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TOTAL QUALITY MANAGEMENT IN E-COMMERCE

Master Thesis

TOLGA ŞEN

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Advisor: Asst.Prof.Dr. AHMET BEŞKESE

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Tolga Şen

ABSTRACT

TOTAL QUALITY MANAGEMENT IN E-COMMERCE

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TQM philosophy is among the most important conditions required to secure the sustainability and development of quality oriented systems. This philosophy has been practiced in conventional production and servicing sectors so far and its advantages are well acknowledged. E-business systems in a growth trend since the year 1995, has started just like conventional commerce systems without being quality oriented. But TQM's necessity has started to become seriously perceived after encountering revenues provided by growing new economy incomparably bigger than transactions of the earlier times. It was realized in a short time that the systems in e-commerce, which is among the most important types of e-business in the world, require this philosophy to keep on and as in each sector TQM has established the place it deserves also in this sector.

On the other hand, because of the fact in e-commerce systems the products are stationary and centric by nature many of TQM's components are interpreted distinctively in practice. One of the most important reasons for these differences of interpretation is that the quality has to be focused on the manageability and qualities of data for the systems are interactive and dense by data.

Hurriyet Emlak portal's structure which resembles a good example that shows if those theoretical information can be used in today's e-commerce systems has been examined under TQM's perspective.

Keywords: Total Quality Management, e-commerce, fuzzy AHP

ÖZET

E-TİCARET SİSTEMLERİNDE TOPLAM KALİTE YÖNETİMİ

Şen, Tolga

Endüstri Mühendisliği
Tez Danışmanı: Yrd. Doç.Dr. Ahmet Beşkese

Haziran 2008, 136 sayfa

Kalite odaklı sistemlerin geliştirilebilmesi ve sürdürülebilir olması için gerekli ve en önemli koşulların başında TKY felsefesi gelmektedir. Bu felsefe şimdiye dek geleneksel üretim ve hizmet sektörlerinde uygulanmış ve sağlanan avantajları gözlenmiştir. 1995 yılında bu yana önemli bir büyüme trendi içine giren e-iş sistemleri , tıpkı geleneksel ticaret sistemleri gibi kalite odaklı olmadan yola çıkmıştır. Fakat gelişen yeni ekonomi ile ilk zamanlarda oluşan işlemler ile karşılaştırılamayacak gelirlerle tanışıldığında TKY'nin önemi bu sektörde de yoğun olarak hissedilmeye başlanmıştır. Dünyada en önemli e-iş çeşitlerinden biri olan e-ticaret sistemlerinde ön plana çıkan sistemlerin bu felsefe ile yola devam edebildikleri anlaşılmış ve her sektörde olduğu gibi bu sektörde de TKY, kendine hak ettiği konumu yaratmıştır.

Diğer yandan e-ticaret sistemlerinde ürünün tek bir noktada ve merkezi olmasıyla pek çok TKY bileşeninin uygulamada farklı yorumlanmasına da neden olmaktadır. İnteraktif ve veri yoğun sistemlerin olmasından dolayı kalitenin yüksek oranda veri kalitesi ve yönetebilirliğine odaklanmış olması bu yorum farklılıklarının en önemli nedenlerinden biridir.

Bu teorik bilgilerin günümüz e-ticaret sistemlerinde nasıl uygulanıp uygulanamadığına çok iyi bir örnek teşkil eden Hürriyet Emlak portalının yapısı TKY çerçevesinde incelenmiştir.

Anahtar Kelimeler : Toplam Kalite Yönetimi, e-Ticaret, Fuzzy AHP

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ABBREVIATIONS

Total Quality Management	: TQM
Quality Management	: QM
Internet Service Provider	: ISP
Business to Customer	: B2C
Business to Business	: B2B
Costumer to Costumer	: C2C
Customer to Business	: C2B
Business to Government	: B2G
Statistical Process Control	: SPC
Total Productive Maintenance	: TPM
Automated Process Control	: APC
Business Process Reengineering	: BPR
Enterprise Resource Planning	: ERP
World Trade Organization	: WTO
Organization for Economic Co-operation and Development	: OECD
World Bank	: WB
International Trade Centre	: ITC
Electronic Funds Transfer	: EFT
Electronic Data Interchange	: EDI
Hyper Text Markup Language	: HTML
Personal Digital Assistant	: PDA
Gross Domestic Product	: GDP
International Organization for Standardization	: ISO
Customer Relationship Management	: CRM
Hürriyet Emlak	: HE
Simple Message Service	: SMS

Voice over Internet Protocol	: VOIP
Standardized Trapezoidal Fuzzy Numbers	: STFN
Contribution Factor	: CF
Factor Index	: FI
Analytic Hierarchy Process	: AHP
Membership Function	: MF

1. INTRODUCTION

The struggle of production and service sectors since 1960's for customer satisfaction and production cost reduction has resulted in a standardization of TQM in 1980's and the practicing companies gained many advantages in terms of efficient production and lower costs. Planning, controlling and development of quality have been evaluated in the concept of quality management and the necessity of the notion "total" has been determined. In the first stage of this study the concepts of quality, quality management and total quality management are examined.

Practiced in various sectors until the early 90's, TQM was introduced to e-commerce systems after the technological developments and gradually became a must with the growth of transaction capacities. The concepts forming e-commerce systems and their development will be discussed in the second section of this work while in the third section quality criteria in e-commerce systems and total quality management practices will be analyzed. More specifically the quality criteria are focused on closer and the application methods of TQM in order to match those criteria were examined.

The applicability of TQM in a sector such as e-commerce which is known for its high tempo will reveal the feasibility rate of that theoretical information. The examination of Hurriyet Emlak portal which contains both C2C and B2C systems together in a TQM framework has proved to be a sound research. In order to witness in practice how to practice important components of a TQM and with what kind of advantages it provides to be able to reach the desired criteria will help other companies realize and estimate the achievability of that target.

And finally, in the last chapter a modified fuzzy AHP methodology is proposed to measure quality of an e-commerce system. In addition to proposed methodology, case study for Hürriyet Emlak is prepared.

2. TOTAL QUALITY MANAGEMENT

2.1. QUALITY

Quality is associated with the features of a product or service that may satisfy the needs of the customers. As the needs of the customers are not limited, a common definition for the quality is not possible. As a result of this, the definition of quality has many dimensions. The dimensions are listed below:

a. Performance: It is the primary aspect of a good or service. It is the ability of performing necessary functions.
b. Features: The features are the aspects that make the good or service attractive to the customers.
c. Trust: It is the criteria for a product as if it can perform its functions in its whole life time period.
d. Compliance: It defines as if the good or service meets the predefined standards.
e. Endurance: It is the length of useful life of a product
f. Functionality: It is the easy, fast and reliable renewal of a product when it is broken.
g. Appearance: It is the attractiveness of the product and perceived by the customers through their sensorial organs.
h. Perceived Quality: It is a subjective feature as appearance and resulted from indirect criteria by other people. It is the image of the brand in the public.

2.1.1. Definition of Quality

Definitions of quality are resulted from five points of view and can be measured using different dimensions. These points are:

i. Product based view
    a. It is a quantity of a particular attribute
    b. It is precise and measurable
    c. Differences in taste are not considered
    d. It is controlled through quality control

ii. Process Based
    a. It is suitable for process methods
    b. It relies on stable, robust processes
    c. It can be measurable using Statistical Process Control (SPC)
    d. It is result oriented

iii. User Based
    a. It is the compliance with "Use"
    b. Quality is in the eyes of the user
    c. It is very subjective

iv. Value Based
    a. It is the most excellence that is afforded
    b. It can be defined in terms of cost and benefit
    c. It is highly subjective

v. Transcendent
    a. It is timeless and enduring.

2.1.2. Quality Management

Quality Management has been defined as the philosophy or the approach to management which is made up of some principles each of which is maintained by a set of practices and techniques. As the Quality Management become more and more important in the organizations in the last two decades, it began to mean different things to the people. Sousa & Voss (2002) has argued that

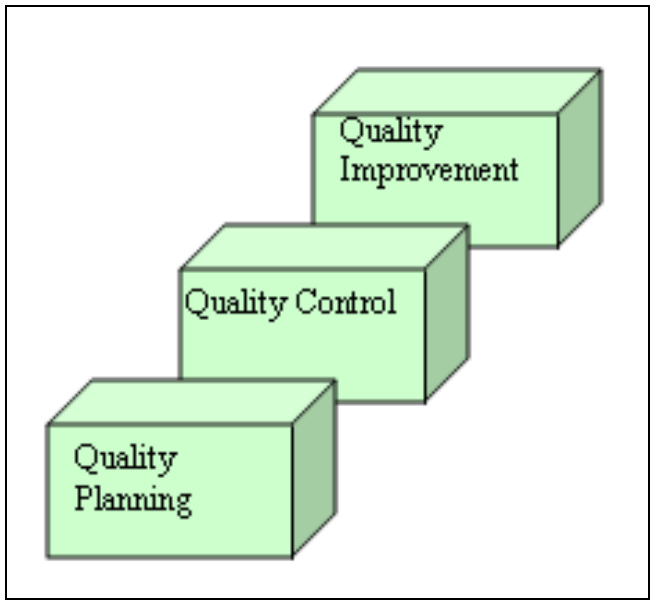
> "The assessment of whether such a thing as QM exists and what constitutes QM should be made at the level of practices: practices are the observable facet of QM, and it is through them that managers work to realize organizational improvements. Principles are too general for empirical research and techniques are too detailed to obtain reliable results (e.g. one practice may be implemented via many optional techniques). For example, the QM principle continuous improvement can be supported by the practice "process management", which in turn can resort to several techniques such as statistical process control and Pareto analysis."

According to Soverbutts (2004), for a successful quality management program, following points should be considered:

a. Identifying and confirming customer requirements and identifying problems and opportunities in meeting these. Gain understanding in the concept of the internal customer and meeting their requirements.
b. Tools for understanding processes. For example, process modeling tools. How to build error prevention into work processes
c. Measurement tools, including check sheets, run charts, sampling and data collection. The use of discreet or continuous data
d. Calculating the "cost of quality" or "price of non-conformance" which defines the cost saving opportunity

e. Information analysis techniques such as run charts, Pareto charts, cause and effect diagrams, flow charts
f. Problem solving techniques such as brainstorming, tree diagrams
g. Improvement Planning through teams and planning tools such as Gantt charts and other project planning techniques.
h. Controlling the work processes. The use of simple Statistical Process Control techniques and control charts which can be used by shop floor personnel
i. Communicate the results, recognize people who have been involved in success and incorporate improvements into the companies processes and systems
j. Maintain the commitment to continuous improvement. After each success, go back and look for more.

The three managerial functions can be summarized in figure 2.1



Source: Goetsch & Davis (2006)

Figure 2.1 : Quality Management Functions

2.1.2.1 Quality planning

The product, system and service development is included in the planning stage. The following steps are required according to Goetsch (2006):

i. The customers should be determined
ii. Customer needs should be identified
iii. Products that satisfy the customer needs should be developed
iv. Systems and processes that satisfy the needs should be established
v. Plans should be distributed to the operational levels

2.1.2.2 Quality control

Quality control involves following steps

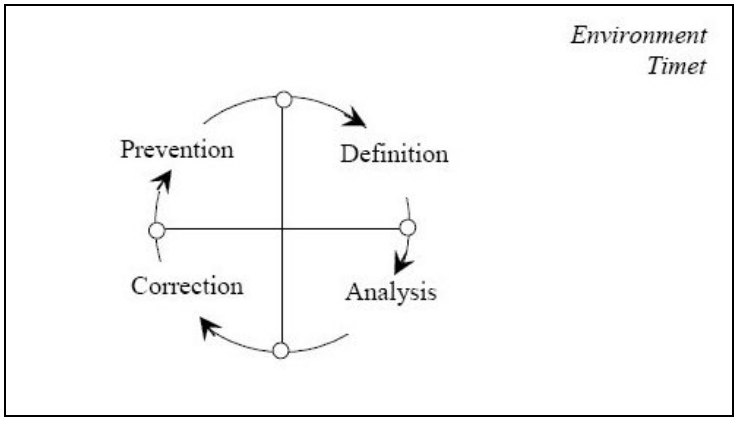
i. Actual quality performance should be assessed
ii. Performance should be compared with the objectives
iii. The differences between the performance and the objectives should be analyzed

2.1.2.3 Quality improvement

Quality improvement should be ongoing and require the following processes

i. Infrastructure development for annual quality improvements
ii. Improvement areas identification
iii. Project team establishment

Quality improvement is connected to the results of quality assessment and it is the most important stage of quality management. Quality Improvement cycle can be drawn as below:



Source: Zgodadova (2007)

Figure 2.2 : Quality Improvement Cycle

The explanations of the terms in the above figure are as below:

i. Definitions of the objectives, processes, assignments and measures should be clear.
ii. Analysis deals with the following of the issues and the causes
iii. Correction is mostly related with the determination, performing and assessment of the interferences.
iv. Prevention prepares procedures from the results of corrective interferences.

2.2. TOTAL QUALITY MANAGEMENT

Soverbutts (2004) has defined the total quality management as below:

"Total Quality Management (TQM) has been one of the most influential methods used in managing business processes over the last 30 years. It has been incorporated as a vital component, in the management systems of some of the world's most successful enterprises.

In trying to define TQM is it is well worth considering the relevance and meaning of the three words in its title.

Total - The responsibility for achieving Quality rests with everyone a business no matter what their function. It recognizes the necessity to develop processes across the business, that together lead to the reliable delivery of exact, agreed customer requirements. This will achieve the most competitive cost position and a higher return on investment.

Quality - The prime task of any business is to understand the needs of the customer, then deliver the product or service at the agreed time, place and price, on every occasion. This will retain current customers, assist in acquiring new ones and lead to a subsequent increase in market share.

Management - Top management lead the drive to achieve quality for customers, by communicating the business vision and values to all employees; ensuring the right business processes are in place; introducing and maintaining a continuous improvement culture."

Total quality management (TQM) can be defined as an approach that is based on continuous improvement of the quality of goods and services delivered through the participation of individuals at all levels and functions of the company. TQM states a management philosophy derived from process improvement using data and builds upon participation and commitment of top management to the shop floor. TQM has a focus on customer orientation, comprehensive quality monitoring and supportive management systems. TQM makes itself evident through an organization-wide shared belief in total customer. This philosophy also requires cooperation between management and labor. As a result, TQM requires essential changes in every facet of an organization including its workers, its management, its structure and its culture.

2.2.1. History of Total Quality Management

The total quality had its roots in the time and methods studies which are performed by Frederick Taylor in the 1920s. The important milestones have been given in the below Table 2.1

Table 2.1 : The important milestones in quality improvement

Year	Milestone
1911	Frederick Taylor publishes "The principles of scientific Management" giving birth to such techniques as time and motion study
1931	Walter A. Stewhart of Bell Laboratories introduces statistical quality control in the book "Economic Control of Quality of Manufactured Products"
1940	W. Edwards Deming assists the US Bureau of the census in applying statistical sampling techniques
1941	W. Edwards Deming joins the US War Department to teach quality control techniques
1950	W. Edwards Deming addresses Japanese scientists, engineers and corporate executives on the subject of quality
1951	Joseph M. Juran publishes the Quality Control Handbook
1961	Martin Company builds a Pershing missile that had zero defect
1970	Philip Crosby introduces the concept of zero defect
1979	Philip Crosby publishes "Quality is Free"
1980	Television documentary "If Japan can…Why Can't We?" airs giving W. Edwards Deming renewed recognition in US
1981	Ford Motor Company invites W. Edwards Deming to speak to its top executives
1982	W. Edwards Deming publishes "Quality, Productivity and Competitive Position"
1984	Philip Crosby publishes "Quality without Tears: The Art of Hassle-Free Management"
1987	• US congress creates the Malcolm Baldridge National Quality Award • Motorola introduces "Six Sigma" method
1988	• Secretary of Defense Frank Carlucci directs the US Department of Defense to adopt total quality • Tom Peters writes "In search of Excellence"
1989	Florida Power and Light wins Japan's coveted Deming Prize, the first non-Japanese company to do so
1993	The total quality approach is widely taught in US colleges
2000	The ISO 9000 standard is rewritten to incorporate total quality concepts
2001	E-commerce and massive customization are important considerations

Source: Goetsch & Davis (2006)

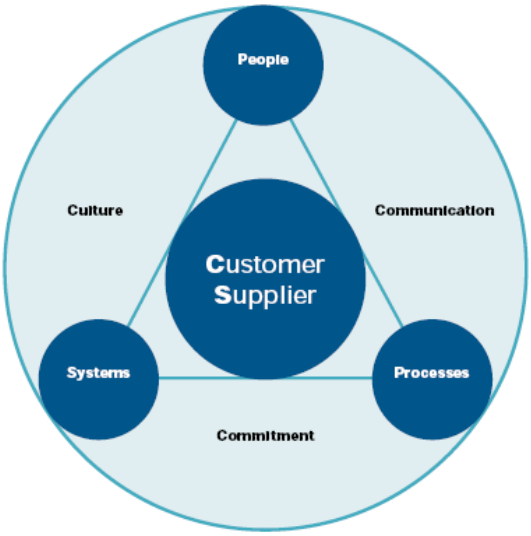
2.2.2. Benefits of Total Quality Management

The benefits of the total quality management have been listed by Lai (2003) as below:

i. Cultural change
ii. Structural change
iii. Awareness for quality in the organization
iv. Improvement in training and education
v. Increase in productivity and team work
vi. Communication
vii. Satisfaction of employees and more involvement by the employees
viii. Customer satisfaction
ix. Process and quality enhancement
x. Performance and efficiency improvement
xi. Decrease in the employee turnover rate
xii. Improvement in supplier relationships
xiii. Decrease in the cost
xiv. Competitive advantage

2.2.3. Elements of Total Quality Management

The core of the Total Quality Management is the both internal and external customer interfaces at which several processes lie. This core should be bounded by the commitment to quality, communication of the quality message, and recognition of the need to change the culture of the organization to create the total quality. The Figure 2.3 represents the elements of total quality clearly.



