lifestyle.

People still need food and beverage to survive. The food and Beverage sector generates about 45% of all packaging machine business in Turkey (Roy, 2017). Furthermore, it is vital to use packaging machines for food and beverage manufacturers, and they need to prove the disinfection process for the customers. The

manufacturers would consider a shrink tunnel or a pallet wrapping machine with a disinfection part. A stamp on the products as a hygiene certification would help sustain the manufacturer's sensitivity in the food and beverage industry. So, it is critical to produce visual materials about these products to use on the webpage. Also, the commercials about the product would be profitable for the manufacturer.

These needs are combined with previous needs to prepare an affinity diagram of the thesis.

3.2.3.4. Affinity Diagram

Customer needs are determined and eliminated in this stage with the help of the customer process model and customer context table. As indicated in Table 38, primary needs are appeared to be as:

1. Content
2. Communication
3. Usage

And secondary needs are:

1. Updated information,
2. Detailed information,
3. Rich information,
4. Company information under the primary need of content.
5. Live interaction
6. Informing tools
7. Flexibilities to communicate under the primary need of communication.
8. Ease of use
9. Fast Access
10. Easy search under the primary need of usage.

Table 38: Customer Needs Affinity Diagram

Primary	Secondary	Tertiary
Website Content	Updated Information	Accessing the information of new generation products
		Up to date information about the products
		Accessing information about events (Exhibitions, fairs, conference, symposium etc.)
	Detailed Information	Learning functional features of products
		Taking clear instructions about/on use of products
		Knowing the brands of product parts
	Rich Information	Discovering the products with high definition (HD) videos
		Exploring the products with photos
		Understanding the products with text
	Company Information	Being informed about the professional experience of the company
Accessing customer reviews and comments about company		
Being informed about collaborated local producers		
Communication	Getting Live Interaction	Taking online assistance from a real sales person
		Sending and receiving instant messages through website
	Informing Tools	Getting periodic newsletters
		Getting quick answers for common issues (i.e. FAQ, E-mail)
		Getting notifications about products
	Having Flexibilities to Communicate	Having choices for the language (no language barrier)
Choosing from alternative contact options		
Usage	Ease of Use	Having well-known secure payment options
		To be able to calculate the shipping cost
		Having content sharing channels
		Site accessed in very initial results in Organic SEO
	Fast Access to the Page	Having short loading time of pages
		Easy Search
Searching the products with product code		
Viewing the related product information with the searched product		

After listening to the customer's voice, the Affinity Diagram is contributed to the thesis by providing the necessary categorization by determining the needs. The determined needs are met with five people making purchases in the sector in an environment where silent and back-to-back reminders were made. The needs are identified in the first round continued to meet common denominators in the second round. The third round is understood under standard titles, and the needs are listed regardless of their order of importance. In the next chapter, an affinity diagram is

created with AHP (Analytical Hierarchy Process), and the importance levels of the customer needs are determined.

3.2.4. Level 4: Goal Analysis Stage

This part of the QFD stage defines the results of AHP, MVT, QPT, DPT studies. It is one of the most critical part of the study to understand the customer needs, functional requirements with CN-FR matrix (Modern House of Quality) which is crucial to explain for following stage.

3.2.4.1 Analytical Hierarchy Process

In this section, a survey is conducted to the purchasing department of specific companies to obtain information about the prioritization of customer needs for the packaging machinery website. The respondents have directly asked questions about the comparison of designated needs. The survey is conducted with the help of computer technology, and Google Forms has been used to send the questions to the target population and collect and save the data. Later on, the data gathered has been processed into helpful output.

In order to avoid the disadvantage of computer-assisted surveys, such as the little control of sample, respondents have not been chosen randomly, but the survey is sent to 30 individuals from the purchasing department of specific companies. The advantage of a computer-assisted survey is still used, where respondents did not have to indicate their names and surnames, which offered them more freedom, to be honest with their replies.

The structure of this survey involves the comparison of each designated customer needs in the same level with each other; meaning that primary customer needs (website content, communication, usage) are evaluated with each other, secondary customer needs under each primary need are evaluated with each other, and similarly, tertiary customer needs under each secondary need are evaluated with each other.

The scale used for the evaluation is set from 1 to 9, where 5 indicates equal importance and 1 indicates extreme importance of one customer need, whereas 9 indicates extreme importance of the other customer need. For instance, the first evaluation is between the primary customer needs of the website content, communication, and usage. The first question compares website content and communication, where respondents are asked to evaluate the importance of specified needs from 1 to 9. The meaning of the scale is as the following:

Q.1 Website content – communication

- 1- Website content is extremely more important than the communication
- 2- Website content is very strongly more important than the communication
- 3- Website content is strongly more important than the communication
- 4- Website content is moderately more important than the communication
- 5- Website content and communication are equally important
- 6- Communication is moderately more important than the website content
- 7- Communication is strongly more important than the website content
- 8- Communication is very strongly more important than the website content
- 9- Communication is extremely more important than the website content

All the designated customer needs are evaluated in that way by 30 respondents. After completion of the survey, in order to transform the data to valuable outputs first, a scale conversion is done. Secondly, AHP (Analytical Hierarchy Process) is applied to determine the inconsistent replies and accurate ratio-scale priorities. Lastly, the geometric and re-normalized means of the consistent replies have been calculated.

- **Scale Conversion**

The original likert scale use is from 1 to 9, where 1 indicates equal importance. Therefore, the scale used in the survey should be converted to the original scale in order to be able to continue with AHP and determine the inconsistent replies.

The following table demonstrates the conversion between the two scales.

Table 39: Example of Scale Conversion

Original Scale	Survey Scale	Meaning
9	1	Extreme
7	2	Very Strong
5	3	Strong
3	4	Moderate
1	5	Equal
1/3	6	Moderate
1/5	7	Strong
1/7	8	Very Strong
1/9	9	Extreme

(Example of conversion)

The corresponding number in the original scale will be used in the further calculations in Table 39, meaning that if the respondent has chosen 3 in the survey, the corresponding number in the original scale, which is 5, will be used in the calculations.

- **AHP & Inconsistency**

By using pairwise evaluation, inconsistency ratio and accurate ratio-scale priorities are determined.

Each primary need, secondary needs- under the same primary need, and tertiary needs- under the same secondary need are grouped between each other, which results in 14 groups at the end. The groups and their assigned numbers are as the following:

1. Website Content- Communication – Usage (Primary)
2. Updated information- Detailed information – Rich information – Company information (Secondary)
3. Accessing the information of new generation products- Up to date information about the products- Accessing information about events (Tertiary)
4. Learning functional features of products- Taking clear instructions about/on use of products- Knowing the brands of product parts (Tertiary)
5. Discovering the products with high definition (HD) videos- Exploring the products with photos- Understanding the products with text (Tertiary)

6. Being informed about the professional experience of the company- Accessing customer reviews and comments about the company- Being informed about collaborated local producers (Tertiary)
7. Getting live interaction- informing tools- having flexibilities to communicate (Secondary)
8. Taking online assistance from a natural salesperson- Sending and receiving instant messages through the website (Tertiary)
9. Getting periodic newsletters- Getting quick answers for common issues- Getting notifications about products (Tertiary)
10. Having choices for the language (no language barrier)- Choosing from alternative contact options (Tertiary)
11. Ease of use- Fast Access to the page- Easy search (Secondary)
12. Having well-known secure payment options- To be able to calculate the shipping cost- Having content sharing channels (Tertiary)
13. Site accessed in very initial results in Organic SEO- Having short loading time of pages (Tertiary)
14. Navigating on sector-based categorized products' menu- Searching the products with product code- Viewing the related product information with the searched product (Tertiary)

As shown in Table 40, pairwise evaluation for each reply is conducted to calculate the inconsistency rate, thus determining the inconsistent replies. For instance, Respondents 17 and 18 have replied to the questions in Group 1, which is website content, communication, and usage, like the following:

Table 40: Pairwise Evaluation of Respondent 17 and 18 in Survey Scale

	Website Content	Communication	Usage
R.17	3	4	6
R.18	7	6	8

The scale used in the survey is converted to the original scale. Therefore, the new replies are as the following in Table 41.

Table 41: Pairwise Evaluation of Respondent 17 and 18 in Original Scale

	Website Content	Communication	Usage
R.17	5	3	1/3
R.18	1/5	1/3	1/7

After the scale conversion, inconsistency rate and accurate ratio-scale priorities are calculated for the Respondent 17 and 18, respectively in Table 42.

Table 42: Inconsistency Rate and Accurate Ratio-scale

R.17	Content	Communication	Usage	<i>normalized columns</i>			sum	row avg
Content	1	5	3	0,652	0,556	0,692	1,900	0,633
Communication	1/5	1	1/3	0,130	0,111	0,077	0,318	0,106
Usage	1/3	3	1	0,217	0,333	0,231	0,781	0,260
	1,533	9,000	4,333	1,000	1,000	1,000	3,000	1,000
Inconsistency Ratio								0,03

R.18	Content	Communication	Usage	<i>normalized columns</i>			sum	row avg
Content	1	1/5	1/3	0,111	0,024	0,226	0,361	0,120
Communication	5	1	1/7	0,556	0,122	0,097	0,774	0,258
Usage	3	7	1	0,333	0,854	0,677	1,864	0,621
	1,533	9,000	4,333	1,000	1,000	1,000	3,000	1,000
Inconsistency Ratio								0,67

The inconsistency rate of the Respondent 17 is acceptable (below 0,2), whereas the inconsistency rate of Respondent 18 is not acceptable (over 0,2). Accordingly, inconsistency ratios of all the responses have been analyzed in order to understand whether they are consistent or not.

- **Final Consistent Results**

After the elimination of inconsistent responses, the geometric means of all the consistent responses in each group are calculated in order to calculate the central tendency.

Similar to the previous step, the inconsistency ratios of the geometric means are calculated in the AHP table. As expected, all the geometric means are found to be consistent (only the inconsistency ratio of Group 1 is seen to be more than the expected, which is 13%, but it is confirmed that the inconsistency ratio up to 20% is acceptable (Ikiz and Masoudi, 2008: 27).

As the final step, the customer needs are compared between each group and among each other in general in order to understand their level of importance and a hierarchy diagram with priorities is developed in order to understand the local and global ranks of each of the customer needs. The most important ten emerging customer needs are considered under the goal analysis of QFD in Table 43, 44, 45.

Table 43: Customer Needs Hierarchy Diagram with Priorities (Website Content)

Primary	Secondary	Tertiary	Local priority	Global priority	Rank
Website Content (54.5%)	Updated information (15.8 %)	Accessing the information of new generation products	39,5%	6,2%	7
		Up-to-date information about the products	48,2%	7,6%	4
		Accessing information about the events	12,4%	2%	15
	Detailed information (20.5 %)	Learning functional features of products	59,6%	12,2%	2
		Taking clear instructions about/on use of products	30,9%	6,3%	6
		Knowing the brands of product parts	9,5%	2%	16
	Rich information (12.5 %)	Discovering the products with HD videos	68,5%	8,5%	3
		Exploring the products with photos	21,3%	2,7%	11
		Understanding the products with text	10,2%	1,3%	22
	Company information (5.7 %)	Being informed about the professional experience of the company	59%	3,4%	9
		Accessing customer reviews and comments about company	28,3%	1,6%	17
		Being informed about collaborated local producers	12,8%	0,7%	27

Table 44: Customer Needs Hierarchy Diagram with Priorities (Communication)

Primary	Secondary	Tertiary	Local priority	Global priority	Rank
Communication (29.3%)	Getting Live Interaction (19.9%)	Taking online assistance from a real sales person	66,3%	13,2%	1
		Sending and receiving instant messages through website	33,7%	6,7%	5
	Informing Tools (4.6 %)	Getting periodic newsletters	22,3%	1%	24
		Getting quick answers for common issues	31,1%	1,4%	21
		Getting notifications about products	46,6%	2,1%	14
	Having flexibilities to communicate (4.8 %)	Having choices for the language	48,8%	2,3%	13
		Choosing from alternative contact options	51,2%	2,4%	12

Table 45: Customer Needs Hierarchy Diagram with Priorities (Usage)

Primary	Secondary	Tertiary	Local priority	Global priority	Rank
Usage (16.2%)	Ease of Use (10 %)	Having well-known secure payment options	58,3%	5,8%	8
		To be able to calculate the shipping cost	33,5%	3,4%	10
		Having content sharing channels	8,2%	0,8%	25
	Fast access to the page (2.9 %)	Site accessed in very initial results in Organic SEO	49,6%	1,4%	20
		Having short loading time of pages	50,4%	1,5%	18
	Easy Search (3.3 %)	Navigating on sector based categorized products' menu	32,3%	1,1%	23
		Searching the products with product code	43,8%	1,4%	19
		Viewing the related product information with the searched product	23,9%	0,8%	26

As summarized in Table 44, “taking online assistance from a real sales person” is the most critical attribute in website design, which is followed by the need of learning functional features of products.

Table 46: QFD Customer Needs Priority

CN	LOC AL	GLOB AL	RA NK	CUMM. PRIORITY	RE- NORM
Taking online assistance from a real sales person	66,3 %	13,2%	1	67,7%	18,0%
Learning functional features of products	59,6 %	12,2%	2	28,0%	16,6%
Discovering the products with high definition (HD) videos	68,5 %	8,5%	3	44,8%	11,6%
Up to date information about the products	48,2 %	7,6%	4	13,8%	10,4%
Sending and receiving instant messages through website	33,7 %	6,7%	5	74,4%	9,2%
Taking clear instructions about/on use of products	30,9 %	6,3%	6	34,3%	8,6%
Accessing the information of new generation products	39,5 %	6,2%	7	6,2%	8,5%
Having well-known secure payment options	58,3 %	5,8%	8	89,6%	7,9%
Being informed about the professional experience of the company	59,0 %	3,4%	9	52,2%	4,6%
To be able to calculate the shipping cost	33,5 %	3,4%	10	93,0%	4,6%

As seen in Table 46, ten critical customer needs are revealed, transferred to the maximum value table, and analyzed to transform functional and design requirements.

3.2.4.2. Maximum Value Table of QFD

Maximum Value Table (MVT) is the most important part of the QFD to explain the customers' value and results. The columns in the MVT table used in the thesis include the customer, analysis, design, build and delivery, cost, project, and tasks sections, which provide a deep understanding of the technology, components, requirements, and tasks to reach a well-designed product.

In the MVT, the section that finds solutions to the customers' needs is called the functional needs section. This section creates a design model based on the solutions analyzed in detail. The requirements for the design proposals for prototype creation are determined. This way, the project's cost, time, and staff schedules are settled. Eventually, the final tasks are decided in this context.

While creating the MVT, it is possible to see analysis, design, realization sections, and subtitles that lead to different needs and goals. These sub-headings from

a need to a goal can get combined. In other words, the tools, materials, and applications in the subtitles used while reaching a goal from a need can affect each other. By considering these features from an analytical point of view, the benefits can get combined with the tasks that will be achieved.

As reflected in Table 47, ten critical customer needs appear after the thesis's final analysis. They all are in a strong relationship with each other. However, the table takes vital customer needs and guides them to the various dimensions of the design that they must align end-to-end to ensure quality and customer value (Mazur, 2012).

Table 47: MVT in the order of Importance

CUSTOMER				
Segment	Tasks	Problems	Business Competitiveness	Needs
Food & beverage manufacturers	Online search for product and merchant brokering	Lack of trust due to harsh market conditions effecting customer decision	Customer need to feel human-human interaction	Taking online assistance from a real sales-person
Food & beverage manufacturers	Comparing the demanded machine with the existings	Information asymmetry/ lack of detailed information	Comparison and material recommendation algorithm	Learning functional features of products
Food & beverage manufacturers	Discovering the products	Slow internet connection and big size of HD videos	Videos in different resolution	Discovering the products with HD videos
Food & beverage manufacturers	Updated information feed	Scattered sources of information	Automated information update	Up-to-date information about the products
Food & beverage manufacturers	Communicating through the website	Customer is under the time pressure	Contact forms with multiple reason for reaching out	Sending and receiving instant messages through the website
Food & beverage manufacturers	Explaining the usage of the products	The process of packaging different products of different sectors	Preparation of machine maintenance, packaging and promotional videos separately in a professional environment	Taking clear instructions about the use of products
Food & beverage manufacturers	Developing products related to new trends	Staff capabilities to innovation	Autonomous PLC screens on machine with wireless connection	Accessing the information on new generation machines
Food & beverage manufacturers	Providing online payment options	Credit card spending limits prevent online purchasing of high-priced products	Internationally valid credit card payment acceptance over bank's website.	Having well-known secure payment options
Food & beverage manufacturers	Providing references	Misleading information	Providing information about previous projects, draws etc.	Being informed about the professional experience of the company
Food & beverage manufacturers	Delivery cost knowledge obtaining	Detailed information filling up takes time	Worldwide shipping integration to website	To be able to calculate the shipping cost

The thesis aims to discover critical customer needs and functional requirements without any budget limitations in this concept. The primary target segment is food & beverage manufacturers who need secondary packaging machines. There are four customer needs whose priority are 10% and above and are transferred into the functional requirements table (FR).

According to focus group classification, three main primary needs are listed as "communication," "content," and "usage" and findings listed in Table 48.

Table 48: Website Design Modules and Tasks of MVT

Primary Need	Web Design Module	Components	TASK
Content	- MIMO (Multiple input/output) control systems - Database	- PLC control with internet connection - Secure Password System - IBM Z-series Cloud Server	Using centralized information system
	- RSS integration - Embedded Code	Newsletter	Generating an integrated autonomous RSS feed for e-mail marketing
	- Electronic Catalogue - Database	- Content Management Systems (SaaS, IaaS, CMS) - CAD Draws of the machines - IBM Z-series Cloud Server - HTML 5	Collecting, filtering and publishing machine information
	- FAQ - Know-How videos	- Wireless IP Camera System (Zoom Function) - Secure Static IP Protocol	Obtaining the quick information links to share
	- HD Visual Materials - Personalized Photo and Video Slider	- Industry-specific HD Videos - Personalized Video Player 4K or 8K resolution - Categorized promotion videos	Video capturing and editing during different operations
	Corporate Page	- Recent projects - Company vision & mission with visual and writing materials - Introduction of the team members) - References	Publishing accurate information about company history
Communication	- Live Chat - Mobile Website Version	- Quick Content Sharing Links - Quick Purchase Buttons	Prompt link sharing of sales employee over live chat
	- Contact Forms - Membership System	- E-mail - Social Media - Anti-virus Software - Automated Message Delivery System for Transactions	Temporary quick reply of automated system and message delivery to responsible department
Usage	- Virtual POS - Cryptocurrency Payment Option	- SSL 3D Secure Payment System	Providing internationally valid payment service
	Internationally Valid Shipping Cost Calculator	Free Shipping Option	Maintaining and integrating easy shipping cost calculator integration to product page

The tasks created according to customer needs are summarized as above. This table of the thesis generates general perception over QFD findings.

It is clear that "taking online assistance from a real salesperson" is the first customer need with an 18% of re-normalized priority of AHP. The main task is "online search for product and merchant brokering" under the lack of trust due to the harsh market conditions, directly affecting customer decisions. Therefore, the customer needs to feel the human-human interaction during the shopping process. Instant reply to questions by actual salesperson creates a significant competitive advantage in the market. Basic mobile and computer infrastructure with the internet connection and web services may considerably benefit the company. This function can be enhanced with instant messaging, sending and receiving PDF files, video sharing, voice material sharing, live video chatting, and online meeting/instant meetings. It is possible to provide an instant reply with a chatbox. However, the chatbox content needs to be optimized after monitoring customer replies. Live chatbox responses are another research area for future work. The frequently asked questions (FAQ) section of the webpage can be an excellent component to decrease the work weight on expert salesperson responses. The system is upgraded every six months due to the changing customer needs to keep the live chat updated. The color, functions, specifications, structure of live chat can be re-designed every six months. There is a good possibility that recommending mobile technology to be fast and efficient usage of the live chat application. Of course, a well-designed live chat application over a website requires tools, application memberships, and services such as an e-commerce website, internet-connected computer, internet-connected mobile phone, integrated live chat application, mobile application of website service, and FAQ databases to the chatbox. As a result, an expert salesperson with computer skills needs to be employed by the organization. It is important to note that prompt reply of an employee over live chat with a computer or mobile phone is the most critical task of this thesis due to the customer's voice. The cost deployment section (Chapter 3.2.5.2.) will explain the expenses in detail.

The second vital customer need is prioritized as 16.6%, "learning functional features of products" under the threat of information asymmetry when comparing the demanded product with the existing one. It is essential to note that the feature requires

electronic catalogs, automatically created from the server due to customer preferences. The customer is demanding to understand all product features in-depth, such as the spare part brand names, machine specifications, working speed, power supply, warranty, guarantee time, carrying capacity, machine dimensions, machine working area dimensions. Research on learning functional features of the products suggests that specifications need to be viewed clearly. Automation needs to transfer the electronic catalog from the high-capacity servers. The content management systems (SaaS, IaaS, CMS) require an easy update of the servers. A new website design with HTML 5 is recommended for efficiency and performance. IBM Z series cloud servers are suitable servers for the process. The functional features can be enhanced with the machine's CAD drawings, and Solidwork can visualize these drawings by an MIS (Management Information Systems) employee. This employment position requires collecting, filtering, and publishing machine information skills for a successful business plan and execution.

Thirdly, the customer needs to "discover the products with high-definition videos," with 11.6% prioritization serving the purpose of discovering items. The slow internet connection and increased HD visual materials require different resolution options for the various internet connections and hardware speeds. The research suggests that customers need to see the products in well-designed HD videos and visual materials on the website. There are several essential issues to consider as hardware and software in this section because the technology usage and capacity level of the company determines the visual support of the website. 4K or even 8K graphic material resolution can impress the website's appearance for customer satisfaction. Personalized video player integration can increase the competitive advantage. For instance, Youtube player tend to recommend the competitor's video after the customer watch the video. HTML 5 is recommended as a unique tool for uploading videos on a website using the drag and drop method. In this part, apart from the resolution, it is vital to mention the importance of background and length of videos. Professional experience suggests a factory atmosphere with a transparent background. A translucent white background is the second option if this is not possible. Also, the participants suggest that various customers demand a video from their sector with the same or similar industrial products. These promotion videos need to be in different categories

such as set up, usage, repair, and maintenance. As interviews present the results on CVT, the customer is carefully considering the content of the visual materials.

Customers care about playing visual materials with popular applications such as POWR video and picture slider for a quick reply and a one-click purchasing button on a video. Besides, they even pay attention to the clothes of the operating personnel of the video. The operation staff's clothes should be clean with a professional attitude, one color, and the company logo, giving the customer the impression of a corporate workplace. Moreover, Canon EOS R5 with improved 8K recording device and POWR video gallery application are valuable tools for strategy realization. Of course, a machine operator (technician) and an employee for video capturing and editing (photoshop skills) would benefit the company.

Fourth, the research finding of "up to date information about the product" has 10.4% priority to reach updated information by customer. However, the secondary packaging machinery sector is unlikely to have scattered information sources as unspoken business secrets. Therefore, there is a slight possibility of automating the information via RSS (Really Simple Syndication). The sector has limited sources from NGOs and exhibitions. It is essential to get a membership for the remarkable sector association's newsletters. RSS update is a critical program to publish important information over website newsletter such as exhibition's event calendar. Auto-updating the information can process data and create an informing tool such as an e-mail or a live newsletter. It is vital to provide one-click membership to the newsletter and permanently add the new customers' contact information. One of the recommended employees in previous needs may organize the process because the system needs to repair and updated simultaneously, and it is essential to consider possible mistakes. In addition, the customers consider environmentally friendly machine concepts such as energy-saving machines. An E-mail marketing tool integrated into a website may cause unusual customer communication traffic. This situation is an excellent opportunity for customer satisfaction, retention, and repeat customers.