Source: DTI (n.d.)

Figure 2.3 : Elements of Total Quality

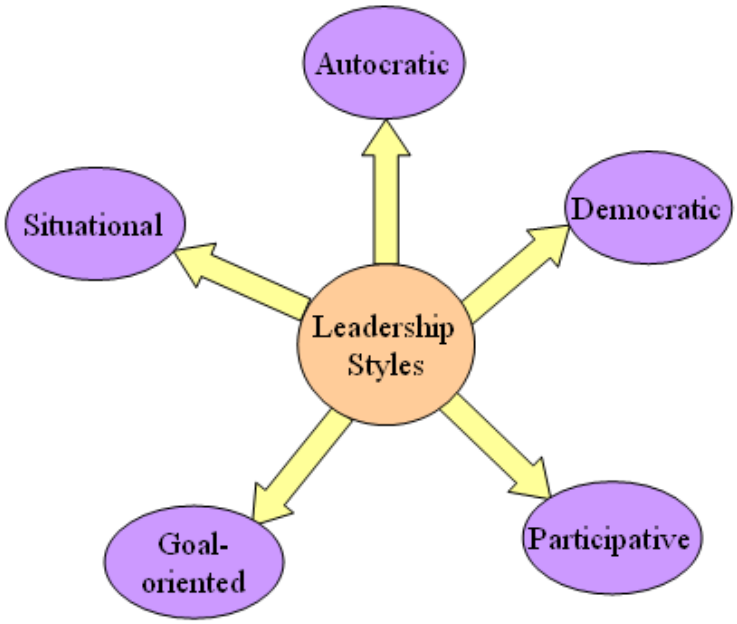
The important factors of a successful total quality management are going to be discussed in the following sections.

2.2.3.1. Leadership

Leadership is a very important factor in the successful total quality management implementation and it is different from management. Managing a system requires systematic planning, execution and monitoring. On the other hand, leadership requires creating a clear vision for the future. Leadership depends on non-analytic and non-rational skills. Planning skills are very important in the leadership skills as well. Quality planning is necessary for managing the quality throughout the company. In this sense, the leader acts as the driver of TQM implementation by creating values, goals and systems customer satisfaction. According to Tari *et al.* (2007), following points can be recorded for the leadership:

i. Leadership is positively related to quality planning
ii. Leadership is positively related to human resource management
iii. Leadership is positively related to learning
iv. Leadership is positively related to quality techniques and tools
v. Leadership is positively related to customer focus
vi. Leadership is positively related to supplier management

There are different types of leadership in order to reach the above points. The leadership styles are given as in the below figure 2.4



Source: Goetsch & Davis (2006)

Figure 2.4 : Leadership Styles

i. Autocratic: This is a dictatorial type of leadership where one person makes the all decisions. Expectations are always obvious. This kind of leadership is the type that causes the most dissatisfaction in any organization. It is rarely used but it can be used for the completion of routine or unskilled tasks.

ii. Democratic: It is a participative leadership style and it is the most effective type of leadership. Employees and team members can feel in charge of what they perform. When they are involved in a decision making process, it may lead to a greater sense of satisfaction. But the leader has the authority to say the final decision in everything.

iii. Participative: A participative leader is the one that gives instructions only after he /she has consulted the group. Authority is decentralized by the participative leader. In contrast to an autocratic leader who controls through the authority, the participative leader exercises the control mostly by using forces within the group.

iv. Goal oriented: It is called result oriented or objective based leadership as well. The goal oriented leader request from the team members to focus on the goals. Only the organizational goals are discussed in the teams and effects of the personalities are minimized.

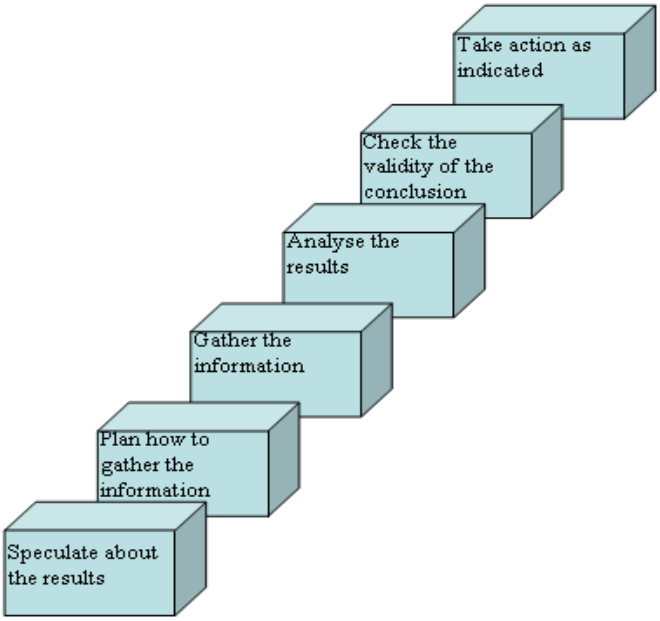
v. Situational: It is also called fluid or contingency leadership as well. Each time, the suitable approach is selected in this type of leadership. The situational leaders considers the:

    a. Relationships between managers and team members
    b. How specific actions should be taken to be in compliance with the guidelines
    c. The authority level that the leader actually has.

2.2.3.2. Customer satisfaction

There are two kinds of customers in an organization; internal customers and external customers. Internal customers are in the downstream processes within the organization and external customers are on the markets.

It is already well known that the external customer needs should be identified in order to provide the necessary goods or services to the customer. Historically, the customers were not included in the product development process and the customer satisfaction could not be predicted. In today's competitive marketplace, such an approach can lead to many problems as well. In order to identify the needs of the external customers, six step strategy has been defined by the Goetsch & Davis (2006). The below figure 2.5 represents the customer needs identification.



Source: Goetsch & Davis (2006)

Figure 2.5 : Six Step Strategy for Identifying Customer Needs

Internal customers' needs are essential for the success of total quality implementation as well. In order to identify the needs, quality circles, self managed teams, cross departmental teams or improvement teams should be established and a continuous communication should be sustained. These mechanisms facilitate the communication between the employees, managers and suppliers.

As the needs of the both internal and external customers are not static, a continuous process should be established in order to measure the satisfaction. Customer defined value is very important for the satisfaction issue and the customer perception in terms of the below factors should be taken into consideration:

a. Product / service quality
b. Services provided by the company
c. The personnel of the company
d. The image of the company
e. Selling price of the product or service
f. Total cost of the product or service

2.2.3.3. Continuous education

Right level of education and training should be sustained to the employees and the managers in order to ensure general awareness of the concepts of quality management, necessary skills and attributes that are suitable for continuous improvement philosophy. The right level of education and training provide a consistent and common language among the employees and managers as well. In order to provide the common language, formal education and training program should be planned and prepared on a regular basis. The program should help people to cope with the complex issues and it should be suitable to the operational conditions of the business. The training programs should be perceived as an investment for developing the ability and knowledge of people and helping them to discover their potentials. Additionally, the training programs should be focused on helping the managers to think through what improvements can be feasible.

Ciampa (1992) has given some examples for successful learning programs for the total quality implementation as in table 2.2.

Table 2.2 : Examples for successful learning programs for the TQ implementation

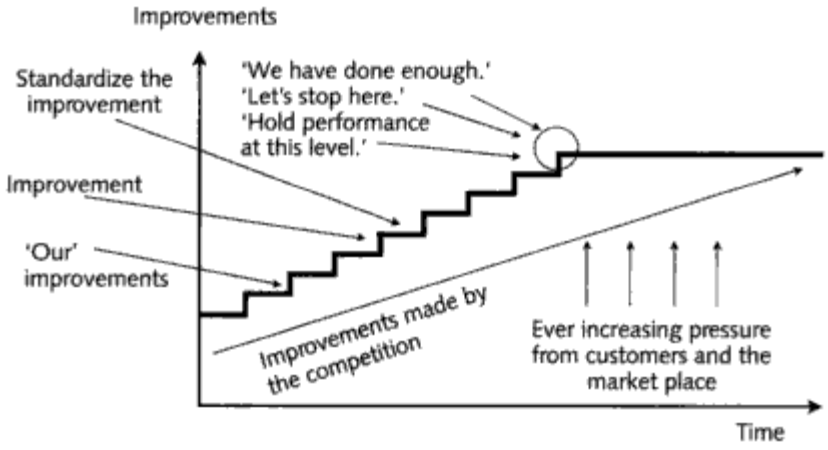
Population	Awareness	Training	Education
Top management	- Introduction to TQ for leaders - Update awareness sessions as the TQ effort progresses	- Common vision workshop - Steering committee training - Teamwork training - Positive influence and negotiation	- Measurement / reward systems for TQ - TQ tools and techniques
Middle management	- Introduction to TQ for managers - Update awareness sessions	- Task team training - Team leader training - Positive influence and negotiation - Facilitator training	- Structured problem solving - Work flow analysis - Design for excellence JIT tools for TQ
Supervisors / professional	- Introduction to TQ for supervisors - Introduction to TQ for nonsupervisory professionals - Update awareness sessions	- Task team training - Team leader training - Facilitator training - Supervising in a TQ environment - Positive influence and negotiation	- Structured problem solving - Work flow analysis - Design for excellence - JIT tools for TQ
Workforce	- Introduction to TQ for work force - Update awareness sessions	- Task team training - Team leader training - Facilitator training - Positive influence and negotiation	- Structured problem solving - Work flow analysis - Design for excellence - JIT tools for TQ

Source: Ciampa (1992)

2.2.3.4. Continuous improvement

The requirements and the expectations of the customers are becoming more and more important in today's world. The services with regard to the reliability, durability, performance, appearance, user friendliness, safety and environmental compliance are increasing as well. The improvement issue has become the main competition factor between the companies in the markets. Some companies pay attention to the total quality management for the continuous improvement facts but total quality management can no be

achieved just by the continuous improvement and it should be seen as a process rather than a program. The below figure 6 expresses the quality improvement as a continuous process.



Source: Dale & Bunney (1999)

Figure 2.6 : Quality improvements as a continuous process

2.2.3.5. Top management commitment

Top management commitment is essential for the successful demonstration of quality improvement efforts. It is a key step for quality improvement in the organizations. However, all the managers are not aware of the effect of their commitment on the total quality management. As quality moves from a process of inspection of finished products to a continuous process which permeates all aspects of the organization, the importance of top management commitment and the issues of organizational culture should not be underestimated.

For a successful Total Quality Management, the executives should be committed in leading his / her employees. The executive should understand TQM, believe in it and then

demonstrate his / her commitment through daily practices of TQM. The executive should ensure that the necessary strategies, philosophies, values and goals are transmitted down throughout the organization in order to sustain focus, clearness and direction. It is the key point of TQM that it has to be introduced and led by the top management. Commitment and personal participation is required from top management in creating and deploying clear quality values and goals consistent with the main goals of the organization and in creating and deploying well defined systems, methods and performance measures for achieving those goals.

2.2.3.6. Learning organizations

Learning can be defined as the gaining of a relatively lasting change of behavior (or the potential for it). It means exploring and investigating new things, being curious and ending the routine things. Beside this, in order to improve the efficiency organizing implies the laying down standards and routines, and a restriction of the behavioral spectrum.

On this understanding, every combination of "learning" and "organization" form an oxymoron. As soon as the term organizational learning had been introduced, several attempts have been made to reconcile the unfortunate couple. According to the author:

a. When comprehending "organization" as a rule describing the desired functionality of a social system, an "instrumental perspective" is adopted this contains prescriptive specifications regarding the characteristics of the organization.
b. When viewing an organization as a social learning society comprising many individuals, an "institutional perspective" is adopted based on descriptive approaches on how collective learning processes actually look.

Furthermore, there was a discussion whether management knowledge is a combination of know-how and know-why Different researchers have studied on this issues and described as a mixture of explicit and implicit or tacit knowledge, as co-operative learning in a social

system as a "learning organization" as the formal framework which allows continuous lifelong learning.

As a result, the following points can be noted for the organizational learning:

a. Organizational learning as a change and adaptation of the organization members' mental models takes place as direct, mostly informal interaction.
b. There are organizational processes which improve information processing and transfer like learning orientation, trial and error-learning, team work, and standardization.
c. It is essential to hold a balance of "old" and "new" personnel. Social relationships support the organization but at the same time innovations are prohibited. Social relations tend to stabilize within a few months only, but an organization can only learn by leaving familiar paths.

2.2.3.7. Statistical process control

The application of statistical techniques to control processes is referred to as Statistical Process Control or SPC. Control charts are important SPC tools that can identify unusual variation in process activity and as a result, enable the decision makers to perform immediate adjustments to make their processes stable.

SPC has become a very general tool in the manufacturing industry to maintain an acceptable and stable level of quality characteristics. Even though most of the studies in the literature discuss the use of SPC in manufacturing and service industries, there have been several research has assessed different applications of SPC. For example, it has been suggested that the SPC techniques can be applied to job enrichment processes and lead to higher levels of work motivation and job satisfaction. Additionally, it has been emphasized that the inappropriate use of SPC tools may cause more uncertainty than value. An

integrated process control model can be used like total productive maintenance (TPM) and automated process control (APC), to achieve optimal product quality as well.

X-bar and R charts are the most common types of SPC control charts. While X-bar charts are used to control sample means, R charts are used to control variation within samples by measuring range. In other words, the R chart plots the range of each sample, which is the difference between the largest and the smallest observations. If the observations fall within the upper and lower control limits, the process is considered to be statistically in control. Changes in the X-bar chart would suggest that the process is generally drifting away from its process average. Monitoring the sample range helps one determine whether the variability of the process is changing.

If the process is not statistically in control, then decision makers should investigate the causes of this variation. Some situations that should be investigated follow:

i. if one or more observations are out of a control limit
ii. if two subsequent observations are very close to a control limit
iii. if five or more subsequent observations are above or under the process average
iv. if five or more subsequent observations are moving to one of the control limits.

Because X-bar chart control limits are calculated from R charts, if the range is not stable, the calculations based on it will not be accurate; in this case, an analysis based on an X-bar chart might not be meaningful.

2.2.3.8. Business process reengineering

"Change" is the only thing that does not change in today's ever-changing world. In today's world, customer, competition and change are the very essential factors that companies are on the lookout for new solutions for their business problems. Recently, some of the more

successful business corporations in the world seem to have hit upon an unbelievable solution: Business Process Reengineering (BPR). Some of the recent headlines in the popular press read, “Wal-Mart reduces restocking time from six weeks to thirty-six hours.”, “Hewlett Packard’s assembly time for server computers touches new low- four minutes.”, “Taco Bell’s sales soars from $500 million to $3 billion.” The reason behind these success stories have been the Business Process Reengineering.