These four fundamental customer needs and functional requirements resulting from the AHP are transferred to the CN-FR Matrix and Design Planning Table. However, considering the limited sources of the QFD team, it is vital to recognize the

most critical ten needs and functional requirements in a secondary packaging machinery business environment.

The fifth customer need is "sending and receiving instant messages through the website," with a re-normalized priority of 9.2%. This need is firmly informing about the customer-company communication through the website. According to the situation analysis, the customer is under time pressure for manufacturing. The customer has little time to make a purchase decision and wants to start using the product as soon as possible. When we look at the websites in the sector, forms that take a long time to fill and try to determine the customer's needs are striking. Even if the customer fills out the form, the organization does not prefer this communication, where the feedback is low. Customers demand to reach out to the company to get a quotation about a spare part, machine, or material. The communication devices are computers and mobile phones. Primarily, a membership system can be a solution technology, and secondly, automated quotation software with anti-virus software can be the other service considering customers' privacy with a policy. Marketing and sales personnel with computer skills is enough for the operation. Additionally, an automated message delivery system between customer-computer and employee would significantly benefit.

The sixth customer need, "taking clear instruction about/on use of products," has a re-normalized priority value of 8.6%. It is mainly about the customer wanting to try the demo of the machine with their product. In order to meet this customer's need, first of all, the usage of the machines and the PLC screen menu content should be described to the customer. Usage instructions about the products play an essential role in customer trust. It is essential to inform that focusing on niche markets with specialized materials (soft, alcoholic, energy drinks, Turkish delight, biscuits, etc.) makes the customer want to understand the packaging process with their product. The process needs to be conducted with a live IP camera over secure HTTP protocol, which can be shared with the client over a live chat application. It is critical to note that live videos need to be recorded in the website archive to increase purchasing speed for possible next orders. This data can enhance with short know-how videos for the secondary packaging machines. According to CNs, the company needs to invest in technological infrastructure. The static IP, Arlo Ultra 4K UHD Wire-Free Security 2

camera system (indoor/outdoor), is the required component of the project. A marketing and sales employee with computer skills needs to obtain link-sharing technology to demonstrate the machine with a safe IP live camera. The zoom feature of the IP camera is a must be for the system.

The seventh customer call, "accessing the information of new generation products," has a priority rate of 8.5%, but it has an appended value that excites the customer and the manufacturer. Due to the impression that the manufacturer follows the new trends, the customer confidence in the purchased product increases. A significant relationship is observed between the increase in the technology level of the products and environmental awareness. One of the biggest obstacles is that the organization's ability to keep up with this development depends on emerging technology. The secondary packaging machines with autonomous PLC displays are available in the market. However, most of these machines do not have an internet connection. Data transfer between packaging machines and PLC screens with wireless connections found in new generation machines can provide control from a single-center about the features and capacities of integrated machines. MIMO (Multiple input/output) control systems are suggested for one screen control of multiple devices. Customers need aims to information gathering from the PLC screens about the manufacturing. This data can be transferred to the marketing department to understand the insights about the material usage of the machine. It may create a better technical service and sales opportunity for the machine manufacturer. However, a technician with PLC coding and operating skills needs to be hired to process machine usage data for production and marketing information. In addition, a secure password system for the PLC systems is an obligation, as well as system upgrade&maintenance every six months.

Related to the realities of business life, payment is essential for a business process, and the MVT table confirms this feature with 7.9% of "having well-known secure payment options." The main task of this duty is to provide online payment options for the client. It is vital to consider credit card spending limits to prevent online purchasing of high-price products. The sector firms usually do not provide online payment options. However, this thesis recognizes the importance of internationally valid credit card payment acceptance over the bank's website as a 3D secure payment

with SSL (Secure Socket Layer) certification. Comodo UCC SSL is a recommended certification for the feature that functional requirement refers to the online pay over virtual POS via mobile or computer. The client aims for safe and easy payment over a remarkable bank partnership. Due to interviews and Gemba visits, a significant bank partnership increases the customer's trust. The popular payment method for the companies is bank transfer in the market. Of course, there are several reasons to use bank transfer instead of virtual POS, such as credit card installment and high commission fees. The commission per transaction changes from bank to bank between 2.8% and 11%. Besides that, internationally valid payment service provided over a website has some barriers for the companies. It is not easy to get a virtual POS that is internationally valid related to security. The firm needs to have at least USD 30.000 export income from the last year for the Turkish companies. Also, the virtual POS has USD 95.88 price per year. That kind of process likely needs to lead with an accountant employee with computer skills. In the future, it is also possible to use cryptocurrency payment according to the customer's voice.

There is a good possibility that providing references to protect from misleading information will obstruct publishing information about previous projects and co-operated company names. CVT points out that "being informed about the company's professional experience," with the priority of 4.6%, plays a role in persuading the client to purchase. Introducing the company profile on the "who we are" is essential to publish accurate company background and references. In general section's title is recommended as "Corporate." This section can contain visual materials of the recent projects, reflecting the company vision&mission with visual and writing materials, introduction of the team members. The research reports that the direct link of the references from the company's website increases website traffic in SEO. CMS (Content Management System) is a unique tool that an MIS employee will use.

Finally, it has been revealed that manufacturers of secondary packaging machines want to know the shipping method and shipping cost of their customers "to calculate a ship that is prioritized as 4.6%. Although the free shipping option seems to be the best option due to the detailed information requirement of the cargo companies and the reasons for not getting results quickly, the possibility of realization in practice brings constant problems. As interviewer D. said, it was revealed that 40% of the losses

incurred in the sector last year were due to shipment. The products sent by the manufacturer with payment are received carelessly because the end-user has paid the fee, and in this way, the manufacturer's loss occurs. Therefore, adding an internationally valid shipping calculator to the website is an option, but the otherwise option allows the customer to view the regionally defined shipping rates conveniently on the product screen. In this way, while the loss of the manufacturer is minimized, the customer's purchase decision can be accelerated.

3.2.4.3. Quality Planning Table

In the Quality Planning Table (QPT), which can be seen in Table 49, the most critical four fundamental customer needs are considered, and online assistance from an honest salesperson is the primary element of the table. It is strongly related to the quick communication and way to distribute HD videos, product features, and updated information as fast as possible. It is an exciting service for the customers, according to Kano surveys as well.

It is vital to understand that prioritized needs by customers have different impacts on users. For instance, a customer need can be a “*must be*,” whereas the other need can be excited. The first fundamental need on the table is significantly related to the exciting information which dominates the other needs as a distribution channel. It is not possible to determine a time to reply for the customer. According to the analysis, the reply of the real-sales person needs to be as quick as possible. In other meaning, an early reply has a significant competitive advantage at all.

Table 49: Quality Planning Table

	Information							
Customer	Importance	Current Situation		Hoped for Situation		Competitiveness		Kano
Key Customer Needs	From Renormalized CN Hierarchy diagram	Magnitude of current performance level	Satisfaction with current performance level	Magnitude of hoped for performance level	Satisfaction with hoped for performance level	Competitive Choice	Selling Point Potential if hoped for level met	Prediction of Kano Category
Taking online assistance from a real sales person	18,0%	No reply by real sales-person in a short time	Dissatisfied	Reply by real sales-person in 10 seconds	Satisfied	Directed to e-mail form	Major	Exciting
Learning functional features of products	16,6%	Can't provide all the requirement of the customer	Neutral	Cad drawing, technical specification , brand names of machine parts	Satisfied	Registration to website as a member for details	Minor	Desired
Discovering the products with HD videos	16.6%	Low quality videos	Neutral	High definition pictures and videos categorized by sector-based	Satisfied	HD visual materials	Major	Expected
Up to date information about the products	10,4%	Lack of technology	Dissatisfied	Promotion of additional hygiene feature via e-mail marketing, RSS updates from search engines	Satisfied	Exhibition attendance dates and locations	None	Expected
	77,4 %							

As shown in above Table 49, high-value customer needs are taken, and a comprehensive evaluation of the target needs is made with the customer target group within the project according to the customer's satisfaction and the competitive characteristics of the product. In this way, the impact of different customer satisfaction

values and competitive conditions was evaluated together with the priority of customer needs.

When we examine the table, the needs of "taking online assistance with a real salesperson" and "learning the functional features of the products" come for, as a result of the AHP analysis, these needs, which were of importance in the first two places, continued to increase their importance in QPT as well. It has been determined that presentations such as responding to the customer as soon as possible for customer satisfaction and competitive advantage, detailed technical drawings of the product's features, specifying the brands of the parts used in the machine, create excitement and satisfaction in the customer. In addition, the speed of the live chat service in the market conditions and the up-to-dateness of the websites create a severe competitive advantage.

3.2.4.4. Customer Need – Functional Requirement Matrix (Modern House of Quality)

There are five steps to execute a proper matrix. First, Functional Requirements inevitably need to be extracted from Customer Needs. The customer needs are transferred into the rows, and the FRs are entered into the columns. Second, the QFD team maintains the numeral of relationship priorities. The team also reveals the corresponding power of these levels using AHP. Third, the team determines the CN-FR relationship while working row by row in a table. Then, the relationship's numerical symbol is entered into the cell. It is essential to consider Likert (0-9) scale in this section. Fourth, CN weights are calculated under the table. Moreover, the fifth stage is calculating the re-normalized weight of the FRs. In the end, a successful QFD matrix shows the contribution of the column elements to the row elements in Table 50 and, it is important to note new appearing relations on the matrix to find out new opportunities such as innovative technologies.

Table 50: Customer Need – Functional Requirement Matrix

Customer Needs / Functional Requirements	Priority	Instant Reply	Detailed technical specifications	High Definition visual materials	RSS Feed newsletter
		FR1	FR2	FR3	FR4
Taking online assistance from a real sales person	0,132	9	5	8	3
Learning functional features of products	0,122	8	9	7	5
Discovering the products with HD videos	0,085	9	8	9	8
Up-to-date information about the products	0,076	5	9	8	9
Absolute Weight		0,322	0,290	0,294	0,180
Functional Requirement Weight		0,296	0,267	0,271	0,166
FR Rank		1	3	2	4

Four fundamental customer needs are prioritized in the hierarchy diagram and written into the CN column. These needs are "taking online assistance from real-sales person" with a weight of 0.132, "learning functional features of the products" with a weight of 0.122, "discovering products with HD videos" with a weight of 0.085, and "up-to-date information about the products" with a weight of 0.076. Among the tasks in the hierarchy diagram, FR's corresponding to these needs is added. Six industry experts present their idea about the relationships between CN and FR. Finally, average results are calculated, and these experts are arranged to ensure a typical ranking for the relations between the columns.

In this way, the total weight of FRs for each need and weights of FRs resulting values are calculated with the help of relations between vertical columns of the matrix. Consequently, the order of importance of FRs is identified. As shown in Table 50, these results are turned out to be 0.296 for FR1, 0.267 for FR2, 0.271 for FR3, and finally 0.166 for FR4.

3.2.4.5. Design Planning Table

It is a technical benchmarking of competition on Functional Requirements. It is important to consider the factors from the gembas of vital customers.

Table 51: Design Planning Table

Information	Customer	Priority	Instant Reply	HD visual materials	Detailed technical specification	RSS Feed newsletter
			FR1	FR2	FR3	FR4
	Customer	Priority	29,6%	27,1%	26,7%	16,6%
	Technical evaluation of performance	Current	Real salesperson	Low quality materials	General specifications	Couple of shout-outs
		Competitor	Automation	HD materials	General specifications	No shout-outs
		Target	Reply in shorter time	HD materials with professional background	Machine parts details with CAD drawings	Automation of order and shipping process with RSS feed
	Relative to Competition	Judgment	Better	Worse	Equal	Better
	Technical Challenge	Judgment	Major	Minor	None	Major
	Technical Advantage	Judgment	Major	Major	Major	Major
	Kano	Survey	Exciting	Expected	Desired	Exciting

Table 51 shows the Design Planning Table (DPT), the competition evaluated over FRs from the CN-FR table. FR's weights are transferred to the DPT with priority weights. It is vital to inform that the table is designed by a machine designers from a secondary packaging machine manufacturer.

The technical performance and target emphasize the importance of short time reply by real sales-person which the current company is booming compared to other companies. This functional requirement is vital for the customer and an exciting situation for customer satisfaction. However, the company's second FR should be improved compared to others, which is an expected issue for the customers. The professional visual materials are behind from the sector. As seen on the Table 51,

visual materials need to be re-organized by the company, and the professional background of the materials may enhance customer satisfaction.

Moreover, the third FR is a desired issue for the customer and is not satisfying. CAD drawings of the machines, brand names of the machine's mechanical and electrical parts need to be declared on the specification section to provide customer satisfaction.

At last, the fourth FR, the RSS feed newsletter, needs to be upgraded as a shout-out process. It means that customers need to be informed by the company about new technologies, environmentally friendly machines, exhibitions, promotions, etc., via e-mail marketing. It is also an exciting performance for customer satisfaction. Lastly, the automation of the purchasing process may enhance the incomes such as direct e-mail of purchasing form, agreement, payment document, tracking information, etc.

3.2.5. Level 5: Explain Stage

This stage of The Blitz QFD study explains the four most important needs and functional requirements, cost analysis as a downstream deployment for the website design.

3.2.5.1. Website Design with Customer Needs and Functional Requirements

According to the applied QFD methodology, the customer needs are identified and classified, the importance levels of customer needs and functional requirements are determined, and the website design is established to meet the customer needs. The specified criteria are associated with customer satisfaction requirements. The creation of maximum value tables and cost analysis at the firm level is carried out during the comparison and evaluation of the visitor data of the prototype website.

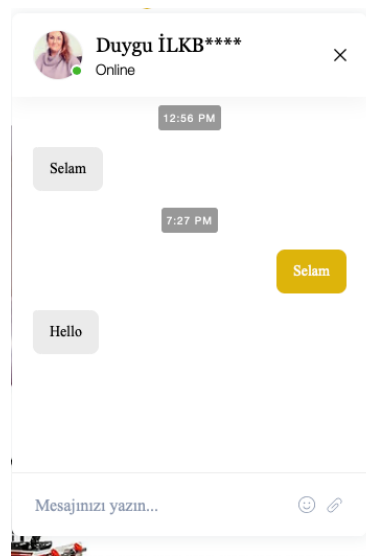
The findings support the idea and show successful utilization of customer participation over updated, detailed, rich information and easy navigation. However, these narratives are not the customer's needs. A focus group with six customers recommended an affinity diagram with individual brainstorming and then a collective

brainstorming to find out 36 real customer needs. This group classified the needs into primary, secondary, and tertiary customer needs.

In fact, AHP is used to determine the importance levels of the customer needs. A survey is conducted to the purchasing department of thirty specific companies to obtain information about the prioritization of customer needs for the packaging machinery website. The results show the most critical customers' needs, but only above 7,5% are listed as top four needs. These are "taking online assistance from a real-salesperson," "learning functional features of products," "discovering the products with high definition (HD) videos," and "up to date information about the products." Besides, the top ten customer needs are considered whose priority is above 3,4%.

Firstly, regarding the preliminary and regular study, live chat is the most critical customer need with a profile picture, video chat, memory of the chat application for customer relationship management, customer IP saving, and monitoring features. The salesperson can quickly share rich content about the products and inform the customer of shipping and payment options. If possible, free shipping should be provided to the clients. If free shipping is not possible over long distances due to large machine sizes, the shipping fee should be classified and seen by the customer according to the regions. As shown in Figure 12, a mobile application and live chat integration can enhance with a video call for urgent technical help.

Figure 12: Live Chat Design



As given in Figure 13, secondly, a comprehensive presentation of the machines and systems drawn with Solidworks to the customer, and if possible, playing the simulation of the machine park in the virtual environment will facilitate the purchasing decision over products.

Figure 13: Machine Park Simulation on Solidworks



Receiving the payment with the help of crypto money, which is one of the new technologies, will accelerate the purchasing process in a virtual environment. Invoice in the purchasing procedure, order form, warranty certificate, sign up for the website membership in the machine order process and sending it to the customer via e-mail stand out as essential requirements. As mentioned above criteria, it is essential to announce that the thesis' outputs will also be a significant source for the metaverse technology in the future.

Thirdly, as an example presents in Figure 14, it is essential to notify the customers about technology developments, new products, machine materials, spare parts, national and international fairs' schedules with the shout-out application is necessary for customers. Therefore, the selected information is instantly reported to the web designer with the intelligent agent who scans the internet in detail to transfer up-to-date information to the customer via e-mail instantly. The approved information is shared in the appropriate section of the website and transferred to the customer pool with the help of e-mail distribution. The environmentally friendly concept of the products is a type of unique theme. Especially in the Covid-19 process, the machines

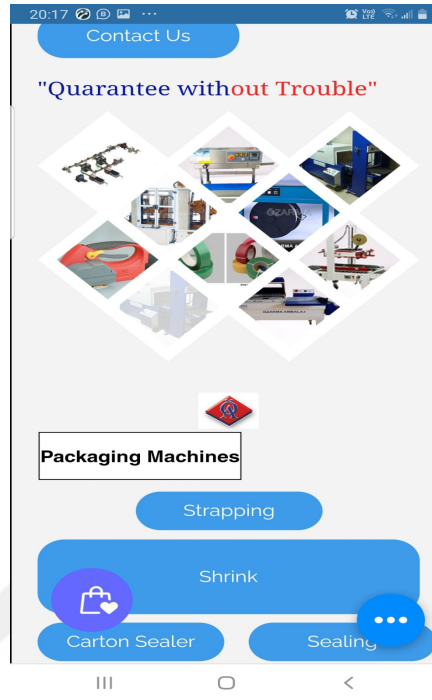
are environmentally friendly, energy-saving, and disinfecting will ensure they are one step ahead of their competitors.

Figure 14: Shout-out Example as an Up-to-date Information



Fourth, the customer, who aims for a quick response, wants to select the desired features of the product over the website and needs to transfer them from the company database to the online brochure. It is critical to declare that high-definition images, videos, and 3D images which can be played, watched, and customized by customers will provide a competitive advantage. The customer wants to see the product's packaging process according to the manufacturer's sector, and the visual materials should be classified according to the sector by shooting videos for the product. In addition, presentation with audio narration is requested in the videos classified as technical maintenance, use, and installation of the machine.

Figure 15: Mobile Website Overview



Related to the studies' research findings, contact touch is necessary for packaging machinery companies. This kind of contact can occur with a mobile phone, face-to-face, or computer technologies as a reference. The positive customer references need to be collected on the website. This situation also refers to the usage of the mobile application to feel the customers in permanent contact. A mobile application is also a sustainable way to inform the website's tools. Especially, updated new products and services need to inform the customer continuously. Besides of that, live interaction, online order, online payment, and technical help will have functional features of the application. The membership will be required for these specifications. According to web analytics, mobile devices were generated the half of the website visits which reminds the increasing capacity of mobile usage. It worth investing the mobile for the future. Figure 15 shown an overview of secondary packaging machinery mobile website as an example.

3.2.5.2. Cost Analysis

An evaluation period of the research, which is designing a website for secondary packaging machine manufacturers, is set as ten years since the thesis outcomes are believed to be valid for the next ten years. After the defined research life of 10 years, a new QFD must be conducted due to the changing environment and technology conditions based on the same literature outlined in this thesis.

While discounting the future costs to the present value of 2021, the financial discount rate, according to the Central Bank of Turkey, is set as 15,75% based on the average value in 2020.

In order to proceed with the analysis, some assumptions need to be made for the unknown factors. As seen in Table 52, these assumptions are:

Table 52: List of Assumptions and their Explanation

Variable	Assumption	Explanation
1 USD	8,28 TL	Current currency rate on 06/09/2021.
Financial Discount Rate (FDR)	15,75%	Based on the rate of Central Bank of Turkey in 2020
Annual wage of a qualified employee (inc. insurance)	USD 15.500	Based on the average wages in 2020
Annual wage increase	10%	Based on the average numbers in 2020
Annual increase of the exhibition prices	5%	Based on the author's own experiences

The costs are explained as assets, which include a Macbook Pro, mobile phone with an internet connection, Canon EOS R5, Arlo Ultra – 4K UHD wire-free security camera system and PLC screen; software, which is an E-commerce website and hosting, live chat application membership, IBM Z series cloud server 4*4, AutoCAD, Solidworks, POWR video gallery application, RSS, Static IP, automates quotation software and CMS; an agreement of 3D payment with central banks; employees of an expert in sales, an IT and a technicians with computer skills and finally the cost of exhibition attendance.

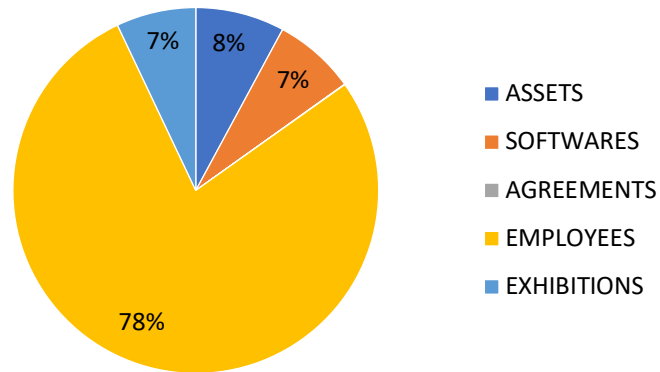
Table 53: Costs of the Project

COSTS/YEARS	NPV (15,75%)	2021	2026	2031
ASSETS	\$35.442,03	\$35.442,03	-	-
Mackbook Pro	\$2.415,46	\$2.415,46	-	-
Mobile Phone	\$1.026,57	\$1.026,57	-	-
Canon EOS R5	\$4.000,00	\$4.000,00	-	-
Arlo Ultra camera system	\$27.000,00	\$27.000,00	-	-
PLC Screen	\$1.000,00	\$1.000,00	-	-
SOFTWARES	\$35.949,07	\$6.115,29	\$6.115,29	\$6.115,29
E-commerce website & hosting	\$707,13	\$120,29	\$120,29	\$120,29
Live chat app.	\$1.128,68	\$192,00	\$192,00	\$192,00
IBM Z series	\$7.054,27	\$1.200,00	\$1.200,00	\$1.200,00
AutoCAD	\$10.434,44	\$1.775,00	\$1.775,00	\$1.775,00
Solidworks	\$7.612,73	\$1.295,00	\$1.295,00	\$1.295,00
POWR video gallery	\$3.174,42	\$540,00	\$540,00	\$540,00
RSS	\$917,05	\$156,00	\$156,00	\$156,00
E-mail marketing app	\$910,00	\$154,80	\$154,80	\$154,80
Antivirus program	\$352,71	\$60,00	\$60,00	\$60,00
Automates quotation software	\$440,89	\$75,00	\$75,00	\$75,00
CMS	\$398,57	\$67,80	\$67,80	\$67,80
AGREEMENTS	\$193,99	\$33,00	\$33,00	\$33,00
3D payment agreement with major banks	\$193,99	\$33,00	\$33,00	\$33,00
EMPLOYEES	\$397.311,91	\$46.000,00	\$74.083,46	\$119.312,15
Expert sales-person	\$133.876,84	\$15.500,00	\$24.962,91	\$40.203,01
IT employee	\$133.876,84	\$15.500,00	\$24.962,91	\$40.203,01
Technican with computer skills	\$129.558,23	\$15.000,00	\$24.157,65	\$38.906,14
EXHIBITIONS	\$35.411,09	\$5.000,00	\$6.381,41	\$8.144,47
Exhibition attendance	\$35.411,09	\$5.000,00	\$6.381,41	\$8.144,47
TOTAL	\$504.308,10			

As shown on Table 53, the cost of the assets only occurs when they are bought in the first year, 2021, since they can be used during the project life of 10 years, and not necessary to buy new assets. Similarly, no raise is applied to the software and agreements. However, a 10% of wage increase and a 5% of price increase for the exhibitions are applied to the related costs each year.