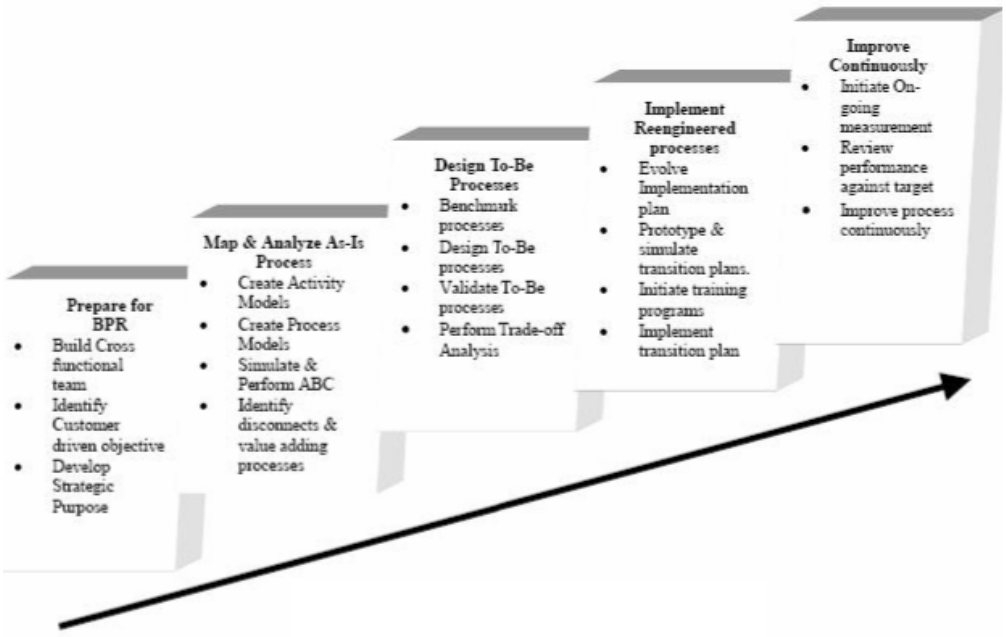
So, what is reengineering? Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service and speed. The key words in the preceding definition are the italicized ones.

BPR advocates that enterprises go back to the basics and reexamine their very roots. It doesn’t deal with small improvements. Rather it aims at total reinvention. As for results, BPR is clearly not for companies who want a 10 percent improvement but for the ones that need a ten-fold increase. The last but the most important of the four key words is the word- ‘process.’ BPR focuses on processes and not on tasks, jobs or people. It endeavors to redesign the strategic and value added processes that transcend organizational boundaries.

According to many in the BPR field, reengineering should focus on processes and not be limited to thinking about the organizations. At this point the process concept should be defined. A business process is a series of steps designed to produce a product or a service. It includes all the activities that deliver particular results for a given customer (external or internal). Processes are currently invisible and unnamed because people think about the individual departments more often than the process with which all of them are involved. So companies that are currently used to talking in terms of departments such as marketing and manufacturing must switch to giving names to the processes that they do such that they express the beginning and end states. These names should imply all the work that gets done

between the start and finish. For example, order fulfillment can be called order to payment process.

The business process reengineering can be seen in Figure 2.7.



Source: Muthu (1999)

Figure 2.7 : Business Project Reengineering

2.2.4. Factors That Affect The Success of Total Quality Management

Almaraz (1994) has listed the factors that affect the TQM success as below:

i. Lack of executive support.
ii. Lack of middle management support.
iii. Lack of necessary commitment in the whole company.
iv. Haphazard approach - a little of this and that with no meaningful change in the system.

v. Lack of necessary training programs for the employees.
vi. Measuring the success on short-term profits bases
vii. Lack of resources to make meaningful changes in the system
viii. Not enough market research. Not knowing what the real requirements are.
ix. Overselling hourly workers - expecting instant pudding.

In addition to these actors, additional pitfalls have been determined by Ho & Wearn, (1995). The issues are as below:

i. Oversimplification and underestimation of the difficulty of the cultural change issues
ii. Unable to identify that every organization and every environment is dissimilar
iii. Lack of required project management and / or the management of TQM implementation as a project
iv. Overemphasizing technical tools at the expense of leadership and management issues
v. Submitting the application tools before the needs are considered and direction is determined
vi. Unable to sustain the structure to move the program to supplier or subcontractor organizations.

3. E-COMMERCE

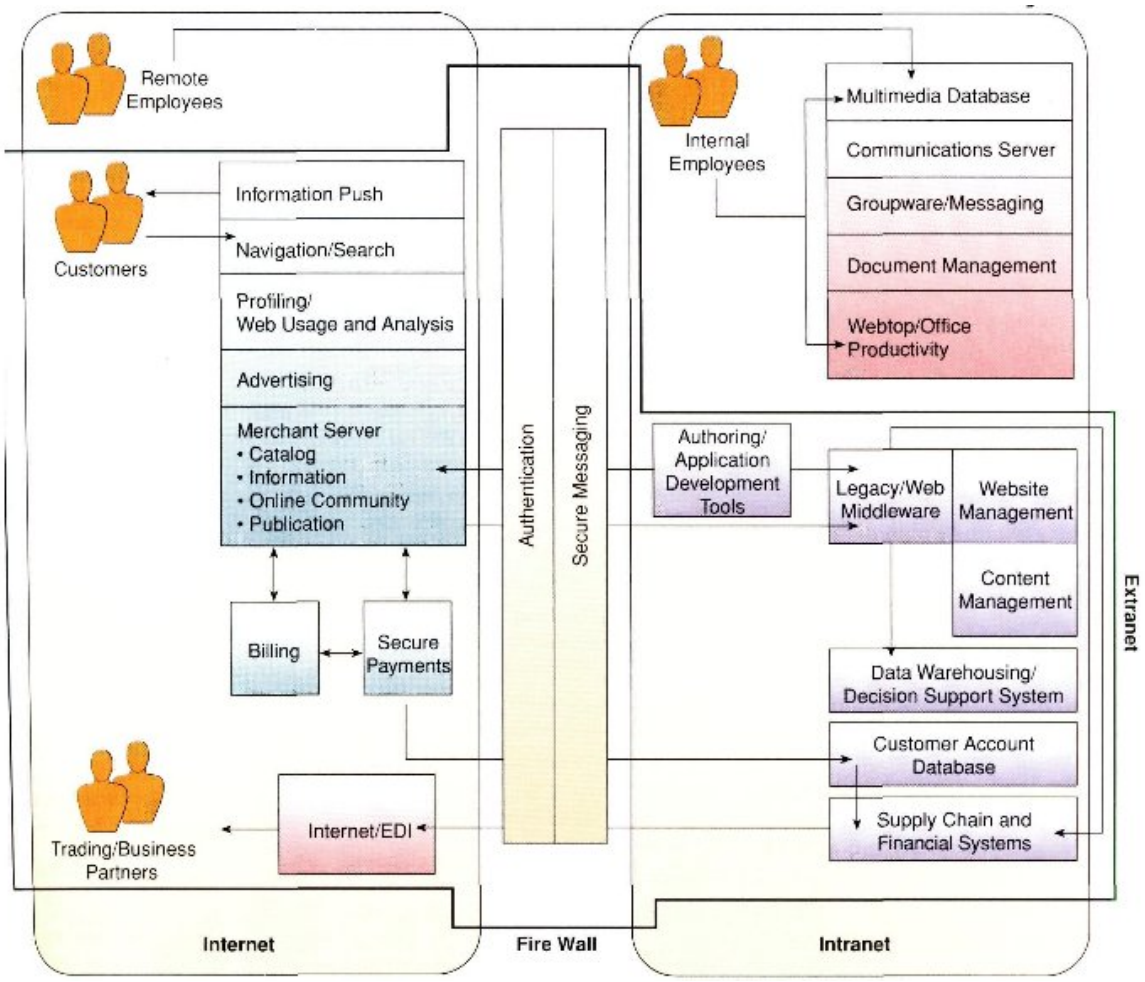
E-commerce can be described as

> "The buying and selling of information, products and services with the assistance of computer technology and the Internet"

This description basically includes the exchange of electronic information between participants and it is normally followed by the exchange of goods and payment transactions. When the e-commerce is conducted, many different activities may take place. Some of these activities can be marketing, interaction with clients and suppliers, interaction with government, acquisition of products and the sales forthcoming of these events.

Another description for e-commerce is the carrying out of transactions by electronic means. The integration of electronic commerce and normal business processes is supposed to provide instant information to the business partners of a particular company. This should then lead to a very efficient value chain by which products are manufactured and distributed. This efficiency is believed to be done as a result of that, the companies can respond very quickly to their business partner's needs. During the last decade of the previous century, the absolute desire of organizations to accomplish the best incorporation between business processes led to the development and improvement of Enterprise Resource Planning (ERP) system. The exponential development of the Internet technologies is sometimes not easy to follow and requires dedication and commitment from all players of the game, whether they are participating for commercial reasons or studying the academic merit of e-commerce.

According to Sachenko (2007), technologies that are needed for e-commerce can be shown as in the below figure 3.1



Source: Sachenko (2007)

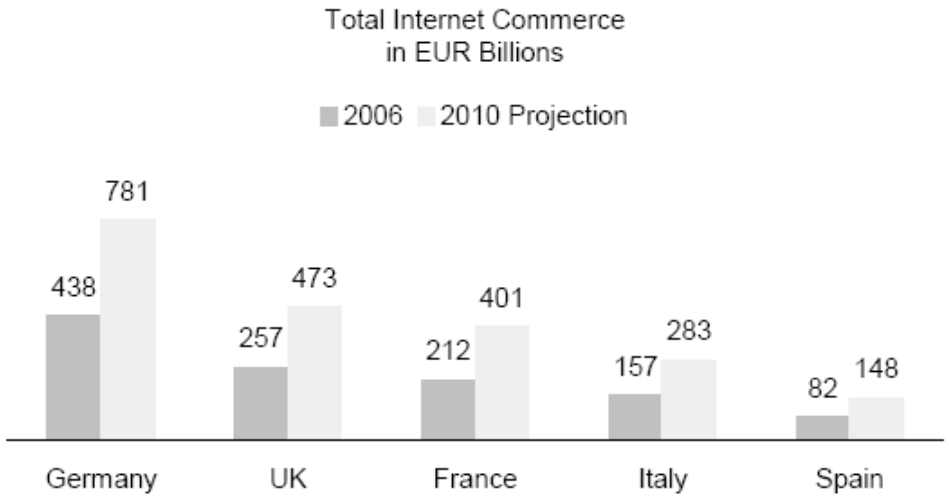
Figure 3.1 : E-Commerce Technologies

Technologies that are necessary for e-commerce are:

- Information Technology
- Telecommunication technology
- Internet Technology

The growth of internet is incredible. Across Europe, broadband connections are progressively replacing dial-up connections, and WLANs are becoming more and more popular. Germany has nearly 56 million Internet users, which makes the country the largest

connected population in Europe, of whom 94.5 percent are using the medium to seek product information in 2007. The below figure 3.2 represents the internet commerce in the biggest European countries.



Source: Müller *et al.* (2007)

Figure 3.2 : Total E-Commerce

3.1. DEFINITION OF E-COMMERCE

There are many different definitions for electronic commerce. Every organization has defined electronic commerce based on their related areas. World Trade Organization (WTO), Organization for Economic Co-operation and Development, (OECD), United Nations Conference on Trade and Development (UNCTAD), World Bank (WB) and International Trade Centre (ITC) are the example of these organizations and some of the definitions are as below:

i. Performing the sales and distribution of goods and services over telecommunication network. (WTO)

ii. All trade transactions that are based on digital texts, sounds and figures and related with the people and organizations. (OECD)

iii. Distributing the structured and unstructured information about business, management and consuming activities between producers, consumers and public organizations over electronic devices such as WWW technology, smart cards, EFT and EDI. (UNCTAD)

Electronic commerce, in its wide meaning, is the usage of computer networks to increase the performance of the organization. Some of the organizational performance improvements that can be possible with electronic commerce are the profitability gains, more market share, satisfied customers and faster delivery of the products. Electronic commerce is more than ordering goods from an online catalog. It includes all characteristics of an organization's electronic interactions with its stakeholders, the people who determine the future of the organization. As a result, the electronic commerce includes activities such as creating a web page to support investor relations or communicating electronically with the employees. To sum up, electronic commerce includes the usage of information technology to make the communications and transactions with all of an organization's stakeholders better. The stakeholders include customers, suppliers, government regulators, financial institutions, mangers, employees, and the public at large.

The scope of e-commerce is not agreed yet and there are several comments about the concept of the e-commerce. There are many reasons of that but the most important reason is the usage of e-commerce and internet concepts together. Despite the fact that there are various tools in e-commerce, different commerce types are discussed to be a method of e-commerce.

The commerce is executed by way of telephone, fax, television, EFT and EDI and these are all parts of electronic commerce. The main aim of electronic commerce is to upgrade the commerce through computers. Internet provides a significant innovation to this issue since

it contains all the other e-commerce tools. Another reason for the discussion is the conflict for describing the commerce activities as e-commerce since the communications are held virtual. For example, the data interchange between organizations should be determined as e-commerce or the electronic communication between health, education or public organizations can be electronic commerce. Despite all the conflicts, whether this information exchanges provide commercial activities or not, these are all parts of the basics of commercial activities and should be accepted in the scope of electronic commerce. These kinds of discussions demonstrate that the beginning and ending points of electronic commerce are not clear. The scope of the electronic commerce can be explained in general as below:

i. Electronic interchange of goods or services
ii. Production planning and establishing a production chain
iii. Advertisement
iv. Ordering
v. Agreement
vi. Electronic bank transactions and funds transfer
vii. Electronic waybill
viii. Customs clearance
ix. Monitoring of production in electronic environment
x. Monitoring of distribution in electronic environment
xi. Conjoint design and engineering
xii. The transactions with electronic cash
xiii. Exchange of electronic interest
xiv. Storing the commercial transactions and monitoring
xv. Direct marketing to the consumers
xvi. Digital signature, electronic notary
xvii. Taxing in electronic environment

As it can be seen from the scope, all of the traditional commerce activities can be executed in electronic commerce as well. It is possible to produce goods or services, control the

production, advertise, take order, arrange the agreements, submit the goods to the consumer, and take the payment in an electronic environment. Additionally, the purchase or sales of public biddings can be done electronically. Beside these, there are some organizations and transactions in electronic commerce which cannot be applied in the traditional commerce such as digital signature, digital products, electronic cash, etc. These transactions are specific to e-commerce. The advantages of electronic commerce makes it preferred to traditional commerce.

3.1.1. Characteristics of E-Commerce

The characteristics of electronic commerce project can be explained as below:

a. The roles involved in electronic commerce project
b. In contrast with the traditional project, electronic commerce project includes not only the sponsor and the freelancer, but also the vendor, the consultant and the outsourcer.
c. The complicacy of electronic commerce project
d. In the process of project implementation, management, technologies and commercial activities, competition and other factors mixed together, so the changes that are related to the commerce and business activities should be controlled. In order to sustain the adaption to these changes, many companies need to regulate the internal structure. Additionally, the information technology structure is very complicated as well.
e. The dynamics of electronic commerce project
f. Nowadays electronic commerce project acts in a highly competitive environment; it is no longer just a systematic software production process. In its implementation process, the factors including the changes of customer demand, the appearance and applications of new technologies, competitors, etc would lead to the adjustments to the original plan and designs.
g. High risks of electronic commerce

h. Since the electronic commerce creates new business activities and the implementation will change the existing business processes and affects the business structure, it will be difficult to make up if it fails. Moreover, as it depends on a large extent on platform and technical support, the system requires expansibility which can be difficult to grasp.
i. Short life cycle of electronic commerce project
j. Electronic commerce project usually involves information technology, and the life cycle of information technology is very short. The computer systems, software which the project depends on are upgraded fast. In addition, the opportunity is lost very easy for the uncertainty in the business, so if electronic commerce project costs too much time, it may be eliminated before it is finished.

3.1.2. History of E-Commerce

The history of electronic commerce can be investigated in two stages; early development and web development.

a. Early development

The meaning of "electronic commerce" has become different over the last 30 years. In the beginning, electronic commerce has meant the execution of commercial activities electronically by way of using technology such as Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT). EDI and EFT were both launched in the late 1970s and allowed organizations to send their commercial documents like purchase orders or invoices in an electronic environment. Besides, the growth and acceptance of credit cards, automated teller machines (ATM) and telephone banking in the 1980s are the forms of electronic commerce. From the 1990s onwards, e-commerce has included additional features like enterprise resource planning systems (ERP), data mining and data warehousing.

Possibly the earliest instance of many-to-many electronic commerce in physical goods was the Boston Computer Exchange, which was a marketplace for second-hand computers. It introduced in 1982. The first online information marketplace, including online consulting, was the American Information Exchange which is the other pre-Internet online system launched in 1991.

b. Web development

When the Web first became famous among the general public in the 1994, the media and specialists forecasted that electronic commerce would soon turn into a major economic sector. However, it took about four years for security protocols (like HTTPS) to become adequately developed and broadly arranged. Afterwards, between 1998 and 2000, a significant number of organizations in the United States and Western Europe developed simple web sites.

In the dot com era, e-commerce came to contain transactions more specifically termed as “Web commerce" which is the procurement of goods or services over the World Wide Web, usually with secure connections, with electronic shopping carts and with electronic payment services like credit card payment authorizations.

Although significant quantities of pure e-commerce companies disappeared during the dot-com collapse in 2000 and 2001, many "brick-and-mortar" retailers recognized that such companies had identified valuable niche markets and began to add e-commerce capabilities to their Web sites. For example, after the fall down of online grocer Web van, two traditional supermarket chains, Albertsons and Safeway, both started e-commerce subordinates through which consumers could order groceries online. The emergence of electronic commerce significantly lowered barriers to entry in the selling of many types of goods; many small home-based proprietors are able to use the internet to sell goods as well. In many times, small sellers use online auction sites such as eBay or sell by way of large corporate websites like Amazon.com, in order to take the advantage of the exposure and setup convenience of such sites.

At present there are 67 Fortune 1000 companies that have electronic commerce revenues which are greater than $10 million. The five largest Internet retailers are Amazon, Staples, Office Depot, Dell, and Hewlett Packard. This shows that the top categories of products sold on the Internet are books, music, office supplies, computers and other consumer electronics.

The milestones in the electronic commerce development are given below:

i. 1990: Tim Berners-Lee wrote "The Worldwide Web browser" using a Next computer.
ii. 1994: Netscape released the Navigator browser in October under the code name Mozilla. Pizza Hut offered pizza ordering on its Web page. The first online bank opened. Attempts to offer flower delivery and magazine subscriptions online. Netscape 1.0 in late 1994 introduced SSL encryption that made transactions secure.
iii. 1995: Jeff Bezos launched Amazon.com and the first commercial 24 hr. internet only radio stations "Radio HK" and NetRadio started broadcasting. Dell and Cisco began to aggressively use Internet for commercial transactions. EBay was founded by computer programmer Pierre Omidyar as Auction Web.
iv. 1998: Electronic postal stamps can be purchased and downloaded for printing from the Web.
v. 1999: business.com was sold for US $7.5 million (purchased in 1997 for US $150,000) The peer-to-peer file sharing software "Napster" was launched.
vi. 2000: The dot-com bust.
vii. 2003: Amazon.com: first-ever full-year profit.

3.2. E-COMMERCE DOMAINS

The types of electronic commerce are stated as:

i. B2B E-Commerce: B2B E-Commerce is the electronic commerce portal that links different branches of the business establishment or different establishments. As an example, the SCM (Supply Chain Management) has turned into E-SCM regarding to the developments in these areas. This segment contains the largest volume of business transactions.

ii. B2C E-Commerce: B2C E-Commerce is the electronic commerce portal that helps selling products or services directly to the customers in the predetermined geographical border.

iii. C2B E-Commerce: This type of electronic commerce creates new areas for the consumers to define the prices. The focus is buying and selling. In this category, there are lots of products or services for the consumers in order to compare the prices and opportunities. With the help of this method, negotiation period becomes shorter, flexibility increases and the communication between the consumer and organization enhances.

iv. C2C E-Commerce: This model is established from virtual auctions. The most important example to this electronic commerce style is E-bay.

3.2.1. B2C (Business to Consumer)

Since the first web-based organizations began to offer their products on the Internet in the mid 1990s, the way of doing business has changed significantly and never became the same. The Internet enabled to buy products without leaving home, 24 hours a day, from organizations in almost any part of the world. Internet shopping has introduced new methods of communication between consumers and suppliers. It is not necessary to visit a shop, visually inspect the product or even speak to the salesman on the telephone to order a product any more. As a result of this, the consumer and the supplier are separated in time and space. The physical distance between them has increased. This distance has occurred in traditional mail-order businesses every time. According to the new idea, the Internet shops can offer an increased amount of communication media for both consumers and suppliers. Despite the physical distance, the Internet has made it possible for companies to create closer customer relationships, by customer profiling, one-to-one marketing,

In a virtual enterprise, most of the communication with customers centers on the interaction between the customer and the website. However, most B2C electronic commerce web sites were not arranged to provide to this aspect. As a result, it creates barriers in gaining the user trust in order to make the consumer feel adequately contented to perform a commercial transaction. Certainly, some websites successfully discourage the purchase, producing results that are completely opposed to those desired.

Furthermore, the on-line retailing industry has experienced continuous growth due to the Internet in many countries. This digital channel has increased the market share in the retailing industry totally. However, sufficient knowledge is not available for the effects of this virtual environment on consumer behavior, such as customer manner and intention throughout the course of the purchasing process. Furthermore, it is essential to stress that in this precise scenario, all communication between the customer and the digital organization is developed via the website. So, its characteristics are linked to the personal and objective

elements that will affect the purchase. That makes careful planning of the website of since it will either lead to the success or failure of the virtual organization.

E-commerce sales go on to grow in the past few years and, by the end of 2007, e-commerce sales accounted for 3.4 percent of whole sales. An estimation of the U.S. Retail e-commerce sales are presented on the below chart (Figure 3.3).

Source: E-commerce-Land (2004)

Figure 3.3 : US Retail E-commerce Sales

Electronic commerce has a big deal of advantages over "brick and mortar" stores and mail order catalogs. Customers can easily search through a large database of products and services. They can observe the actual prices, build an order over several days and email it as a "wish list". Customers can evaluate prices with a click of the mouse and buy the selected product at best prices. B2C offers the customer:

i. Convenience by way of time-shifting and elimination of travel and waiting at the place of business
ii. Convenience of a common user interface: HTML forms in a web browser
iii. Automated checking of orders
iv. Feeling of control (no pushy sales people)

v. More interesting advertising
vi. More trustworthy relationship
vii. Shipment tracking (when it is offered to consumers)
viii. More general supply chain management

Online vendors, in their turn, also get distinct advantages a well. The web and its search engines provide a way to be found by customers without expensive advertising campaign. Even small online shopping organizations can reach global markets. Web technology allows to track customer preferences and to deliver individually-tailored marketing as well. B2C offers the business:

i. measurement of shopper interest and affiliations by way of click trails and cookies
ii. superior control over customer input through forms
iii. less costs by encouraging customers to search
iv. less costs by reducing size (and number) of retail stores
v. lower more expected costs by reducing labor input
vi. higher shopper satisfaction (and maybe loyalty)

3.2.2. B2B (Business to Business)

One of the last and best promises during the Internet explosion of the late 1990s was the impact of business-to-business (B2B) e-commerce on the traditional business landscape. Industry experts along with marketing "gurus" overvalued B2B e-commerce so much. Thousands of online marketplaces (e-marketplaces) began to come into sight to satisfy this obvious need.

Business-to-business e-commerce can be defined as the buying and selling of goods and services between organizations in the digital environment. There are two distinct aspects of B2B e-commerce that separate it from business to consumer (B2C):

i. Flexibility in pricing. Transactions between businesses often require inconsistency in the pricing of products between buyers. This concept of bargaining is not often in the B2C marketplace.
ii. Integration of business systems. In order to realize increased productivity and savings, organizations are involved in B2B will integrate their internal systems together, enabling less human intervention.

The basic concepts of B2B are as below:

i. E-Procurement

   E-procurement can be defined as the internet based electronic procurement of goods and services between organizations.

ii. E-Marketplaces

   Electronic marketplaces, which are known as B2B exchanges, serve as electronic hubs bringing together suppliers and purchasers in common electronic environments. Electronic marketplaces can be either "many-to-many" where many buyers and sellers are brought together in a particular vertical market or "one-to-many" where one major supplier or consumer attracts many of its trading partners to its e-marketplace. Over the past couple of years, it has been these private, one-to-many e-marketplaces that have proven to be the most successful. One well-known public Canadian e-marketplace is SourceCan.com.

B2B offers the vendor to lower costs and higher customer satisfaction, customer lock-in, forward integration of supply chain management, possibility of greater specialization by using e-commerce to integrate material flows while disintegrating the organizations

On the other side, business to business have some benefits to the customer side as well. B2B offers the customer to lower the costs as in B2C, more reliability, vendor lock-in, backward integration of supply chain management, possibility of greater specialization by using e-commerce to integrate material flows while disintegrating the organizations.

3.2.3. C2C (Consumer to Consumer)

Electronic Commerce has come into view that allows not certain, un-trusted parties to sell goods and / or services to each other as well. An excellent example of this type of E-commerce is EBay, where consumers sell their goods and services to other consumers. In order to accommodate these activities, several technologies are used. First of all, EBay allows all the sellers and buyers to provide rating to one another. With the help of this possibility, future potential purchasers may see that a particular seller has sold to more than 2,000 customers - all of whom rate the seller as excellent. In another example, a potential purchaser may see a seller who has previously sold only 4 times and all 4 rate the seller poorly. This type of information is useful for the consumers.

Another technology that has emerged to support C2C activities is the payment. Pay Pal can be given as an example. Instead of direct item purchase from an unknown, un-trusted seller, the buyer can instead send the money to Pay Pal. Pay pal is an intermediary firm. From there, Pay Pal notifies the seller that they will hold the money for them until the goods have been shipped and accepted by the buyer.

3.2.4. C2B (Consumer to Business)

Greenberg *et al.* (2004) have defined C2B (Consumer to Business) as below: “Consumer-to-Business (C2B) can be defined as the comparison shopping activities performed online by a user before purchasing a product. While this definition may

accurately represent current implementations, it barely scratches the surface of what is possible. By enabling direct-marketing and self-marketing, the C2B concepts will allow consumers to do far more than simply compare prices and characteristics. It will place consumers on an equal footing with corporations.

As recently as a year ago, Microsoft was discussing a new wallet based technology, code-named Hailstorm and later renamed as .NET MyServices. While the current status of the project is unclear, it is interesting to note that the wallet portion was to be called a safe-deposit box. While no complete version of Hailstorm is currently available, these naming choices, and the very existence of the product, demonstrate consensus concerning the evolution of C2B from comparison-shopping services to a complex consumer-based set of applications. This expanded view of the wallet more closely matches the domain of electronic commerce, which as described in "involves everything one can do in the physical world: advertising, shopping, bartering, negotiating contracts and prices, bidding for contracts, ordering, billing, payment, settlement, accounting, loans, bonding, escrow, etc."”

For the C2B e-commerce, below examples can be given:

i. Mobile Shopper: In the past, a person is passing the shops and pauses on the windows in order to look at the special offerings. But now, the stores may have installed a C2B system and the system takes the information of the person on his / her personal digital assistant (PDA). The system use the person’s clothing preferences and based on the store’s inventory, the system picks up the suitable clothes and sends to the PDA of the person as a message.

ii. Emergency room: A person has become ill and the ambulance has taken him to the nearest hospital. The person may not fill the insurance forms in that condition. Today, his identity is established and the authorized hospital personnel retrieve his medical information.

3.2.5. E-Governance

With the development of Internet and Web technologies, e-government sites have been developing from the pure information-sharing phase to interactive, transactional, intelligent or integration phases for better serving the constituencies.

Government comprises a very important component in the formation of a truly comprehensive and functioning e-society. In this context, it has needed to be addressed to the following questions:

i. How can the e-government be made truly citizen-centered?
ii. Are there any realistic objectives?
iii. How can these objectives be achieved completely and cost-effectively?
iv. Are these objectives jointly determined and agreed upon by citizens and their government agencies?

E-governance provides several interactions which are categorized as: government-to-government (G2G), government-to business (G2B), and government-to-citizen (G2C). The reverse of these activities are also essential types of e-government; business to government B2G (Denotes online communication between business entities) and citizen to government C2G.

3.3. ADVANTAGES AND DISADVANTAGES OF E-COMMERCE

Advantages and disadvantages of e-commerce can be discussed as below.

3.3.1. Advantages of E-Commerce

The implementation of electronic commerce offers an important chance for organizations to access potential global customers and suppliers by the use of the Internet. It is driving

present online growth from an estimated 4 percent of total world economy in 2003 to an estimated 30 percent by 2010. Some of the major benefits of e-commerce are the extended marketplaces, possible cost reductions, efficiency improvements, customization of products and services, 24 hour trading and information exchange and management. This expansion e-commerce has led to growing research into the impact of new IT investments.

The basic advantages of electronic commerce that distinguishes it from the traditional commerce are as below:

i. More customer satisfaction
ii. Maximizing the profit
iii. Cost reduction for the customer services
iv. Sales on a 24 hour / 7 day basis
v. Dynamic structure of the internet. Additions can be done in a very short time and the information can be updated with a low cost.
vi. Sales to / purchase from all over the world
vii. Competitive advantage / Improvement in the service quality.
viii. Decreasing the costs of personalized products. The vendors can understand the needs of the consumers easily and as a result of this, they can provide special services with economic prices.
ix. Decreasing of the intermediaries. In the most cases, the vendors provide the goods to the customers without any intermediary organization. This results in the decrease of time and cost which benefits to the both sides.
x. Decreasing the cost of transaction costs. The electronic transactions reduce the cost significantly when compared to the traditional commerce. The documents in the electronic commerce are prepared in the digital environment and sent to the related parties easily. As a result, the potential mistakes are avoided and the transaction costs decrease.
xi. New job opportunities / new products. The electronic commerce changes the structure of the goods and services and provides new goods or services with new marketing and distribution techniques.

3.3.2. Disadvantages of E-Commerce

Some researchers believe that some anticipation on e-commerce have no chance to become true, because of its legal and technical barriers. The researchers highlight the issue that the Internet is an information trash for some societies who have not innovated and managed the technology yet. There will be a permanent technology transfer from the developed countries to the developing and undeveloped countries. It means an increase in foreign trade shortage and benefit differences.

Some of the disadvantages of e-commerce can be listed as below:

i. The digital divide, a common term for socio-economic segregation is becoming an obvious issue with regard to the Internet. It involves the cost of acquiring Internet access, the technical support to maintain it and the proper instruction to bring into homes and school.
ii. The development of e-commerce has effects on labor markets as well as the composition of employment. Internet is emerging the new working areas, new definitions of working conditions (i.e. more job flexibility, work longer hours; flatten hierarchy) and new duties. E-Commerce will create new job structures and less educated workers will lose their jobs.
iii. The incorrect belief that implementing e-commerce systems is not expensive, the beginning cost of a web site may seem to be low, but the continuing development and maintenance can be expensive then estimated.
iv. It is assumed that the e-commerce will raise the GDP. However, there is not much macroeconomic evidence to support this idea.
v. The Internet can be an entrance to doubtful material and illegal activity such as pornography or gambling.

4. TOTAL QUALITY MANAGEMENT IN E-COMMERCE

Barnes & Vidgen (2002) argues that:

> "A key challenge for e-commerce organizations is to understand customer requirements and to develop their Web presence and back-office operations accordingly. An organization with a Web site that is difficult to use and interact with will project a poor image on the Internet and weaken the organizations position. It is therefore important that an organization be able to make an assessment of the quality of their e-commerce offering, as perceived by their customers and in the context of the industry. In doing so, organizations can improve their offerings over time and benchmark against competitors and best practice in any industry."