Consequently, the total cost of building and maintaining a website for secondary packaging machinery manufacturers for the project life of 10 years is calculated to be approximately USD 504.000.

Figure 16: Representation of the Each Cost Component Over the Total Cost



Accordingly, as it is shown in Figure 16, the biggest portion of the total cost is the wages of the employees that is 78%, followed by the assets with 8%.

CHAPTER FOUR

PROTOTYPE OF SECONDARY PACKAGING MACHINERY WEBSITE

This chapter is the final part of the thesis. After all the research and information gathering services identified and product explained, it is clear that knowledge will help for sustainable growth of the companies and contribute to literature as a customer-oriented and sector-specific research on packaging machinery. The Wix website editor was used to build the prototype design.

4.1. GENERAL WEBSITE DESIGN FOR SECONDARY PACKAGING MACHINERY

Consistent with prior research in the Blitz QFD, this study provides empirical evidence of a link between customer satisfaction and website design. CVT findings contribute to the literature on this sense. It confirms the results of previous researches and creates a link between the studied customer needs of this thesis and the existing literature.

While much is known about the type and power of the factors that influence the website design, little is known about the definition of specific website quality attributes such as font, background color, website functions, etc., for the packaging machinery business.

Considering the theoretical gap in the packaging machinery literature, it is important to define the attribute's specifications for secondary packaging machinery business website design beginning with customer interviews, Gemba visits, meetings, and observations like QFD research. Appropriately, the research findings correspond with those of similar studies of different dimensions of Lewis (2017), Meghani (2018), Rabideau (2018), Gerber (2020), Technopedia (2018), and Kotler and Keller (2006).

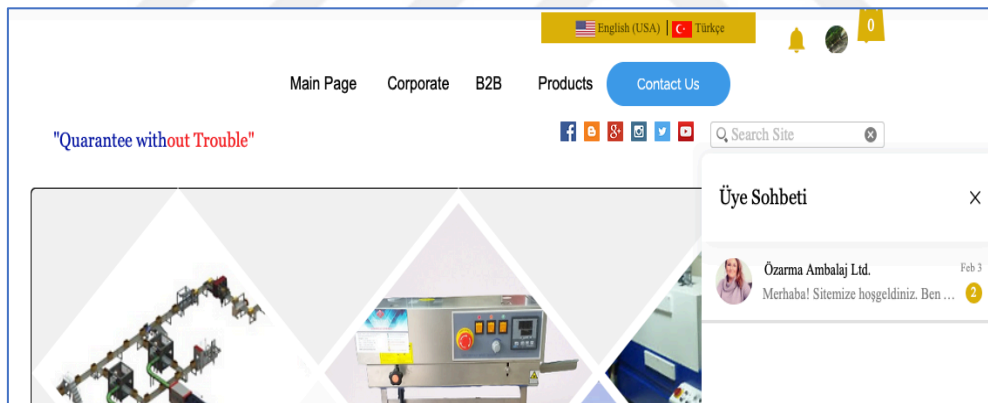
A secondary packaging machinery design quality positively influences customer satisfaction. In this case, it is necessary to explain the website prototype's basic requirements by considering the customer voices, as shown in Table 54.

Table 54: General Criterias for a Secondary Packaging Machine Website

Quality Attributes	Design Requirement
Font size	10x, 12x, 16x
Font	Arial, Courier, The New Times Roman, Verdana
Font Color	Brown, Black
Background color	Light Yellow, Light Blue, Light Green
Backgorund resolution	At least 1920x1080 and at least dpi 72
Pictures	Resizeability
Typesetting	Fluent Grammar
Search Option	At Right Corner, Advance Search, Keyword Search
Product Categorization	Indusrty, Machine Type, Sector Type
Mobile Website Availability	App Store and Google Play

According to Wong (2019), the most legible fonts were Arial, Courier, and Verdana. 16px is the ideal font size for main body text, which improves the paragraph's readability. Therefore, the font size used while creating the prototype in the main content areas is 16px as can be seen in Figure 17.

Figure 17: Mainpage



Lewis (2017) suggests that light yellow and light blue are the paper colors that are the easiest to read. Besides, sharp background/letters such as black and white are recommended to distinguish the letters easily. Even though yellow and black are versatile machine colors for the machinery industry, it depends on personal preferences as on Figure 18.

Figure 18: Colors and Backgrounds



As presented in Figure 19, typesetting is an essential part of typography, reflecting the author's respect for the audience by giving attention to the user experience. If the work looks good and feels right, the visitors will follow the work.

Figure 19: Typography

B2B - Business to Business...

We have a partnership with the leading B2B e-business companies in Turkey and in the World. In fact, Our brand image create remarkable fame even in abroad...

sahibinden.com

We have a significant co-operation with Sahibinden.com for 5 years in Turkey. Thanks to this partnership, Ozarma Packaging Co. reach the all regions and create trust and customer satisfaction

Alibaba.com
Global trade starts here.™

Our co-operation has been started with Alibaba.com since 2010. Specially, We export our shrink machines to the World with the power of Alibaba.com website. This situation provide global competition for our company.

n11.com

We have a 1 year co-operation with n11.com. Despite of that situation, We reach a significant growing in market. We are the first and leading company on

hepsiburada.com
TÜRKİYE'NİN EN BÜYÜK ALIŞIŞTIRMA MERKEZİ

Hepsiburada.com is the one of the biggest shopping website of the Turkey with also their partnership with ebay. Specially, Brand new machines has value in

Several interviewees suggest that for a more muted and corporate look of a website, the color scheme should bring together the shades of green, blue, and brown that combine both professionalism and reliability.

On the packaging machinery websites, photographs constitute the customer's first impression of the machine (Kliever, 2020). B2C websites require the background of the photographs to be used in plain white background. However, the background of

the photographs taken at the production location or company showroom can reply to the visitor's many questions about the company. This situation can be turned into an advantage for the company.

According to Rabideau (2018), the best website background image size is 1920 x 1080 pixels, and the ideal ratio is 16:9. The dpi (dots per inch) should be at least 72. It is critical to suggest keeping the file size as small as possible to minimize the website loading time. Furthermore, the resolution should be 1536 x 1024 pixels minimum for the packaging machine image print as given in Figure 20.

Figure 20: Product Page

A blue and white industrial packaging machine, the ARM-305 L-Type Sealer Shrink Packaging Machine, is shown from a side profile. It has a large blue hopper on the left, a white main body with various rollers and guides, and a blue output chute on the right. The machine is mounted on four legs with casters.

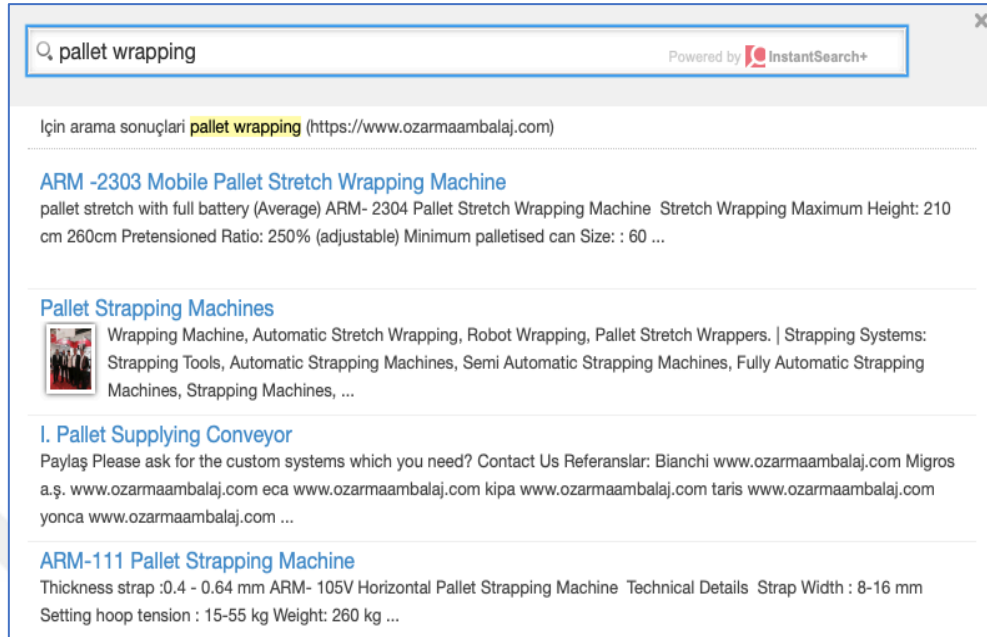
ARM-305 L-Type Sealer Shrink Packaging Machine

Technical Details

Power supply	: 380V/3Phase / 50-60HZ
Heater power	: 9.0KW, adjustable
Capacity(pack/hour)	: 400-600
Seal-cut time	: 0-3 seconds, adjustable
Max. sealing dimension (L*W)	: 450*350mm
Max. packing dimension (L*W*H)	: 450*350*200mm
Working efficiency	: 500-800pcs/Hour
Machine size (L*W*H)	: 2630*790*1440mm
Machine weight	: 220KG
Packing size	: 2070*870*1480mm

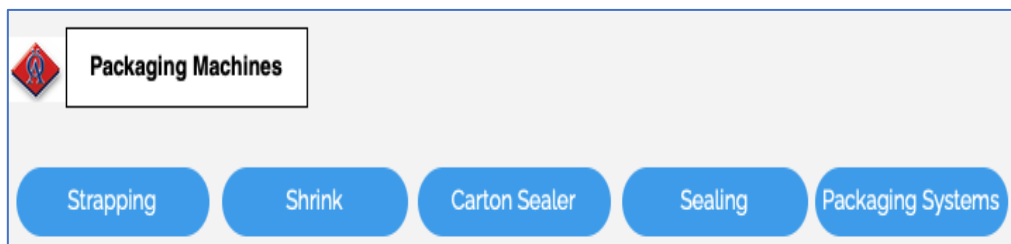
It is possible to see the results in Figure 21, an advanced search on a packaging machinery website that allows visitors to specify additional requirements than a regular search is another critical element. For instance, a shrinking machine can be with or without a tunnel, which helps refine the search. Additionally, keyword search plays a significant role as a navigation feature to find out the products on the website, and product codes and names are vital as a keyword.

Figure 21: Advance Search Tool



As shown on Figure 22, the product categorization is the placement and organization of packaging machines into their respective categories, such as machine type, function type, industry type, etc. It is helpful to categorize the products on the main page as an easy navigation tool. A packaging machine company needs to choose the product department. However, this process is complicated for the volume of products on e-commerce platforms.

Figure 22: Product Categorization



In this sense, Kotler and Keller (2006: 342) demonstrate five product models. As widely demonstrated in the literature, the product categorization is demonstrated as:

1. Core benefits,
2. Generic Product,
3. Expected Product,
4. Augmented Product,
5. Potential Product.

It is essential to note that core benefits for packaging machine product categorization are listed as sealing, shrinking, strapping, wrapping, and vacuuming. It is vital to suggest manual, semi-automatic, automatic, fully automatic classification as a generic product. Also, machine-machine integration creates combined products like cartooning and carton erector machines. This categorization type is suitable for packaging lines and systems.