4.1. QUALITY DIMENSIONS OF E-COMMERCE

Quality has both measurable and non-measurable properties. These properties comprise the general requirements that customers are looking for in a product or service. In addition to these properties, quality has characteristics classified as functional, technical and psychological. These characteristics describe the customers' requirements of a given product or service in more specific terms.

Quality needs to be managed with different perspectives such as the following perspectives:

i. Business Perspective: is related to the investment for the quality and deals with why, where, and to what extent the organization must invest in or exploit quality. Which strategies, products and services, alliances, acquisitions or divestments should be taken into consideration for a successful quality view?

ii. Management Perspective: is related to the determining, organizing, directing and monitoring of the quality-related activities that are needed to achieve the desired business strategies and goals.

iii. Operational Perspective: is related to the applying of the knowledge and expertise to perform quality-related tasks.

iv. Customer Satisfaction Perspective: is related to the characteristic of the service demanded by the customers. Three levels of customer expectations for product and service quality has been discussed by Mohanthy *et al.* (2007). The quality must be met for businesses to:

    a. Basic – must requirements
    b. Performance – expected requirements
    c. Delight – excitement features

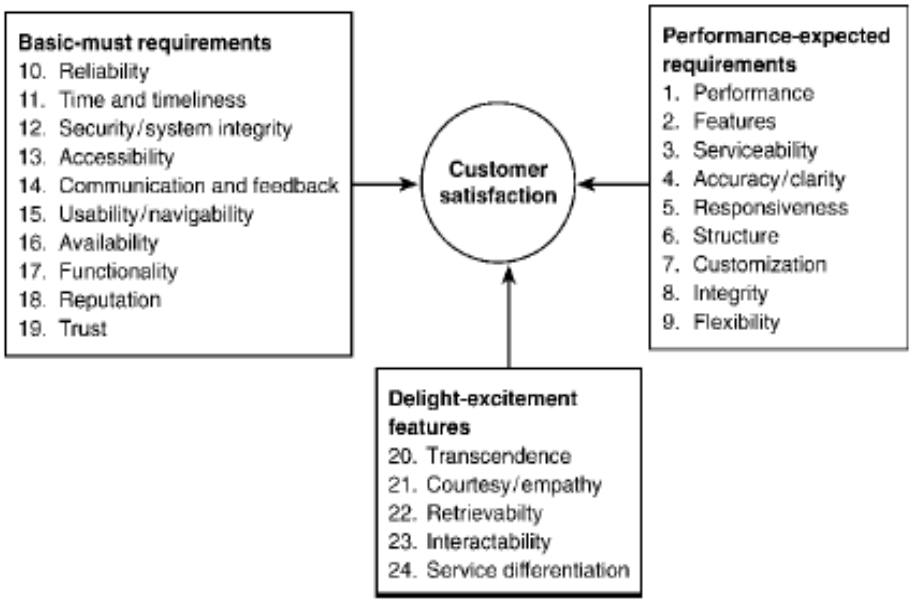
These levels can be attributed under:

i. Psychological
ii. Contractual
iii. Ethical
iv. Technological

To formulate business strategy, the Company may ask itself:

a. How large is the potential market for the service?
b. What percentage of total market must be satisfied in order for the company to realize a profit?
c. How important is continued use of the service?
d. Is the organization essentially having a continuous improvement focus?
e. What do we do to create value in the future?
f. What changes in our operation would make our enterprise profitable?
g. How do we measure up to the best?
h. Which processes within our enterprise are critical to remain alive in competition?

According to the above perspectives and imperatives, significant quality dimensions can be shown as in figure 4.1



Source: Mohanthy *et al.* (2007)

Figure 4.1 : Quality Dimensions

4.2 SERVICE QUALITY IN E- COMMERCE

As business transitions into the new economy, electronic system successful use has become a strategic objective. Especially in business to consumer (e-commerce) applications, users frequently assess the quality of their interactive shopping experience. On the other hand, quality is difficult to define and measure and its impacts on the end-user are hard to evaluate. Among the many research questions that arise, some of the most important concern the exact nature of the quality attributes that define an e-commerce system, and how one could model these attributes in order to increase its acceptance.

According to Speer (2002),

“The importance of quality assurance and testing mechanisms is supported by the well-publicized crashes of prominent e-commerce sites, and persistent concerns about bandwidth, security, and privacy. In an intensely competitive marketplace, stringent quality standards are associated with businesses that survive. With the competition only a click away, quality must be an active strategy instead of merely a slogan.

If, during peak buying seasons a sizable fraction of attempted Web purchases fail, or if users complain of dropped connections, then the economic and public relations consequences can be severe. The same is also true when inaccurate records are generated about transactions or customers cannot determine at the time of ordering if the desired items are in stock or when delivery can be expected, or if the purchased goods never arrive. Fundamental questions about whether it is safe to shop online and, if safe, then if really cheaper, faster and more convenient than on Main Street, are asked and answered in each potential customer's site visitation experience. If the visitor experience is negative due to slow response times, outright crashes, or violations of privacy, consumer confidence can be undermined.

Best practices in e-commerce are challenging to achieve. In business-to-consumer applications, developers are required to be cognizant of and to deliver the following criteria:

i. Rapid and easy assembly of application modules
ii. Testing of component functionality and performance
iii. Designing models to simulate real-world scenarios
iv. Deployment to a distributed environment 24 hours a day, seven days a week
v. Monitoring performance and transactions
vi. Analyzing effectiveness and gathering business intelligence”

4.2.1. Definition of Service Quality

According to Stefani (2007):

> "Evaluation of e-commerce systems may be based either on usability or quality. Usability evaluation includes, among others, feature inspection, collection of data about end-users' opinion using questionnaires and log-analysis methods. Indeed, these methods provide an important feedback to the researcher and their results can be utilized as a useful background providing guidelines for e-commerce systems' design. Quality on the other hand is broader, encompassing many more features besides usability and is thus more adequate for B2C system evaluation. The commonly accepted ISO standard is a good starting point for categorizing the quality characteristics of an e-commerce system. End user perception is usually based on incomplete or uncertain information so probabilistic reasoning may be successfully used to provide calculations of quality measures. Quality is difficult to define and measure and most importantly, it is difficult to measure its impact on the end-user. Even single quality scores for an entire system contain too much bias. Among the many research questions that arise, some of the most important concern the exact nature of the quality attributes that define an e-commerce system and how one could model these attributes in order to increase its acceptance."

As a result of the end user perception, it is important to define the quality of the service in the e-commerce segments. Service quality can be defined as the difference between the consumers' expectations for the performance of the service prior to the service performs the necessary work and the perception of the service received. Service quality is a subjective comparison of the customers.

4.2.2. Traditional Service Quality Measures

Service quality has been the subject of researches for many years. Online customers still demands lots of services in a traditional way. Several studies have been conducted to measure traditional service quality measures. Service quality measure identification is an important point to figure out the measure, control and improve the perceived service quality of the consumers in the B2C market.

A combination of theoretical and empirical research on traditional service quality resulted in a model called SERVQUAL model. The widely used SERVQUAL model is a quality framework and composed of five dimensions:

i. Tangibles: Appearance of physical facilities, equipment, personnel and communication materials
ii. Reliability: Ability to perform the promised service dependably and accurately
iii. Responsiveness: Willingness to help customers and provide prompt services
iv. Assurance: Knowledge and politeness of employees and their ability to express trust and confidence
v. Empathy: Caring and individualized attention provided to customers

According to Saha & Zhao (2005) the elements of the service quality have been enhanced. The dimensions are as below:

a. Tangibles: Physical characteristics, equipments
b. Reliability: Ability to perform the predefined service accurately. Consistency of performance and dependability
c. Responsiveness: Willingness to help the consumers
d. Assurance: Knowledge and awareness of the employees and their ability to inspire trust confidence
e. Empathy: Caring of the consumers
f. Communication
g. Access: Ease of the contact

h. Competence: Ownership of the required skills and knowledge to perform the service.
i. Credibility: Trustworthiness, honesty. Contributions of the credibility are the company name, company reputation and the personal characteristics of the service staff.
j. Security: Freedom from risk, hazard and hesitation. It involves physical safety, financial security and privacy.
k. Understanding the customer: Learning the consumers specific requirements, providing special interest and recognizing the regular custom.

4.2.3. Online Service Quality Measures

In order to measure the quality of the online services, additional dimensions are needed. Several quality frameworks have been prepared for an effective measure. 15 dimensions for online service quality have been listed by Madu & Madu (2002). The dimensions are as below:

Performance:

The performance of a virtual operation is based on its ability to offer two key features. These key features are use and content. The use feature is related to the ease of use of the Web site, easy to get an overview of the structure and easiness of navigation. Online users can simply shut down when the Web site is not easy to navigate, difficult and as a result time consuming. Additionally, it is a significant point that the site should be rich in content. Content deals with the accuracy of information presented, brief nature of the information, and the suitability of the information. If the Web site is not frequently updated, the information becomes old and thus may not deliver the expected performance. The provided information has to be unique and presented in a readable form.

Features:

The customers often want to know what additional features are available through the site, if the web site provides adequate information for the questions and if the site provides the user with links to other sites that may deal better with some issues of interest. Another important feature includes the search ability of the site and being able to get a link to its site from any search engine.

Structure:

Structure is how information is presented on the website. This dimension deals with the information organization with the appropriate keywords or sub-headings that the user can identify. How hyperlinks are used within the pages is the another question of the structure. If the website is not well organized, finding the necessary information becomes difficult.

Aesthetics:

Aesthetics is related to the appearance of the website namely. It is the visual attractiveness. It deals with the color combinations that are used, the type and size of fonts, the animation, the sound effects, the simplicity and readability of texts.

Reliability:

The reliability dimension is related with the consistency of the performance mentioned over time. The price updates in the website can reflect the reliability of the Company. Additionally, the issues of accessibility, speed and ability to quickly download information are critical for the reliability of the Web site.

Storage capability:

Another important dimension of the online services is the storage capability of the website. The simplicity of information access for users is critical. For example, online bank users

may request to access their transaction information for a period of a year. The Company should consider these facts for their websites.

Serviceability:

This dimension is related to the management of conflicts and complaints from customers. The effectiveness of online usage also depends on the user's knowledge and ability to click the right responses. The customers will be more satisfied if the online service sustains fast solutions to their problems.

Security:

The major problem of the online transactions is the credit card security. Similarly, the users do not feel secure when they are providing personal information in the online services.

Trust:

Trust is directly related to the other dimension; security and system integrity. Trust affects the willingness of users to reveal their personal information or to do the purchases online. Users are often concerned about dealing with virtual organizations that may not have a physical location where they could be tracked. It is therefore imperative that a virtual operation must build trust by being highly reliable and dependable in the manner it responds to customer inquiries and complaints.

Responsiveness:

Online stores also have to consider its customer services. The customer service should be assessed as if it is adequate in responding to customer needs through e-mail. Flexible of the services should be taken into consideration as well.

Product/service differentiation and customization:

The uniqueness of the services provided by the web site can be an important factor for the online customers. Additionally, the services provided should be easy for the users to access and this may result in customized products or services, i.e. electronic books or publishing.

Web store policies:

The web stores policies should be customer-oriented. For example, charging excessive restocking fees for returned items, not providing effective warranty programs available in local areas could dissuade users from online purchases since the cost becomes excessive and may outweigh the value of convenience.

Reputation:

Past experiences, the performance of the website and other intangible issues may affect the perception of quality. The main objective of the online services should be to exceed the performance expectations of the customers and to develop satisfied customers.

Assurance:

Electronic operations need to have employees that are very knowledgeable about their operation and polite in their manners. Since most of the electronic transactions does not encourage direct communication except through e-mail services, they need to provide perfect service. According to Van Riel *et al.* (2003), the assurance dimension is related to the confidence in the company, reputation and product warranties.

Empathy:

Although the direct human interactions in online operations are very limited, certain elements of human contact are still involved like e-mail communications. Empathy can be sustained through providing individualized interest to customer concerns and requests

rather than a generic auto reply. Responses must be aware of the needs of the user and consider the customer needs.

Saha & Zhao (2005) have explained seven dimensions for the online service quality measures which are explained by Madu & Madu (2002) as well:

a. Efficiency: Ability of the customers to get into the website, find the desired product and related information with the minimum possible effort.
b. Reliability: Technical adequacy of the web site.
c. Fulfillment: Accuracy of the service and the delivery time of the service that is promised to the customer.
d. Privacy: Assurance that the customer's credit card details or any personal information is not shared.
e. Responsiveness
f. Compensation
g. Contact

Until this point, the service quality is discussed mostly for the B2C services. Gounaris (2005) discussed the B2B services in his study. According to the author, many researchers have been conducted over the last few years that treat the perceived customer service as an individual construct. Similar approach can be used for evaluating the quality as perceived by institutional customers of the organizations. Overall perceived quality can also be treated as an individual construct measured through four items:

i. Brilliant overall service
ii. Service of a very high quality
iii. High standard of service
iv. Perfect service in every dimension such as service reliability, personnel attention

There are actually many differences between the customers such as the differences in the buying behavior, the assessment criteria for appraising alternative suppliers and the

existence of buying centers. As a result of this, the marketing effort and priorities of the producers vary according to the customer types. When it comes to b2b services, the circumstance is even more different because of the essential characteristics of services: Their intangible nature and the inseparability between production and consumption.

For example, services purchased from B2B organizations are sustained by skilled professionals whose expertise and skills are the key factors of the quality of the service. The professionals interact closely with managers from the buying organization frequently. Additionally, B2B services are much more multifaceted and require the management of a larger number of constraints to ensure their perfect provision and outcome also stress this increased demand for specialization, which in a way is a consequence of the increased customization that is required when serving organizational buyers. As a result, selecting, evaluating and deciding on the continuation of the relationship with a b2b service provider is not a routine even for established providers. What organizations actually purchase is frequently a customer-specific and quite unique solution to a specific problem.

4.3. TOTAL QUALITY MANAGEMENT IN E-COMMERCE

Total quality management can be applicable in e-commerce systems with its important elements.

4.3.1. Leadership

McElheran (n.d.) defined leadership as “to help disentangle strategic and stand-alone adoption incentives and differentiate market effectiveness from market power in the behavioral mechanism”. According to the researches of the author, the leaders prefer electronic buying then electronic selling. It means that the leaders prefer B2B than B2C processes. The leaders are the decision points in maintaining market dominance. The leaders should begin, with the process innovations of that are beneficial to consumers, such

as reductions in production costs (which can lead to lower market prices) and quality improvements.

Adopting electronic commerce in an organization needs change which requires the development of the strategic viewpoint and the capability to deal with these changes. The management of these organizations will be successful when focused on leadership that make the proper change possible and as a result can establish a conductive electronic commerce environment. The particular characteristics that required to lead an electronic commerce transition are being visionary, inclusive, risk taking, approachable, forward thinking, open to change, dedicated, determined, and having the ability to communicate.

Leadership can be conceptualized in terms of commitment at the top of the organization; thorough analysis of a company's electronic commerce position where the company must assess its situation regarding electronic commerce; major financial investments which must make the resources obtainable and cultural transformation which must make sure the organization culture adapts. With the help of these, the organization can begin to develop and implement electronic commerce initiative.

When looked at the Small & Medium Sized Enterprises, the owner or the manager initiates, participates in electronic commerce project and establishes a clear objective for his business enterprise. To move forward, the owner or the manager needs to be a enthusiastic, passionate and a firm believer of the benefits of electronic commerce and must commit himself to considering electronic commerce as playing a significant role in the organization. Such kind of a project can only be implemented successfully if owner or the manager is committed to fully support the costs and champions the project. Through the beliefs and participation, of the owner or the manager, he use the time and energy to shape vision and strategies for the usage of the web technologies; exploring ways in which technology's functionality could be balanced into the business processes and transactions.