Table 55: Website Substructure Design Criteria for SPM Website

Quality Attributes	Design Requirement
Website theme	Environmental friendly
Menu	Under Corporative Section, Certifications, Previous Projects, Referances, Company Information, Manufacturing Plant
Shopping Cart	Purchase History, Bundle Sale Recommendation, Flexiable Payment, Flexiable Delivery, Membership
Buttons	Downstream cross-link
Pictures	360 pictures, Professional background of machine such as in manufacturing plant or just White
Videos	Short and well-defined videos from different industries
Print Quality of Brochures	1536 x 1024
Delivery	FOB, CIF, Carrier Information
Payment	Debit cards, charge cards, prepaid cards, direct debit, bank transfers, digital wallets, phone and mobile payments, checks, money orders, cash
Warranty and Maintenance	2 years for production 7 years for spare part maintability under CE
Technical Support	Live chat, Direct link to know-how
Comparasion with similar products	Recommend material of use
Fast Loading Time	Below 10 seconds
Real Time Information update	Daily update of current information, bookmarks
Google Adwords Integration	Food&Beverage Industry Specific
Google Analytics Integration	Weekly Monitoring of performance
Error Check on Browsers	Safari, Explorer, Chrome, Opera, Firefox

Table 55 shows the general design criteria of website substructure for secondary packaging manufacturers' websites. The most critical elements are the

existence of a shopping cart, delivery and payment methods, warranty and maintenance agreements, and technical support that can be obtained directly on the website.

According to focus group classification, three main primary needs are listed as "communication," "content," and "usage" and relations of findings listed in Table 56.

Table 56: CNs and Website Design Modules

Primary	Secondary	Tertiary	Web Design Module
Content	Updated Information	Accessing the information of new generation products	• MIMO (Multiple input/output) control systems • Database
		Up to date information about the products	• RSS integration • Embedded Code
	Detailed Information	Learning functional features of products	• Electronic Catalogue • Database
		Taking clear instructions about/on use of products	• FAQ • Know-How videos
	Rich Information	Discovering the products with HD videos	• HD Visual Materials • Personalized Photo and Video Slider
	Company Information	Being informed about the professional experience of the company	• Corporate Page
Communication	Getting Live Interaction	Taking online assistance from a real sales-person	• Live Chat • Mobile Website Version
		Sending and receiving instant messages through website	• Contact Forms • Membership System
Usage	Ease of Use	Having well-known secure payment options	• Virtual POS • Cryptocurrency Payment Option
		To be able to calculate the shipping cost	• Internationally Valid Shipping Cost Calculator

This thesis table generates a general perception of the Blitz QFD results, and the findings are explained in details.

4.2. PROTOTYPE WEBSITE ANALYTICS AND A COMPARISON

The study findings provide the empirical evidence to suggest a website for secondary packaging machinery manufacturers over prototype website insights. Therefore, while developing this thesis, the OA Packaging Machinery Company website is developed as a prototype called Company X. The website was first built in 2018 as an essential website, lacking several dimensions, and later developed and improved by the thesis's outputs.

It is essential to remind that to the results of this thesis, the top four customer needs and functional requirements are determined as (1) Taking online assistance from an actual salesperson, (2) Learning functional features of products, (3) Discovering the products with HD videos and (4) Up to date information about the products. Therefore, the most significant difference between the old and the new version of the prototype website is the integration and existence of live chat application, technical details, HD videos and photos, brochures, fast loading, and easy search function. The new version of the website considered the prototype was published on 18 September 2018.

Google Analytics insights have been recorded from 2012 to 2021. In order to see the differences between old and new versions of the website, the recordings are divided and analyzed into two terms. The first term is between 1 January 2012 and 6 September 2016, reflecting the data of the old version of the website without integrating the thesis's outputs. The second term starts with the natural salesperson's live chat application between 7 September 2016 and 18 September 2020. Also, the competitor company Z insights are measured related to second term dates. These are the two main competitors of "Company X" from Istanbul in the Turkey and International markets. "Company Y" has been informed that they are not recording any analytics until now. The other competitor, "Company Z" analytics are mentioned in the part.

The new and old versions of the website are reviewed to evaluate the thesis comprehensively. The comparison shows an increase in the website traffic by 57,24% in two years period time. Besides, the visitors started to view 3,90 pages instead of 1,39 pages which means they explored the product pages in depth. Company Z, a significant competitor in Istanbul, has 3,22 views per session. Company Z has three

times more customer views than company X in the same period, but company X has more page views per session. Besides, company Z is located in Istanbul, which has clear advantages related to geopolitics, industrial, logistical, and population. It is essential to note that company X is reached a more suitable target customer profile than company Z on the website. This situation is one of the proof of the thesis's success.

As summarized in Table 57, this situation causes a 131,77% increase in average visit time with a -71,40% bounce rate decrease. 73,28% of old website visitors were leaving the website immediately, and the rest were spending approximately 1,04 minutes on the website. Besides, the new website guests spent 02,27 minutes on average with a 20,96% bounce rate. Company Z has a 02,13 average visit time per visit but a 47,90% bounce rate.

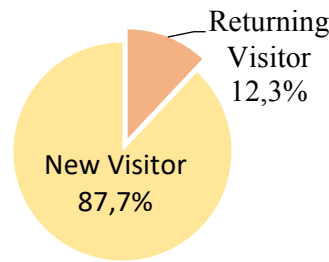
Table 57: Comparion of the Website X and Website Z Visitor Insights

	Company X 1 st term 2016	Company X 2 nd term 2020	Company X Total	Change (%)	Company Z 2nd term
Visitor	18.857	29.650	48.507	57,24	165.454
New Visitor	14.954	22.582	37.536	51,01	164.389
Page View	26.234	115.776	142.010	341,32	736.471
Page/Session	1,39	3,90		180,67	3,22
Avg.Visit Time (min)	01,04	02,27		131,77	02,13
Bounce Rate	73,28%	20,96%		-71,40	47.90%

However, half of the competitor visits maintain by paid and direct search with approximately 60% bounce rate, but organic search visits have a 37,67 bounce rate. This situation is another data to validate customer needs of the Blitz QFD, which is the leading position on organic search results, is a reason to create corporate company image to facilitate purchasing decisions. Indeed, Company X has a significantly reduced bounce rate than Company Z.

In this case, it is noteworthy that 48.507 visitors of a total visit contain 37.536 new guests. After the prototype website, the new visitor share is increased by 51% and reached 22.582. As shown in Figure 23, the prototype website has 87,7% new visitors and 12,3% returning visitors, which is a significant impact on understanding customer satisfaction over the website.

Figure 23: Visitors of the Company X



The competitor website has almost all visitors as new customers, implying that customers prefer to continue the relationship from different channels after the first contact. As the top ten visitor countries are illustrated in Table 58, it is clear that 81,25% of the total guests are from Turkey, with a 17,15% bounce rate. It is vital to decrease the bounce rate of visitors, but much to do it to a lower degree with the Blitz QFD final results.

Table 58: Visitor Information of the Company X/Z

Country	Visitors (f)		Visitors (%)		Bounce Rate (%)	Page/Session (min)	Avg. Visit Time (min/sec)
	X	Z	X	Z	X	X	X
Turkey	20.516	147.498	81,25	89,37	17,15	4,15	00.02.41
USA	1.132	4.184	4,48	2,54	58,9	1,87	00.00.41
France	348	697	1,38	0,42	63,48	1,84	00.01.29
Germany	298	806	1,18	0,49	16,31	3,76	00.02.07
UK	147	468	0,58	0,28	35,4	3,29	00.01.09
China	136	927	0,54	0,56	61,64	2,01	00.01.10
Russia	133	479	0,53	0,29	37,32	2,01	00.03.42
Italy	131	-	0,52		44,59	2,64	00.01.52
Japan	124	-	0,49		41,98	1,95	00.00.21
Brazil	123	495	0,49	0,30	83,06	1,30	00.00.09

According to visitor statistics, it is possible to see users from ten countries in the world's top twenty economies. This statistic shows interest in the products from various geographical locations, and company X and company Z have similar visitor international locations. It is essential to inform that countries are interested in the Turkish packaging market.

In this regard, an effort is made to deliver up-to-date information to the correct locations through e-mail marketing, carried out after 2018. For this reason, trade

undersecretaries of these countries and Turkey are contacted with the help of the internet, telephone, and e-mail. Furthermore, the shout-out application is activated, and potential customers are contacted. Today, this work continues with three e-mails per month. Although the results are not satisfactory, the study is turned into profit. It is a suitable way to keep in touch with potential customers abroad. In addition, shout-out content is prepared in English and Turkish about technical support, celebrations of special days, and machine and material content. As observed in Table 59, Istanbul, Izmir, Ankara, and Bursa significantly cover 60,14% with the 15.755 visitors, which is in the main research area of the thesis.

Table 59: Visitor Locations of the Company X and Z

City		Visitors		Visitors (%)	
X	Z	X	Z	X	Z
Istanbul	Istanbul	6.412	60.892	24,88	36,21
Izmir	Izmir	6.313	13.032	24,50	7,75
Ankara	Ankara	1.585	17.745	6,15	10,55
Bursa	Bursa	1.445	6.403	5,61	3,81
Antalya	Antalya	502	4.469	1,95	2,66
Boston	(not set)	475	7.323	1,84	4,36
Adana	Adana	444	6.332	1,72	3,77
Konya	Konya	350	2.853	1,36	1,70
Paris	Gaziantep	305	2.762	1,18	1,64

Both companies have similar visitor locations, and these locations have the most important industrial zones in Turkey. It is essential to explain that company X has several locations from abroad, which refers to the importance of the second language and international presentation to export.

As shown in Table 60, the organic search channel likely covers 16.297 visitors and 71,68% of all. Then, the direct acquisition channel has a significant percentage with 19,35%.

Table 60: Visitor Change of the Website after Prototype

Visitor Acquisition Channel	Total Visitors: 22,708		Visitors (%)	
	X	Z	X	Z
Organic Search	16.297	86.434	71,68	52,25
Paid Search	-	56.696		34,27
Direct	4.400	22,559	19,35	13,64
Referral	1.676	3.468	7,37	2,10
Other	261	2	1,15	-
Social	103	1034	0,45	0,63

It is critical to note that social channels have a common effect on website traffic which needs to develop a social media strategy to gain more traffic. Direct traffic usually refers to distributors and wholesalers who need to discover the product over the website for trading purposes. It is critical to announce that organic search customers are the one of the most important customer type for the companies.

As can be seen in Table 61, 18.529 visitors use the site using a desktop computer or laptop. These visitors spend an average of 00.02.45 minutes on the company X website, visit 3,85 pages during this time, and have a relatively low immediate abandonment rate of 19,73%. Six thousand seven hundred eighteen visitors with mobile devices spend 00.01.52 minutes, visiting 4,24 pages during this time with a 22,94% immediate exit rate, higher than desktop computers. In this regard, it is worth emphasizing that 58,85% of visits made with Android devices, 39,92% of visits with Apple, and mobile visits are increasing rapidly.

Table 61: Device Category

Device Category	Visitors		Page/Session		Bounce Rate (%)		Avg.Visit Time (min/sec)	
	X	Z	X	Z	X	Z	X	Z
Desktop	18.529	76.184	3,85	3,22	19,73	42,80	00.02.45	00.02.20
Mobile	6.718	89.270	4,24	2,43	22,94	59,45	00.01.52	00.01.10
Tablet	210	-	4,06	--	27,41	-	00.02.30	-

Even company Z has more visitors on mobile than desktop. It is critical to declare the importance of the mobile website for the future. It is critical to understand that paid search users usually prefer mobile devices due to narrow screens and limited internet connection time. Company Z mobile customers have a 59.45% bounce rate

and approximately 00.01.10 seconds visiting time below the prototype website analytics results except for visitor numbers. At this point, it is essential to note the importance of the professional visitors again. Visitor numbers are essential, but targeted customers are more critical of digital transformation.