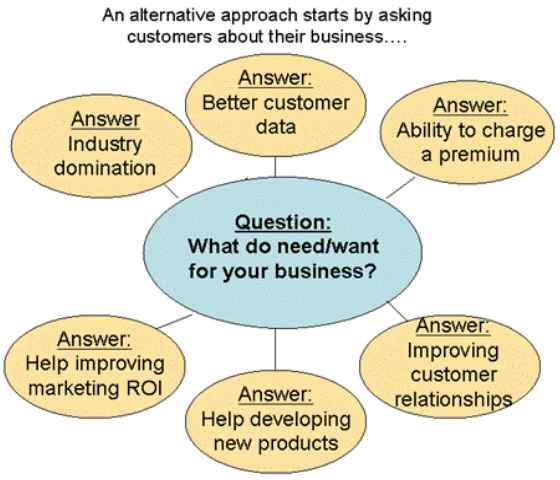
In addition to these, the leadership is an essential factor for B2B and B2C product differentiation as well. Clancy *et al.* (2006) have discussed that

> "To develop product-service packages and solutions, companies might expand their definitions of the industries in which they operate. Nevertheless, their definitions are anchored by their product offerings. So whether a company provides embedded services, solutions, or (as is often the case) both, it doesn't change that these remain inextricably linked to the company's products."

In the B2C market, if an organization started not with its products as the point of reference, but with its customers and their needs, wants, and motivations—again, not as they relate to the company's products or services, but as the products and services relate to the customers' businesses in general. In this point, the leaders should decide on the approach. The possible approaches are given in the below figures (Figure 4.2-Figure 4.3).

Source: Clancy *et al*. (2006)

Figure 4.2 : Product Centric Approach for Identifying Differentiation Opportunities



Source Clancy *et al*. (2006)

Figure 4.3 : Customer Centric Approach for Identifying Differentiation Opportunities

4.3.2. Customer Satisfaction

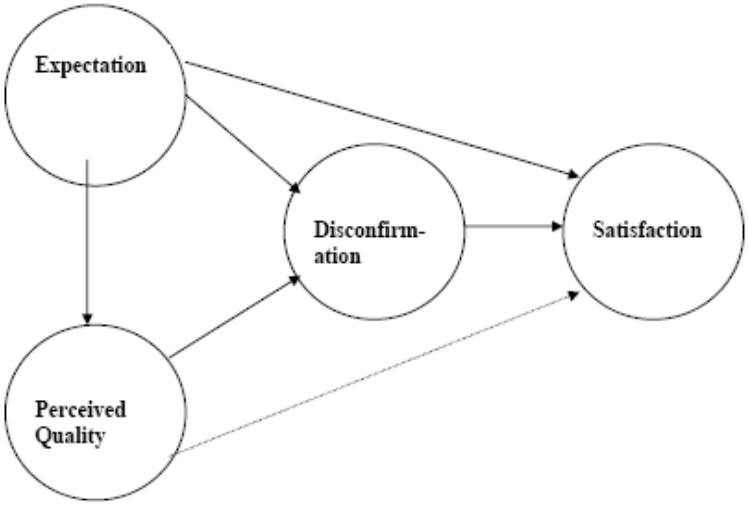
To understanding customer satisfaction in e-commerce it has to be defined with online demands and trends

4.3.2.1. Definition of customer satisfaction

According to Saha & Zhao (2005), satisfaction is determined by the difference between perceived performance and the expectations. Customer satisfaction is defined by the authors as the pretrial beliefs of the customers over a product or a service. Jin-Xiang *et al*. (2006) define customer satisfaction as below:

> "Satisfaction is the consumer's fulfillment response and hence a satisfaction judgment involves at the minimum two stimuli—an outcome and a comparison referent."

Expectations are the predictions made by the consumers about what is likely to happen. Perceived performance or the outcome is the level of the fulfillment of the needs. The below figure 4.4 represents how satisfaction concept is formed.

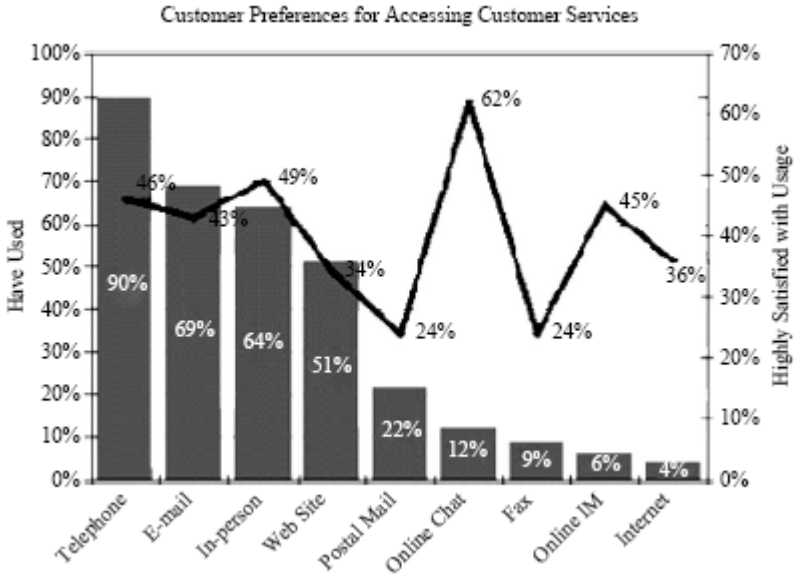


Source: Saha & Zhao (2005)

Figure 4.4 : Satisfaction Formation

4.3.2.2. Customer Satisfaction for e-commerce

New information technology improvements have let the organizations to develop the relationship between the service providers and consumers. In the business-to-business (B2B) market, the interaction between clients and service providers is sustained through various channels. Under these circumstances, customer satisfaction will be determined by the capacity of the firm to manage effective multi-channel customer interactions, integrating CRM procedures with channel management. According to the Gurau (2007), significant research has been conducted on consumer's use of various communication channels and the relative satisfaction level of each layer. Figure 4.5 represents the customer satisfaction for different communication types.



Source : Gurau (2007)

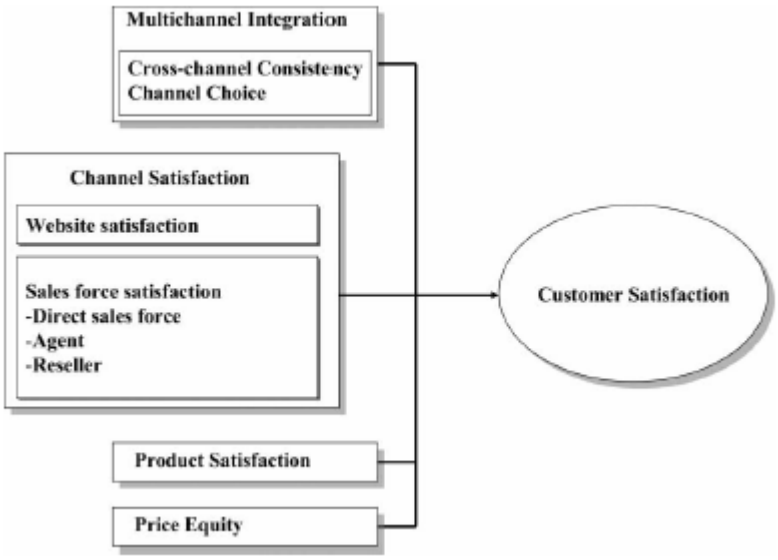
Figure 4.5 : Customer satisfaction for each communication layer

Despite the general recognized importance of customer satisfaction, the rapidly growing business services industry and the general trend towards service outsourcing, research on customer satisfaction with services delivered in a B2B environment is rather scarce. Satisfaction measurement of B2B services should include elements related to the company delivering the service and its service personnel. The satisfaction with tangible aspects appears inappropriate for the measurement of satisfaction with service delivery. As a result of the study conducted by Vandaele & Gemmel (2005), the satisfaction with the support service as well as with the business service is affected by the communication and reliability of that company and the personnel's expertise and knowledge. According to the authors:

> "Then again, not all the satisfaction aspects appear the same across the two service situations and these differences can be explained partly because the end-user's experience with the service provider – the support services supplier or the service organization – differs and partly because the end-user occupies different roles in the buying process –

being merely a user or customer of the support services supplier and being a buyer of the service organization. Thus, different criteria may be emphasized when assessing a supplier's performance. Accordingly, the satisfaction with complaint handling seems only relevant for the service organization as complaints about the support service are handled by the service organization. In the same way, marketing and visibility appears only relevant for the service organization, while the support services supplier should be available and within reach when security problems occur. Therefore, more profound research is needed to examine which aspects of satisfaction are important in different B2B services contexts."

Customer satisfaction determinants are defined by Madaleno *et al.* (2007) with Figure 4.6.

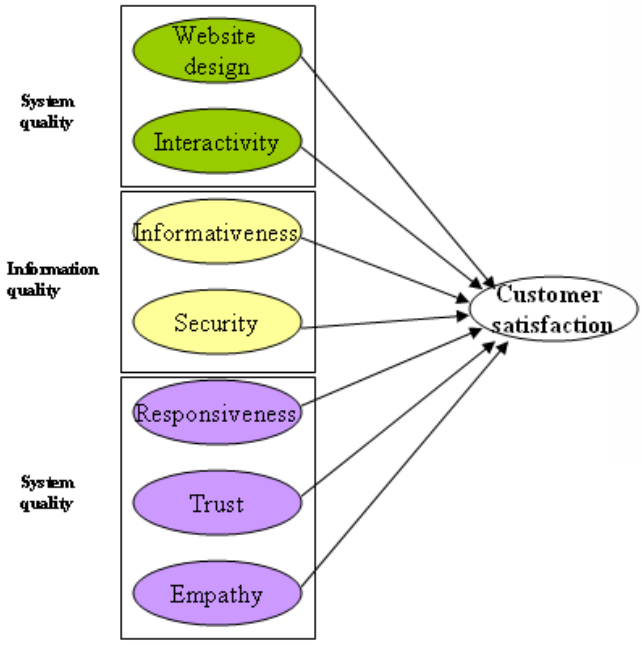


Source: Madaleno *et al.* (2007)

Figure 4.6 : Customer Satisfaction Determinants in B2B

In considering B2C e-commerce as a competitive marketing channel, customer satisfaction plays an essential role for long-term wellbeing of the online retailer. As discussed above, consumer perceptions of convenience, merchandising (product offerings and product

information), website design, and financial security are significant predictors of the customer satisfaction in B2C. Additionally, website customer service quality, product availability, and website features are associated with customer satisfaction. Despite the fact that previous studies have identified that various quality factors are important determinants of customer satisfaction, information systems and marketing have rarely been integrated to examine how system quality, information quality, and service quality affect customer satisfaction. As proposed by Lin (2007), the customer satisfaction is affected as the below figure represents (Figure 4.7.).



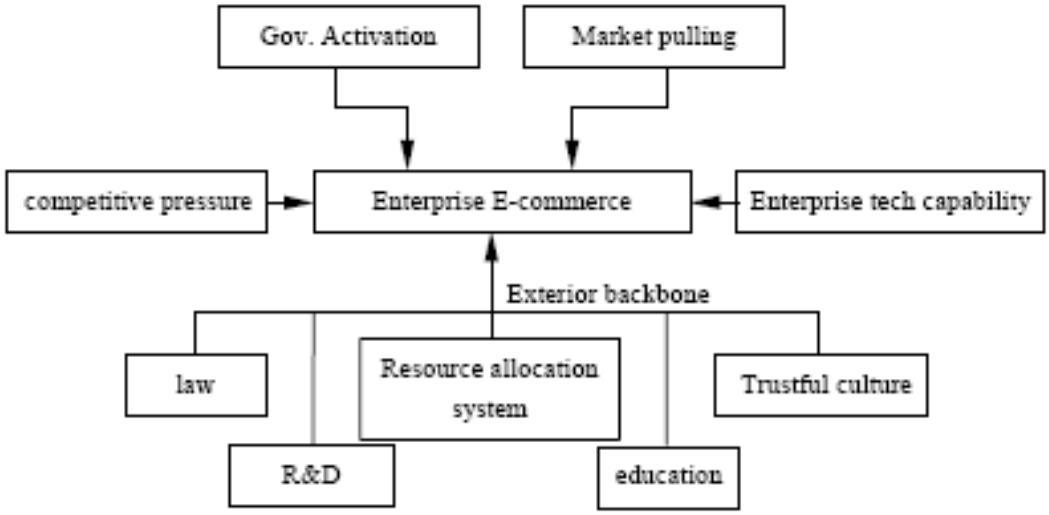
Source: Lin (2007)

Figure 4.7 : Customer satisfaction in B2C

4.3.3. Continuous Education

In spite of the importance of E-commerce to the technological innovation and to the technological learning in developing countries, E-commerce is a luxury technology to most

developing countries including B2B, B2C, C2B, C2C and even B2G and G2B. Individuals and individual organizations can hardly afford such a big investment. As the investment is large, E-commerce policy behavior should focus on the education. The education aspect can be observed from Figure 4.8.



Source: Chen (n.d.)

Figure 4.8 : E-Commerce Mechanism

E-commerce awareness of the people is an important factor to the innovation and diffusion of e-commerce. Continuous education of the society and the continuous training of the e-commerce professionals are essential factors for the quality.

As a result of the total quality efforts in e-commerce, frequent changes in business processes due to the current administration reengineering resulting from changed services on an electronic basis and the adaptation of existing to new market situations are essential. These require tool-based methods in order to provide individuals and teams quickly with the appropriate information for their tasks. In addition, measures for (re-)training staff

should be derivable as fast as possible. In order to take advantage of employees´ knowledge, creativity and experience they should be enabled to provide input to their organization's knowledge in an organized and motivating manner.

4.3.4. Commitment

The interaction between TQM and electronic commerce is complex. Much has been written about how the information systems can improve quality by business process reengineering but less attention has been paid to the potential threat to TQM without commitment in the e-commerce organizations. Quality is not a strange concept for the professional information systems developers, who have been required to work in accordance with formal systems analysis, design and development procedures in order to produce a healthy and fully documented product that satisfied clear technical performance and security requirements. Many IT professionals are familiar with the application of TQM principles or ISO 9000 quality standards to the software development process as well.

4.3.5. Continuous Improvement

Large organizations have great experience in developing a common spirit by analyzing, redesigning and documenting the business processes. The major benefits can be gained by the continuous improvement of the activities that result in the waste of time. In order to sustain the total quality each process should have a clear owner for the execution from the start to end. In the total quality organization, there should be somebody close to the customer such as customer care representative. This person should monitor that the activities are performed within the committed time phases and with the adequate quality. Specific competencies can be assigned to the employees in the e-commerce organizations. Below table 4.1 represents a checklist for covering all activities in the total quality process of an e-commerce organization.

Table 4.1 : Checklist for the processes

Area	To check	Recommendation
Marketing and Sale	Are all activities covered in the organization?	To cover • Product management • Segmentation • Approach Management • Results Review • Decision Management
Customer Care	Are all activities covered in the organization?	To cover • Delivery • Client feedback • Customer relationship • Suggestions • Customer Relationship Management
Back office	Are all activities covered in the organization?	To cover • Order Management • Production • Supplies • Packaging and delivery
Finance	Are all activities covered in the organization?	To cover • Budgets and Accounting • Payables • Receivables • Risk Management • ERP

Source: Morath (2000)

4.3.6. Learning Organizations

Many organizations are encouraging community based learning as a complement to the more traditional approaches of "knowledge transfer." They do so not through some "new age" embrace of "more human processes," but rather out of a practical realization that this kind of learning is required to deliver the results demanded by the higher performance imperatives of today's hyper competition. Specific drivers of community-based learning include:

i. The requirement for people to share knowledge across business units due to globalization and demands for coordination to achieve greater scale and the consequent understanding that such sharing depends critically on social relationships.
ii. the increasing recognition that the most valuable knowledge in an organization is tacit and not easily codified in documents or explained in a formal setting the increasing realization that most fields of expertise are now too complex for any one person to master and thus collective intelligence must be brought to bear to solve important problems.

E-commerce both generates and is affected by learning communities. Most businesses think of electronic commerce in terms of efficient transactions and new method to reach the customers. The greatest potential of electronic commerce, though, lies in moving from a strictly market view of customer relationships to an approach that behaves customers as members of a learning community arranged around a related set of products and services. Communities of practice are valuable to learning organizations because they represent a completely new layer of organizational structure previously not addressed by traditional business units.

4.3.7. Statistical Process Control

According to Tunca & Sutcu (2006), statistical process control enables the website managers to observe and understand the factors that influence the effectiveness of their websites. As a result of this continuous monitoring, they can continuously improve their services, which not only sustain their websites be more effective and attractive, but may also lead to higher levels of customer satisfaction and retention. Statistical process control can provide benefit for B2B, B2C, C2B and C2C sites.