When performing website viewing and usage tests, particular attention should be paid to the IOS and Android system. In addition to being much more practical than other devices, it is understood that the live chat with natural salesperson feature can quickly reach the information requested by the customer, visit more pages with the right direction during this time, explore the products, quickly leave the website and go to the next stage. It is anticipated that mobile usage will increase with the help of secure payment and information forms to be provided at this point. For this reason, it turns out that having a mobile version of the website is of great importance. This feature should continue by providing service to the customer with a mobile application and mobile subscription, as in the Blitz QFD outputs.

As summarized in Table 62, approximately 70% of the desktop callers uses Windows as an operating system, followed by Android and IOS.

Table 62: Operating System

Operating Sistem (OS)	Visitors		Visitors (%)	
	X	Z	X	Z
Windows	17.166	70.699	67,88	43,14
Android	3.954	61.243	15,64	37,37
IOS	2.898	27.719	11,46	16,91
Mac	985	2.737	3,89	1,67
Linux	233	842	0,92	0,51

It is vital to check the website in several operating systems and browsers and test the website's loading speed.

As shown in Table 63, Chrome and Safari are used by 21.507 visitants with 85,3% for company X and 114.927 visitants with 69,67% for company Z. It is noteworthy that Windows users with Desktop and Laptop prefer Google Chrome and Safari as browsers. It is required to test the system with Chrome and Safari before publishing.

Table 63: Browsers

Browser	Visitors		Visitors (%)		Bounce Rate (%)	
	X	Z	X	Z	X	Z
Chrome	18.558	114.927	73,60	69,67	18,2	-
Safari	2.949	25.532	11,70	15,48	23,77	-
Firefox	946	3.281	3,75	1,99	28,99	-
IE	866	5.536	3,43	3,36	20,95	-
Edge	698	2.535	2,77	1,54	29,93	-
Samsung Internet	368	5.710	1,46	3,46	22,58	-
Mozilla	335	1.320	1,33	0,80	93,73	-
Opera	218	1.372	0,86	0,83	22,47	-
Yandex	117	-	0,46	-	22,37	-
Android Webview	49	-	0,19	-	41,82	-

Surprisingly, Internet Explorer of Windows has 3,43% visitors by only 866 guests for company X and 5.536 guests (3,36%) for company Z, who discover that manufacturers are not using Windows in the workplace so often. Flash updates, live chat permissions, HD video players, picture sliders need to be adapted and become suitable to Chrome and Safari as browsers.

As shown in Table 64, it is critical to inform that some visitors leave the website between 0-10 seconds related to the live chat application with the agent because a real sales assistant provides information to the customer via Whatsapp, E-mail, or telephone call which is reduced the session time on the website.

Table 64: Website Visit Time Interval

Session Time Group (seconds)	Visitors	Page View
0-10	13.372	21,096
11-30	4.931	14,931
31-60	3.825	15,369
61-180	5.226	28,631
181-600	3.929	29,538
601-1800	1.921	16,944
1800 +	354	6,027

A real live chat assistant also provides the functional and technical features of the demanded product such as a brochure, video, picture, material brands, etc. Because of the nature of the packaging machinery customers, they usually tend to get all documents to inform the management level for confirmation. However, the other visitor group spends time between 61 to 600 seconds. This group of customers

discovered products after the assistance of a salesperson, or they reached the information on their own. There is no information provided from competitors for his section.

As shown in Table 65, screen resolution is a critical issue for the performance of the HD materials on the website. The website prototype is prepared for the desktop and mobile devices.

Table 65: Screen Resolution

Screen Resolution	Visitors		Visitors	
	X	Z	X	Z
360x640	473	10.236	16,04	21.74
375x667	451	6.700	15,30	14.23
375x812	189	1.859	6,41	3,95
414x736	182	2.586	6,17	5.49
412x846	171	2.178	5,80	4,63
414x896	167	-	5,66	-
360x780	152	2.377	5,16	5.05
393x851	140	2.193	4,75	4,66
412x732	130	2.321	4,41	4,93

There is no comprehensive data about the device resolutions, but 360x640 and 375x667 resolutions have the 31,34% for company X and 35,97% for company Z. This resolution mean an average mobile phone or a computer can easily view the website's features, such as Samsung A10, Note 8 and iPhone 6-7-8 etc.

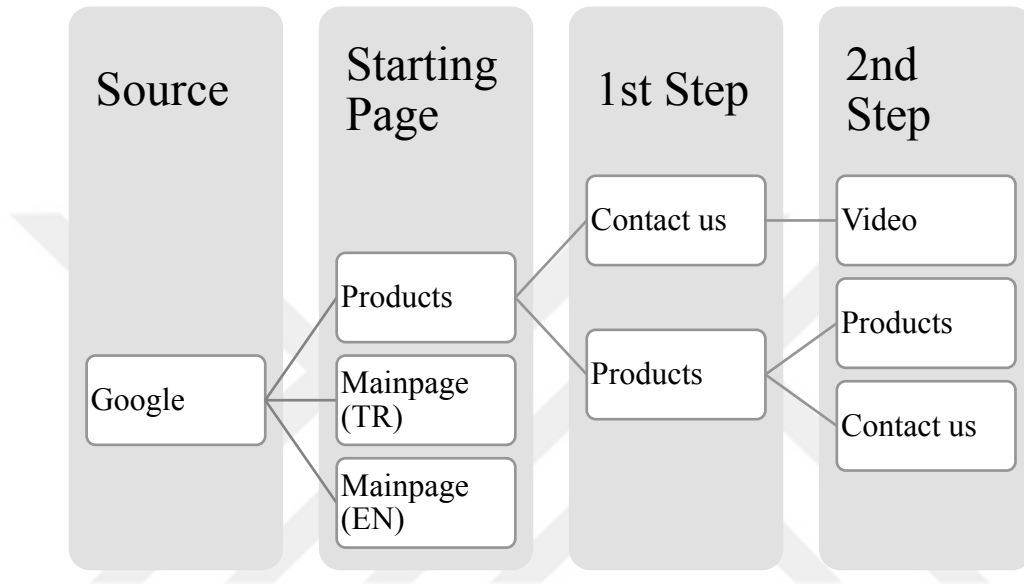
Table 66: Page Visits

Page Visits	Visitors	Visitors (%)
Mainpage (TR)	21.992	16,68
Products	16.225	12,31
Contact us	8.555	6,49
Stretch Wapping Machines	7.177	5,44
Shrink Machines	6.655	5,05
Mainpage (EN)	5.266	3,99
Sealing Machines	4.724	3,58
Strapping Machines	4.621	3,50
Shrink Guns	3.390	2,57
Carton Sealer Machines	3.355	2,54

As reflected in Table 66 and shown in Figure 23, when the customer visit stages tree is examined, 85% of the customer traffic for company X comes from Google. It

is possible to see that the website is directed to Turkish, English, or product section at the initial stage. The product section shows that stretch wrapping machines, strapping machines, shrink, and sealing machines are preferred. There is no data from competitors for Table 66, 67 and Figure 23 sections.

Figure 24: Customer's Website Visit Tree



As on Figure 24, the customer goes to the product page, and in the second stage goes to the communication page. In the third stage, it is seen that the visitor is directed to the products section again with the live assistant or salesperson.

Table 67: Visitor Acquisition Channel

Visitor Acquisition Channel	Increase on Visitors (%)	Decrease on Bounce Rate (%)	Avg. Visit Time
Organic Search	7,68	21,53	
Direct	9,74	103,17	
Referral	80,47	31,26	
Other	-98,72	335,62	
Social	22,92	20,61	
Total	10,38	-48,94	-11,78

As seen in Table 67, e-mail marketing shout-outs and live chat on the prototype website became active on September 18, 2018. When the statistics from this date until September 6, 2020, are observed, an increase is seen in the number of visitors

according to the referral channels. Especially referral experiences an increase of 80,47%. The reason for this is that up-to-date information is shared with the help of shout-outs. When examined in detail, it is determined that the duration of visitor stay on the website is increased by 9 seconds, and the time to leave immediately decreased by 48,94% with the live assistant feature.



CONCLUSION

As electronic commerce activities are widely used, SPM manufacturer companies have begun to organize their websites more effectively. It is vital to note that the customer need and functional requirement analysis are determining the sector-specific dimensions for SPM website design. This thesis is a type of unique research that deals with the concept of a sector-specific approach for the secondary packaging machinery (SPM) websites which is the most basic interaction tool of companies with their customers. “Content”, “Communication”, and “Usage” are the extended dimensions of the pre-study by providing empirical evidence of the link between website design and the company's future vision.

The Blitz QFD research is applied in the main industrial zones of Turkey, which represents the whole country by providing a significant perspective. The study organized the fundamental research with a comprehensive approach with the Blitz QFD, including the cost, content, design, technology components, prototype, and web analytics of stakeholders and employees for the coming years.

It is essential to design a website that meets the customers' needs and functional requirements with customer-oriented outputs which are identified as reliable and accurate information with fast communication modules. This study explores and determines the customers' needs that have the highest rank for SPM manufacturers' websites as "taking online assistance from a real-salesperson," "learning functional features of products," "discovering the products with HD videos," and "up to date information about the products." It also identifies the functional requirements for SPM manufacturers' websites which are “Instant Reply”, “Detailed Technical Specifications”, “High Definition Visual Materials,” and “RSS Feed Newsletter.” It is crucial to make periodic maintenance and updates to the website desing and digital services.

The website of the prototype is showed that the chatbox design for the industry increased the number of customer visits and reduced the bounce rate of the website immediately. Compared to the rival company website prepared by digital agencies, its effectiveness has been proven by the increase in the number of visitors and revenue.

The findings of this thesis can be used as a source for the future applications such as visual augmented reality, artificial intelligence, and virtual universes for the SPM sector. The regular website may be a marketplace that can be developed for many sector companies or the platform where commonly used resources are managed, e.g. product definitions, technical datasheets, and HD visual materials. In the future, this research can be expanded to cover Turkey's export countries to increase the impact and scope of the research. A website can be designed, and commercial success can be achieved by competing with local markets in the logic of drop shipping with affordable shipping rates and secure payment options over international B2B market places. In addition, the website design factors have similarities to enhance for the other sectors and industries to increase the service quality.

BIBLIOGRAPHY

Achilias, D. S., Giannoulis, A., Papageorgiou, G. Z. (2009). Recycling of polymers from plastic packaging materials using the dissolution–reprecipitation technique. *Polymer Bulletin*. 63: 449-465.

Akao, Y. (1990). *QFD: Integrating Customer Requirements Into Product Design*. Cambridge MA: Productivity Press. 65-70.

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.

All4pack. (2016). *Packaging: Market and Challenges in 2016*. <https://www.all4pack.com/content/location/136757>, (28.09.2019).

Arıkan, A. (2011). Ambalaj Makineleri. *Ambalaj Bülteni*: 42-46.

Atikah, E. R. (2018). Designing E-Commerce Website as Efforts to Improve the Quality of Interface Design on Online Store using Quality Function Deployment Analysis. *International Journal of Innovative Science and Research Technology*. 3(4): 690-697.

Austin, E. K. (1981). *Guidelines for the Developing of Continuing Education merings for Nurses*. New York: Appleton-Century-Crofts.

Bailey, K. D. (1987). *Methods of Social Research* (Vol. 3). New York. The Free Press: 1-46.

Barutcu, S. (2006). Quality Function Deployment in Effective Website Design: An Application in E-store Design. *Business Faculty Publish*. 7(1): 41-63.

Bix, L., Fuente, J. d., Rifon, N. J., Lockhart, H. (2004). The Packaging Matrix: Linking Package Design Criteria to the Marketing Mix. *IDS-Packaging 2004*.

Bledsoe, G., Rasco, B. (2018). *Recent Advances on Intelligent and Active Packaging in Food and Beverage Technology*. *Journal of Food Health & Technology Innovations*. 1(2): 72-74

Bonsor, D. (17.04.2020). *The Evolution of Web Design*, Retrieved from WebFX: <https://quibble.digital/the-evolution-of-web-design/>, (21.07.2020).