In recent years, academic personnel and research companies have begun to define web quality by identifying the features (as referred 'quality attributes') of successful electronic commerce activities. Research companies have implemented several tools to evaluate the overall website quality according to certain features; however, the validity and reliability of the measures in these tools lack clarity in terms of the selected criteria and the ranking methodology. As a result, academic personnel have begun to conduct empirical research on web quality as well.

The web quality literature can be classified into two main categories: user-perceived studies and content-analysis studies. There are also some papers that integrate both approaches.

User-perceived web quality studies attempt to develop quality attributes based on experimental research. Perceived quality is suggested to be differed under different conditions. Because of the fact that the lists of features used in current models usually do not include all of the quality problems, little commonality exists among the scales developed for measuring website quality. For example, while the SITEQUAL models use four quality dimensions, the PIRQUAL model consists of six dimensions and the WebQual model utilizes 12 dimensions. In the same way, the earliest version of the SERVQUAL model, which was developed in the late 1980s to measure consumer-perceived service quality, included 10 dimensions. Over the past decade, the SERVQUAL model has been adjusted to the different industries as well. Most recently, the model has been revised further by various researchers to measure web quality.

As discussed above, a significant weakness of existing web quality assessment tools is the subjectivity of assigning quality features. However, if correct data are available, STATQUAL can be a powerful tool to quantify several attributes of web quality. A list of possible applications is provided in the below table. In order to obtain the necessary to carry out the suggested analyses, server log files or other data from the transaction records can be obtained. As an example of the benefit of this method, a website manager may

recognize the unexpected changes in the number of daily visits, and then use this information to investigate the possible reasons for the drop in activity. Such variation may be caused by technical problems with the server or user-related reasons like change in expectations as well. As a result, both factors should also be investigated.

Table 4.2 : Web Quality Factors

No	Investigation	Data(daily, hourly, etc.)	Outcome	Possible actions
1	Access	Number of visits	Determine whether there are unexpected changes in the number of visits	Check nos. 2, 4 and 5 for technical problems, contact customers
2	Speed	Download speed	Determine whether the access speed slows down	Check nos. 4 and 5, upgrade the server if necessary
3	Downloads	Number of downloaded files	Identify popular and unpopular files (e-books, manuals, drivers, etc.)	Use the finding in marketing efforts
4	Downtime	Down hours/minutes	Determine the amount of downtime due to maintenance and breakdown	Upgrade the server and/or hosting service if downtime is abnormal
5	Bandwidth use	Size of downloaded files	Determine whether the server is overloaded	Increase the capacity of the server if it cannot cope with download demand
6	Banner clicks	Number of clicked banners	Observe the effectiveness of e-marketing efforts	Offer a variety of online promotions to different demographic/ geographic groups
7	Registered users	Number of new registrations	Observe the ratio of new customers to loyal customers	Examine what factors (e.g. promotions) attract new customers
8	Inventory level	Number of goods in stock	Identify goods with quick turnover	Choose the ideal inventory model (e.g. EOQ)
9	Sales	Number of goods sold	Identify any sudden changes in sales	Revise the marketing policy
10	Earnings	Daily earning	Observe fluctuations in earnings	Check nos. 1, 2 and 9 contact customers
11	Attacks	Number of attacks	Measure the stability of the service	Upgrade the technology if necessary
12	Inquiries	Number of inquiries	Pinpoint customers expectations	Focus on customer value
13	Responses	Number of responses to inquiries	Determine the actual level of customer service	Assign more staff for customer service, if necessary
14	Returns	Number of returned goods	Determine the ratio of returned goods	If returns are due to the quality of the goods, then offer products of better quality

15	Complaints	Number of complaints	Identify problems	Focus on empathy
16	Loyalty	Number of return customers	Determine the ratio of loyal customers	Examine what factors result in loyalty, reward loyal customer with

Source: Tunca & Sutcu (2006)

4.3.8. Business Process Reengineering

Business process reengineering (BPR) represents a persistent and powerful approach to effecting innovation and quantum performance improvement in the organization and many electronic commerce technologies are now being employed to redesign the inter-organizational processes like procurement and marketing. The company web pages, electronic storefronts and malls, online ordering, electronic catalogs and even the familiar electronic data interchange (EDI) are the common examples for the electronically held processes. The questions are: how do such electronic commerce technologies integrate into process redesign? And how is the trap of simply inserting information technology into a (potentially broken) process avoided? The first question deals with the focused usage of technology in process redesign and reflects the behavior in which reengineering has been achieved so far, but with its emphasis no longer on the internal activities. The concern of the second question is the inductive approach (like the use of the technology first and be anxious about the process later) that is taken by many re-engineers.

4.4. CRITICAL SUCCESS FACTORS FOR E-COMMERCE

The critical success factors for e-commerce in a total quality perspective have been presented by Al-Mashari (2002) for the market leader companies as below:

i. Dell (2001)
    a) User friendly web interface
    b) Top management support

c) Strong relationships with the customers and the suppliers
d) Making the web site stronger by a powerful search engine
e) Ensuring the customer acceptance
f) Sustaining up to date information
g) Providing the prices suitable to different conditions
h) Saving the shopping card in order to sustain the old sales data in the next shopping
i) Continuous promotions
j) Enabling the customers to establish their own specifications in the computers and providing the price according to the selected features
k) Enabling the customers to select different web sites of Dell in another countries
l) Enabling the customers to print his / her own selected specifications when he / she selected the features
m) Sustaining a powerful support service in the web site

ii. Transtec (2001)
a) Using the same database for all information and data sustained in the web site
b) Providing fast and short data processing and implementing the new projects immediately after the tests success
c) Sustaining the transparency of the content provided
d) Having clear objectives for the predefined goals
e) Good technical infrastructure for fast processing of customer information

iii. Ford Motor
a) Providing computers for most of the worldwide work force
b) Communicating the customers in 24/7 basis through web site and enabling the customers to order their own selected parts

iv. BHP Çelik
a) Top management support
b) Continuous education for the employees
c) Maintaining good trade partnerships

d) Analyzing the customers with cost benefit analysis

v. Barnes & Nobel
   a) Business growth
   b) Customer satisfaction
   c) Decreasing costs

vi. West Marine
   a) Top management support
   b) Setting clear objectives
   c) Dealing with excellent suppliers

vii. Amazon
   a) Easy set up with internet and online book sales
   b) Ordering, payment and shipment without any problem
   c) No cost for set up and service
   d) Low cost
   e) Easy set up

viii. FedEx
   a) Ordering, payment and shipment without any problem
   b) No cost for set up and service
   c) Low cost
   d) Easy set up

4.5. ISSUES IN QUALITY MANAGEMENT OF E-COMMERCE

When the information flow is improved and the actions are more coordinated, e-commerce can be used more to reduce transaction costs. This can be achieved by reducing the cost of searching for information about potential buyers and sellers and increasing the number of potential market participants. E-commerce should help the organizations for reducing costs, improving product quality, reaching new customers or suppliers, and creating new ways of

selling existing products. A qualified e-commerce including all e-commerce sections should have the following features:

i. Web site should be attractive
ii. Online transactions should be supported by the web technology
iii. Additional services should conduct online transactions
iv. Security should be sustained

Based on the above features, Chou (2001) argues that the main e-commerce issues on the total quality perspective are as below:

i. Web site content

Information and knowledge can be provided by the users from the web sites. A better web site contains more useful information for the users. Additionally, the content of the web site should support the purpose of the organization. Especially in B2B and B2C, the web site should sustain consumers enough information about the organization, products, sales, contact information and technical support and services. Additional services should be included in the content if available. In addition to these, time is an important asset and for this reason the web sites should provide their main point right away. If there is more than one point to be made, a search function should be included for users to find their way. This includes help buttons, hyperlinks, hover buttons, an index page, or a feedback section.

ii. Technology

There is not any exact technology that can satisfy every customer's needs. The design of the web site is an important aspect especially in B2C. When developing the organization's Web architecture, the reliability, capacity and cost/benefit effectiveness factors should be taken into consideration by the project leader. In order to sustain the efficiency and the effectiveness of e-commerce, high quality Web technology such as qualifies network's bandwidth, reliability and hardware (e.g. modem) are the critical issues especially for B2B.

iii. Additional services

Especially for B2C and C2C, the payment process should be simple and user friendly for the consumers. Although the process includes a few steps, the consumers would like to be informed about the step that they are currently on. Additionally, the consumers would prefer to monitor the status of their orders and the related information such as destination, price, and payment method. The consumers should receive the additional services that a high quality electronic marketplace can offer. Some additional services can be like; electronic payment service, logistics service, risk management service, authenticating buyers and sellers, etc.

iv. Operational quality

The processes should be secure in a high quality electronic marketplace including all e-commerce sections. Although various security protocols have been used for Web processes, firewalls are used mostly for protecting transmission security. The security is an important factor since the people are not willing to give their credit card numbers over Internet. Security issues arise whenever money changes hands regardless of whether or not it is on the Internet.

4.6. BENEFITS OF TQM TO E-COMMERCE

According to Chou (2001), TQM has many benefits to different e-commerce segments. The benefits can be classified into B2C, C2B, C2C, B2B, and B2G.

a. Benefits to B2C

There are different types in B2C e-commerce; E-broker, manufacturer and auction models. In the e-broker model, there is an agent between the supplier and the customer. In the manufacturer model, the manufacturer adds value to the products through the manufacturer's internal processes. In the auction model, buyers are allowed to set the price of the product by requesting bids and determining the willingness of suppliers to sell at the bidding price. By integrating TQM into B2C E-commerce, selling companies can conduct a full Plan-Do-Check-Act cycle. This TQM approach is customer focus,

which provides the customer with quality product at the right time and at the right place. The benefits of TQM to B2C can be classified as below:

i. High-quality Web site contents attract customers
ii. High-quality technology can process transactions over time and across distance
iii. High-quality complementary services help online transactions and sales
iv. High-quality operational methods can protect the security of E-commerce activities
v. High-quality environment maintain E-commerce community

b. Benefits to C2B

C2B includes the individuals that sell their products / services to the organizations. Key participants of C2B E-commerce are buying organizations, individual sellers, electronic intermediary service providers, deliverers and government. Since the sellers are individuals in C2B electronic commerce, the sellers are hesitant to seek the total quality process without enough funds. On the other hand, individual sellers could contribute and gain the quality benefit of Web site content with total quality approach. Other quality characteristics like technology, additional services and operation can be accomplished through high-quality Internet service provider.

c. Benefits to C2C

In this type of e-commerce, customers sell their products or services directly to the customers. Auction sites are examples for these kinds of e-commerce activities. These sites allow individuals to put items up for auction transactions. Key participants of C2C Electronic commerce are individual buyers, individual sellers, electronic intermediating service providers, deliverers and government. The sellers in C2C Electronic commerce are not capable of implementing the total quality process but like C2B E-commerce, individual sellers may contribute and gain the quality benefit of Web site contents and

the government can seek the quality and supportive environment. The other quality benefits like technology, additional services, and operation can be gained as well.

d. Benefits to B2B

Both sellers and buyers are included in B2B e-commerce. B2B E-commerce covers a wide range of applications that lets the companies to form electronic relationships with their distributors, resellers, suppliers, and partners. B2B facilitates supply chain management as well. The coordination of order generation, order taking, and order fulfillment or distribution of products, services, or information is included by Supply chain management process. Additionally, B2B E-commerce plays an important role in procurement management for purchasing companies. TQM process results in providing the customer with quality product at the right time and at the right place. In order to achieve this objective, the selling companies will contribute and gain the quality benefits of E-commerce, including Web site content, technology, additional services, and operational quality. Additionally, TQM process in B2B E-commerce will result in low purchasing costs, reduced inventory and warehouse costs, enhanced efficiency of logistics and procurement, lower marketing cost, and improved sales in the market.

The benefits of TQM to B2B, B2C, B2G, C2B and C2C can be summarized in Table 4.3

Table 4.3 : Quality Benefits and TQM Contributors to E-Commerce

	TQM Contributors to E-Commerce Segments				
Quality Benefits	B2C	C2B	C2C	B2B	B2G
Quality Web site content	Self	Self	Self	Self	Self
Quality technology	Self	ISP	ISP	Self	Self
Quality supplementary services	Self	ISP	ISP	Self	Self
Quality operation	Self	ISP	ISP	Self	Self
Quality environment	Government	Government	Government	Government	Government

Source: Chou (2001)

5. TQM IN HURRIYETEMLAK.COM

Each day in the rapidly growing internet sector of Turkey, new influential portals and systems capable of leading the market come into existence in all branches of e-commerce. Especially since the growth of real estate and construction sectors in 2003, a significant increase in the number of portals operating in these sectors has been observed. Among these recently established portals, Hurriyet Emlak has already taken the lead with its vast influence in the market.

For the purpose of this study, Hurriyet Emlak has provided a just example for it consists of Models B2C and C2C together, and also for the quality approach of the portal thanks to its management strategy which in contrast to its rivals, attaches importance to the quality concerning their corporate subscribers and end users. Moreover, due to the fact that products are made of only one central system in e-commerce systems, TQM's important elements are utilized mostly focusing on data and the system. Considering and assessing this situation as a different approach makes this study unique among the other TQM researches. In this section, a portal that is capable of directing the sector it participates will be examined in the scope of quality and TQM processes and the consequences following them.

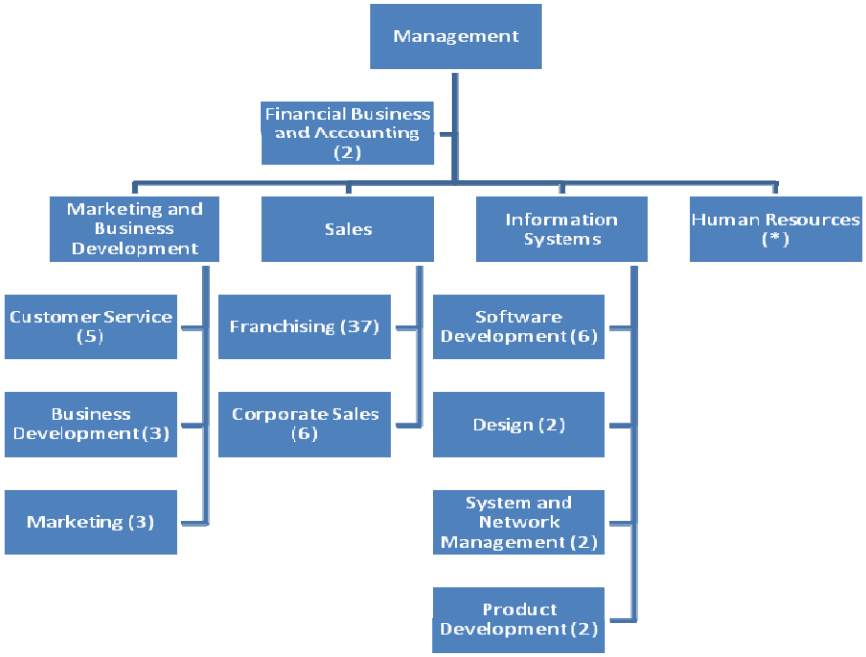
5.1. ABOUT HURRIYET EMLAK

In the October of 2005, in order to strengthen its leadership in the sector and also to turn to account the potential existing in the internet sector, Hurriyet Gazetecilik A.S. started technical and business model analysis for Hurriyet Emlak Portal which eventually launched its internet operation in the April of 2006. Fundamentally targeting to bring together individual members, real estate agencies, construction companies, and side sector representatives such as furnishing and decoration, Hurriyet Emlak has testified the heritage

of leadership coming from Hurriyet Newspaper in the internet sector also. Given the important role in the sector by the singular visitor number around 2.5 million per month, the portal has also made progress by their marketing activities to gain better awareness.

5.1.1. Organization Structure

Taking the target of providing the best possible technological service to its subscribers and visitors each day one step further, the portal's number of subscribers has reached more than 5500 for corporate subscribers and around 150K for individual subscribers. It satisfies its clients' needs with the ever-changing functionality that grows parallel with technological developments, the personnel that dutifully answer the members' needs with their services and lastly, the unique organization planning. The section consisting of sales, marketing and business development, information systems, financial business departments has an operational structure with the following basic functionalities. (see Figure 5.1)



Source : Hurriyet Emlak

Figure 5.1 : Human Resources support is provided by DYH Human Resources Department.