Boyatzis, R. E. (1998). *Transforming Qualitative Information: Thematic Analysis and Code Development*. Thousand Oaks, CA: SAGE Publications. 10-184.

Brody, A. L., Marsh, K. S. (1997). *Encyclopedia of Packaging Technology*. New York: Wiley. 28-55

Cebi, S. (2013). Determining importance degrees of website design parameters based on interactions and types of websites. *Decision Support Systems*, 54(2): 1030-1043.

Chan, L. K., Wu, M. L. (2005). A systematic approach to quality function deployment with a full illustrative example. *Omega: The International Journal of Management Science*. 33(2): 119-139.

Chinomona, R., Sandada, M. (2014). The Influence of E-Service Quality on Customer Perceived Value, Customer Satisfaction and Loyalty in South Africa. *Mediterranean Journal of Social Sciences*. 5(9): 331-341.

Cinchane, A. (2021). *Packaging Machinery Market by Type (Filling Machines, Form, Fill and Seal Machines (FFS), Cartoning Machines, Palletizing Machines, Labelling Machines, Wrapping Machines, and Cleaning & Sterilizing Machines), Business (OEM, and Aftermarket), and End User (Food & Beverage, Pharmaceutical, Chemicals, Cosmetics, and Others): Global Opportunity Analysis and Industry*

Forecast, 2021–2030, Allied Market Research, Retrieved from: <https://www.alliedmarketresearch.com/packaging-machinery-market>, (15.09.2020).

Crowne, A.C. (2019). " 7 benefits of Flexible Packaging." Retrieved from FPA: <https://www.flexpackmag.com/articles/90020-benefits-of-flexible-packaging>, (11.02.2020).

Dominic, C. (2011), Packaging Performance Logistics, Department of Design Sciences, Division of Packaging Logistics, Lund University, Lund. 12-61.

Flavian, C., Gurrea, R., Orús, C. (2009). Web design: A key factor for the website success. *Journal of Systems and Information Technology*. 11(2): 1-21.

Flexible Packaging Association (2020). Leading the way in packaging innovation. Retrieved from FPA: <https://www.flexpack.org/publication/RG93bm xv YWQ6Nzc=/download>, (03.04.2021).

Gerber, S. (03.02.2020). "*11 Ways to Help Protect Your Company (and Customers) When Taking Payments Online*", Retrieved from: <https://www.business.com/articles/online-payment-security-tips/>, (24.05.2020).

Grand View Research. (2021). *Plastic Packaging Market Size, Share & Trends Analysis Report By Product (Flexible, Rigid), By Technology (Extrusion, Thermoforming), By Application (Food & Beverages, Pharmaceuticals), And Segment Forecasts, 2021 - 2028*. Market Analysis Report. Retrieved from: <https://www.grandviewresearch.com/industry-analysis/plastic-packaging-market>

Guevarra, L. M., (06.09.2018), "*E-commerce: The Past, Present, and Future*", Retrieved from Spiralytics: <https://www.spiralytics.com/blog/past-present-future-ecommerce/>, (27.07.2020).

Hasan, L., Abuelrub, E. (2006). Criteria for evaluating quality of websites. In: Proceedings of the sixth IBMA International Conference on Managing Information in Digital Economy, Germany.

Herran, V. W., Wofford, G. D. (1990). *Patent No. 4927708A*. US Patent.

Herzwurm, G., Schockert, S. (2003). The leading edge in QFD for software and electronic business. *International Journal of Quality & Reliability Management*. 20(1): 36-55.

Hopewell, J., Dvorak, R., Kosior, E. (2009). Plastics recycling: challenges and opportunities. *Philos Trans R Soc Lond B Biol Sci*. 2115–2126.

Ioannou, G., Pramataris, K. C., Prastacos, G. P. (2004). Quality Function Deployment Approach to Web Site Development : Applications for Electronic Retailing. *Les Cahiers du Management Technologique*. 13(3): 1-18.

ISO. (2021). *Application of statistical and related methodology for new technology and product development*. Retrieved from ISO: <https://www.iso.org/committee/585031/x/catalogue/>, (18.09.2020).

Jinling, C., Tong, S., Chuncan, L., Tao, S. (2009). Modeling E-Commerce Website Quality with Quality Function Deployment. *2009 IEEE International Conference on e-Business Engineering*. Macau. 417-422.

Jönson, G. (2000). *Packaging Technology for the Logistician, 2nd edition*.

Kapucugil-Ikiz, A., Ozdagoglu, G. (2015). Text mining as a supporting process for VoC clarification. *Alphanumeric Journal*, 3(1), 25–40.

Kliever, J. (23.04.2020). *10 Simple Ways to Enhance your Images*. Retrieved from Canva: <https://www.canva.com/learn/image-enhancement>, (19.09.2020).

Kotler, P., Keller, K. L. (2006). *Marketing Management*. New Jersey: Prentice Hall. 240-382

Kuo, H., Cheng-Wu, C. (2009). Application of Quality Function Deployment to Improve the Quality of Internet Shopping Website Interface Design. *International Journal of Innovative Computing*. 7(1): 253-267.

Kvale, S. (1996). *Interviews: An introduction to Qualitative Research Interviewing*. Thousand Oaks, CA: SAGE Publications.

Kvale, S. (2006). Dominance through Interviews and Dialogues. *Qualitative Inquiry*. 12(3): 59-72.

Lee, K.-E., Kim, H. J., An, D. S., Lyu, E.-S., & Lee, D. S. (2008). Effectiveness of modified atmosphere packaging in preserving a prepared ready-to-eat food. *Packaging Technology and Science*. 21(7): 417-423.

LeMahieu, Paul G., Nordstrum, Lee E., Cudney, Elizabeth A. (2017). Six Sigma in education. *Quality Assurance in Education*, 25(1), 91–108. <https://doi.org/10.1108/QAE-12-2016-0082>

Levitt, T. (1960) Marketing Myopia. *Harvard Business Review*. 38: 45-56.

Lewis, V. (17.04.2017). *Colored Paper and Reliability Test*. Retrieved April 22, 2020, Retrieved from Perkins: <https://www.perkinselearning.org/technology/blog/colored-paper-and-readability-test>, (22.04.2020).

Liu, C., Arnett, K. (2000). Exploring the factors associated with Web site success in the context of 20 electronic commerce. *Information and Management*. 38: 23-33.

Lockamy, A. (1995). A Conceptual Framework For Assessing Strategic Packaging Decisions. *The International Journal of Logistics Management*. 16(1): 51-60.

Mazur, G. (2010). *Integrating QFD in Phase-Gate Product Design*. QFD Institute Red Belt. United States: QFD Institute Press.

Mazur, G. (2018). *Quality Function Deployment Green Belt Workshop*. United States: QFD Institute Press.

Meghani, R. (26.04.2018). *10 Payment Security Measures to Deal E-commerce*, Retrieved from Magneto: <https://magnetoitsolutions.com/blog/ecommerce-payment-security>, (24.05.2020).

Miles, B. M., Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Beverly Hills, CA: SAGE Publications.

Morton, A. Q. (1994). Packaging history: The emergence of the uniform product code (UPC) in the United States, 1970-75. *History and Technology*. 11: 101-111.

Ozarma Packaging Machinery. (2018). *Plastic Strap Specifications and Family of Packaging Machinery*. Retrieved from: www.ozarmaambalaj.com, (08.08.2020).

Ozdogoglu, G., Kapucugil-İkiz, A., Çelik A. F., (2016): Topic modelling-based decision framework for analysing digital voice of the customer, Total Quality Management & Business Excellence, DOI: 10.1080/14783363.2016.1273106

PMA. (2013). *Packaging History*, from <http://www.ambalaj.org.tr/en/environment-history-of-packaging.html>, (05.08.2018).

QFD Institute. (2017). Maximum Value Table or House of Quality-Which to use?, from http://www.qfdi.org/newsletters/modern_qfd_max_value_table.html (05.07.2021).

QFD Institute. (2021). Classical vs Modern QFD-What is the difference? from http://www.qfdi.org/newsletters/classical_vs_modern_QFD_What%27s_the_difference.html (03.07.2021).

Rabideau, C., (2018) *Tips for Choosing a Website Background Image Size*. Retrieved April 22, 2020, Retrieved from Wordpress: <https://wordpress.com/go/design/choose-website-background-image>, (18.08.2018).

Rahimi, A., García, J. M. (2017). Chemical recycling of waste plastics for new materials production. *Nature Reviews Chemistry*.

Redpack Packaging Machinery. (2017). *The Benefits of using Packaging Machines*. Retrieved from <http://www.redpack.co.uk/blog/benefits-using-packaging-machines/>, (04.05.2019).

Ribble Packaging Machinery. (2018). *Seven Benefits of a Packaging Automation Process*. Retrieved from <http://ribble-pack.co.uk/environment/packaging-automation-process>, (05.03.2019).

Roy, A. (2017). *Packaging and Protective Packaging Market by Material (Paper & Paperboard, Rigid Plastics, Flexible, Metal, Glass, and Others), Function (Cushioning, Blocking & Bracing, Void-fill, Insulation, Wrapping, and Others), and Application (Food, Beverage, Healthcare, Cosmetics, Industrial, and Other Consumer Goods): Global Opportunity Analysis and Industry Forecast, 2017-2023*, Allied Market Research. From: <https://www.alliedmarketresearch.com/packaging-and-protective-packaging-market>, (19.08.2020).

Saghir, M. (2002). *Packaging Logistics Evaluation in the Swedish Retail Supply Chain*. Lund: Lund University. 37-46

Saghir, M. (2004). *Concept of Packing Logistic*. Lund: Lund University.

Science History Institute. "Science Matters: The Case of Plastics." Retrieved from: <https://www.sciencehistory.org/sites/default/files/science-of-plastics-2.pdf>, (25.10.2020).

Shaikh, M. A., Al-Badi, A. H., Al-Elaiwi, A. H., Al-Ameri, A., & Whittaker, J. A. (2001). E-commerce need analysis via quality function deployment. *Change Management and the New Industrial Revolution, 200. IEMC '01 Proceedings*. 317-322.

Siddique, R., Khatib, J., & Kaur, I. (2008). Use of recycled plastic in concrete: A review. *Waste Management*. 28: 1835-1852.

Soroka, W. (2002). *Fundamentals of Packaging Technology- 5th Edition*. Institute of Packaging Professional.

Stickler, R. (19.09.2019). *The Evolution of Ecommerce*, Retrieved from WebFX: <https://www.webfx.com/blog/internet/the-evolution-of-ecommerce/>, (27.08.2021).

Su, C., Lin, C. (2007). A case study on the application of Fuzzy QFD in TRIZ for service quality improvement. *Quality & Quantity*. 42(5): 563-578.

Technopedia. (26.03.2018). *Internet Privacy*. Retrieved from Technopedia: <https://www.techopedia.com/definition/24954/internet-privacy>, (26.04.2020).

Twede, D. (2005). The Origins of Paper Based Packaging. *The Future of Marketing's Past*. 288-300.

Twede, D. (2012). The birth of modern packaging: Cartons, cans and bottles. *Journals of Historical Research in Marketing*, 4(2): 245-272.

Wolfinbarger, M., Gilly, M. C. (2003). eTailQ: dimensionalizing, measuring and predicting etail quality. *Journal of Retailing*, 79(3): 183-198.

Wolniak, R. (2018). *The use of QFD method advantages and limitation*. Production Engineering Archives.

Wong, C. (19.11.2019). *How to Pick the Perfect Font Style Design For Your Website*. from Website Builder Expert: Retrieved from: <https://www.websitebuilderexpert.com/designing-websites/pick-best-font-style-for-website>, (21.04.2020).

Zare, Y. (2017). *Recycled Polymers Properties and Applications*. Shropshire: Smithers Papra.

Zuo, W., Huang, Q., Fan, C., & Zhang, Z. (2013). Quality management of B2C e-commerce service based on human factors engineering. *Electronic Commerce Research and Applications*. 12(5): 309-320.