5.1.2. Business and Revenue Model:

Members taking part in Hurriyet Emlak portal's business model can be classified under 4 types:

1. Individual members
2. Real estate agencies
3. Construction companies and contractors
4. Advertisers

The basic targets for the real estate sector have been to create a pool of second hand sales or rental advertisements and to profit from additional services by having the information gathered become a focal point of attraction. These 4 membership types generate the total income of Hurriyet Emlak portal by operating within 4 main items of income which can be listed as follows:

i. **Ad Revenue**: The item of ad revenue consists of the prices of ads in the system and the extra features which are listed optionally. When putting a general ad to the site, this item is the one in operation. But users optionally may also prefer performing their transactions via the pre-paid system. This revenue item consists of the following products:
   a) Ad price
   b) Promoting prices (Bold titles, push-up listing, framed ads, etc.)
   c) Featured ads (on main page, category pages, etc.)
   d) Ad services (HE magazine ads, Hurriyet newspaper classified ads, Real estate TV ads, Video ads, etc.)

ii. **Subscription and Services Revenue**: This item covers the revenues from the subscriptions with varying durations of real estate agencies and from the specific

corporation services provided to those agencies at the background. In this item of revenue there are:

a) Agency membership packages
b) Promotional products (cameras, navigation devices, videos, etc.)
c) Marketing products (banner and vinyls, mass SMS systems, etc.)
d) Services:
    a. Hosting Services
    b. CRM Services
    c. Office management system
    d. Accounting system

iii. **Promotions Income:** Generally grand construction companies and contractors' projects and also some of the real estate agencies' offices and portfolios are introduced and their special promotional products take place in that item of income.

iv. **Advertisement Revenue:** This item of revenue consists of the incomes from advertisements and publicities published on portal by advertisers from inside or outside the sector. These advertisements are products called banners which appear either as fixed or rotationally in the page and sometimes are related to the parametric information of the page.

The distribution of these items taking part in Hurriyet Emlak portal's total incomes can be seen in Figure 5.2, and the types of members that create incomes and their relations with the items of revenue can be summarized as in Figure 5.3

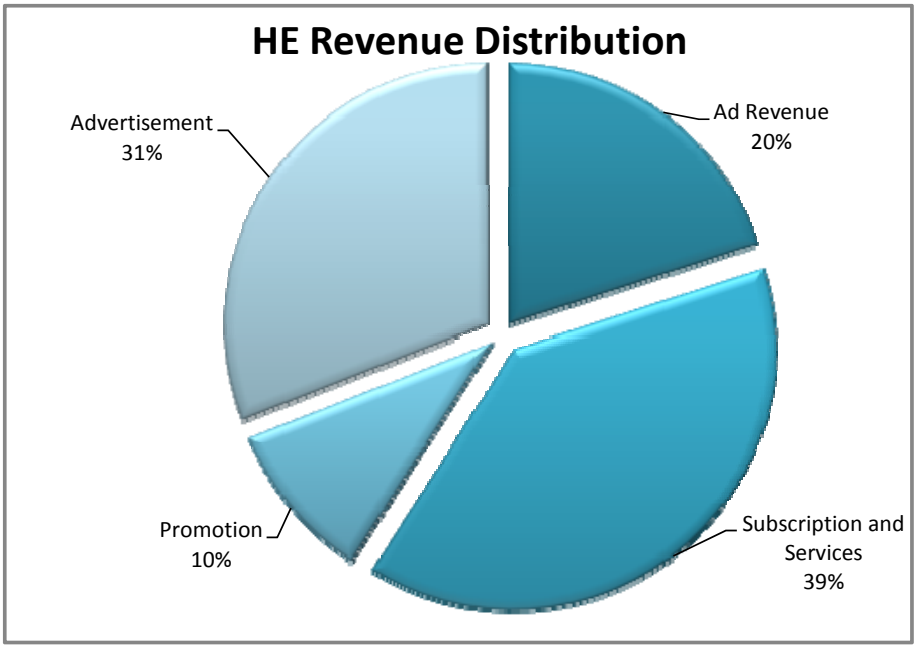
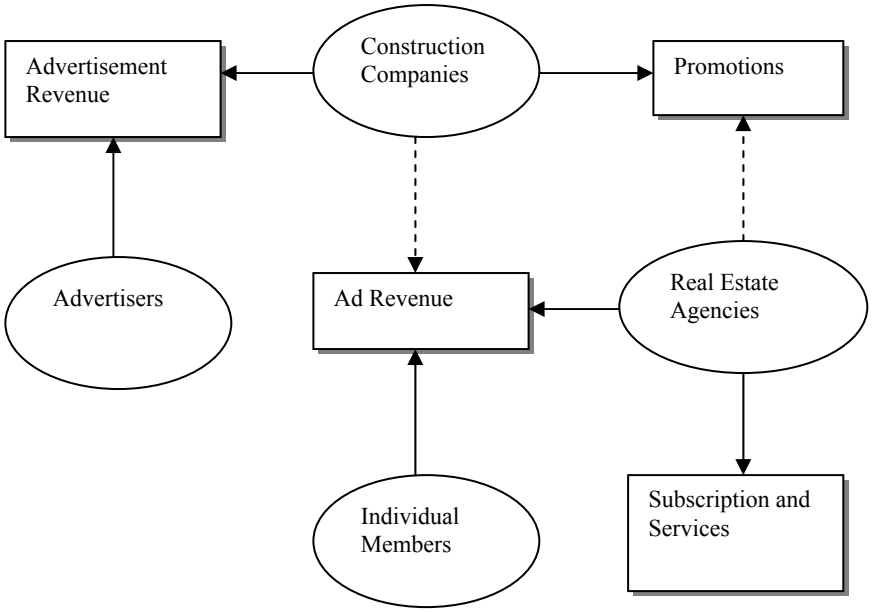


Figure 5.2 : The distribution of these items taking part in Hurriyet Emlak portal's total incomes.



Source: Hurriyet Emlak

Figure 5.3 : The types of members that create incomes and their relations with the items of revenue.

5.2. TQM AT HURRIYET EMLAK

It is not likely to find an instance where TQM is fully utilized in the e-business systems in Turkey as they are still in the stage of maturing. Considering these newly developing systems' problems caused by lack of total quality management are also related with their endorsement and budgets, it is reasonably hard to find companies or systems that reserve sources or that are inclined to deploy TQM except a few cases.

In the case of Hurriyet Emlak portal, regarding the number and amount of transactions they have reached besides the great number of their clients, it is quite not possible they would ignore quality in management. When analyzed by a TQM point of view, there are two important points of attention about Hurriyet Emlak portal. The management staff of the

portal is focused on quality and they try to reserve enough resources to maintain it. On the other hand, it is hard to tell this approach contains all important elements in TQM. Evaluating the important issues in TQM and Hurriyet Emlak portal in a comparative manner reveals the facts that the portal is better than expected about some matters and fairly weak about some others. In this section the portal will be evaluated within the scope of TQM's most important elements.

5.2.1 Customer Satisfaction

When Hurriyet Emlak portal is evaluated by the general factors that affect customer satisfaction, it is clearly seen that all processes in every department are totally customer oriented and designed to fulfill their needs. Besides, the CRM required for solving customers' problems, pre-sales and post-sales support, quick and effective response for technical problems and benefitting is present in the system in order to maintain customer satisfaction.

Tracing of potential customers' or subscribers' activities by customer representatives and automatic maintenance of processes by the workflow system in CRM are contained in a structure which is also integrated with all other processes in the portal. This is how each action in the system performed by the customer can be followed by CRM users and in the case of being in contact with the customer quicker responds can be provided about all their actions.

Besides, all pre-sales and post-sales appointments, meetings, offers and invoicing structure concerning them are also run through CRM framework. Thus, all mentioned information can be followed by customer service staff. The automatic processes created within post-sales support and customer needs analysis tasks establish a very healthy relationship between the portal and the customer. Two of some many successful examples are:

Post-sales customer support:

Once a real estate agency subscribes to the system a post-sales activity is created in the system for that new subscriber. As soon as the client executes the package activation two activity records are created. One of them is forwarded to technical support department. Technical support department contacts the client the same day of activation to provide technical support about the system and solutions to any possible problems. If a portal based problem exists, a ticket about the member is created in the system and forwarded to technical department. The second activity record is held for fifteen days after the package activation date and automatically forwarded to a customer representative. This activity is designed to measure customer satisfaction and to remind the client of important matters which were told first time in the first technical support activity in case if they are missed somehow. By this process flow:

i. The clients are well informed about the product starting from the date of purchase and thus they are provided with the information enough to be able to create entries that can match the system contents.
ii. Not only maximum benefit is provided to the corporate subscriber but also the quality of portal's content is kept under control.

Controlling ads of individual members:

Individual members only are able to place ads into the system for free of charge as that possibility is not provided for any corporation that performs commercial activity. Therefore, sometimes corporations who try placing ads using an individual membership are filtered out by the ads control mechanism and their ads are not approved. Henceforth those corporations are considered potential customers for the portal. An automatic structure is embedded in the CRM system in order to forward those denied users to tele-marketing staff as "potential corporate customers" and to have an activity opened in the system to sell them

corporate packages. So far, a significant percentage (35 percent) of these automatically created activities has resulted with a corporate package purchase by the customers.

The CRM is actively in use at technical department as much as it is used at sales and customer services departments. Any technical troubles notified to the portal by its customers are forwarded to the technical department by customer services. If the problem is caused by the system, it therefore is assigned to the team responsible. If there are any urgent tickets in the system the most important task for all staff working at any department is either to take care of the problem or to provide correspondence for its solution. Thus, quicker solutions can be provided for customers that create transactions and so customer satisfaction is fulfilled.

5.2.2. Continuous Development

Continuous development, being one of the most important aspects of TQM, is also among the most important factors about internet portals that reveals the differences between the rivals in the market. Taking into account that customer satisfaction has a positive effect for the products in continuous development; quality of management in that progress plays a critical part in a portal's success. Sound management of customers' needs, analysis of rivals and the market, functionality of the product, its timing and cost are among the critical points which help the corporation strengthen its place in the market.

Business development progress in Hurriyet Emlak portal is well organized in all above mentioned critical points which was the key to its success. No matter if it is an internal or external demand, collecting them at one central point, taking them into assessment by a standard workflow, planning of the projects after the assessment and providing resource management are among the sound advancing reasons that explain how the portal has

managed to come this far since its starting date of operation. The demand management operation that is under responsibility of business development staff which plays a crucial part in product development can be summarized as follows:

1. **Demand Collection:** Demands are received by business development staff. (Visitors' suggestions are received by customer services. On the other hand portal staff forwards those suggestions as a demand.)
2. **Analysis and Assessment:** The demands are analyzed and assessments are made in this step so that insufficient projects in terms of goal, detailed descriptions and feasibility are returned back to the owner of that demand.
3. **Approval Presentation:** A presentation is performed to the company's management staff about the project in order to get an evaluation and approval from them.
4. **Classification:** The approved projects are classified by means of the resource needs they require to come to existence. These classes are:
    a) Great Projects (Projects that require 4 men/week or more resources)
    b) Mediocre Projects (Projects that require resources between 2–4 men/week.)
    c) Normal Tasks
    d) Projects and tasks about internal mechanisms.

Demands in each category are put in order depending on their importance in their own category. This arrangement is made in the monthly "project plan" meeting with the participation of department managers. Not only the necessary reports about ongoing projects are presented in these meetings but also projects that went through the demand management process are evaluated in order to be appointed their importance degrees under the categories they belong. The main reason the projects and tasks are put under categories in the system is to prevent the demand created especially by revenue expectations to interrupt mediocre projects and normal tasks. Besides, the most critical practice that creates

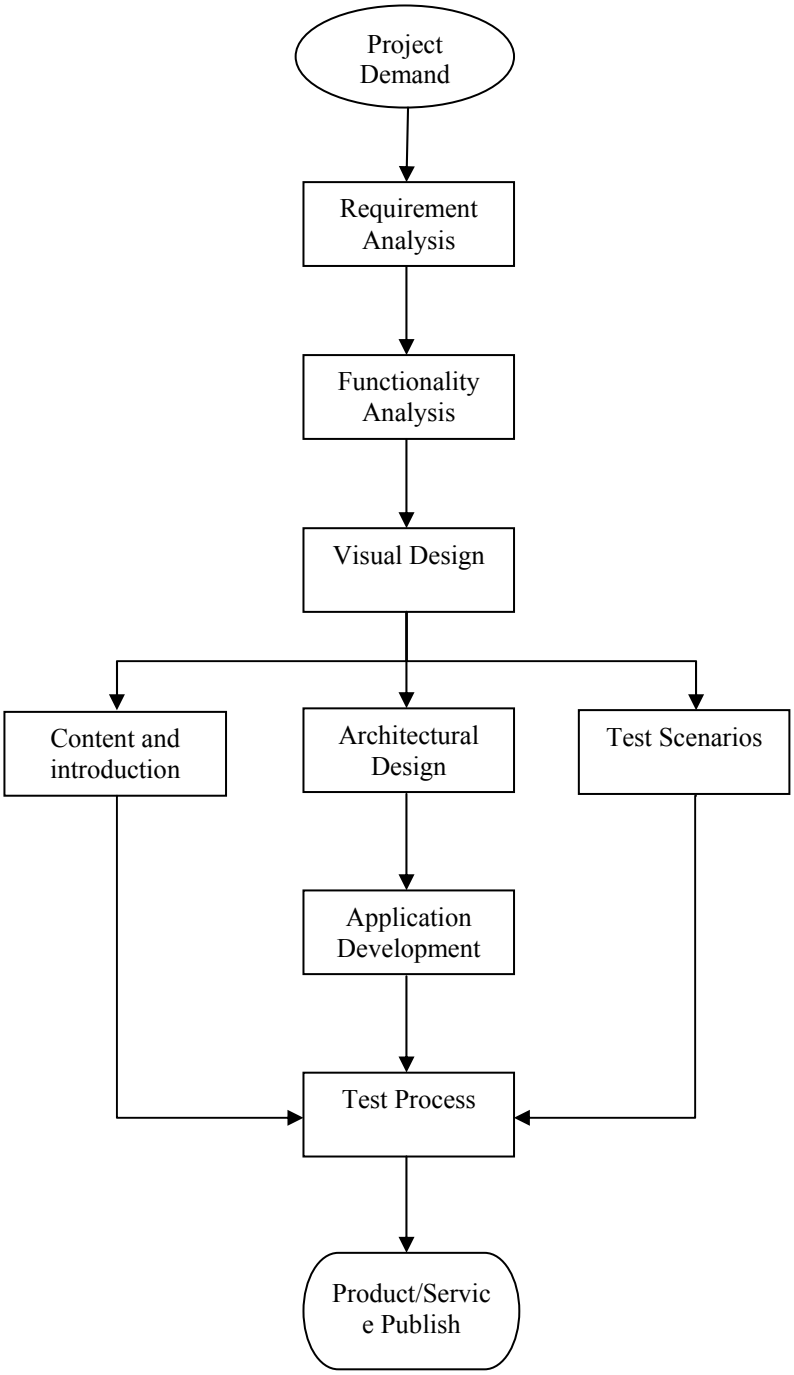
many advantages mentioned above is the fact that the demands in back-office system which plays a critical part for the support provided to customers are put under a separate category.

Another important structure in the planning stage is the iteration and release structure. Duration of an average production period of the group in Hurriyet Emlak portal's business development process is 2 weeks. Business development and software departments organize the tasks assigned on them by iterations that take 2 weeks for each in order to adjust the workload of software developer staff. After four iterations, each time a matured version is achieved. These matured versions are represented by a release and in each release generally;

i. 1 great project,
ii. 2 mediocre projects,
iii. 1 project concerning internal mechanisms,
iv. Maximum maintenance tasks

are aimed to be performed. That's how a homogenous and dynamic planning structure is achieved for projects of variable scales. Execution of planned projects is shown in the flow chart below.

While the products and services carried out by that production plan are passed through each step, they are commissioned with a transmission plan that is designed depending on the project's requirements with the least possible error tolerance and high adequacy to the system's architecture. This structure is one of the most important effects that determine Hurriyet Emlak portal's quality line. Although it may seem like all these structures are recently embraced by the company because it is relatively newly established, the approaches in those processes (see Figure 5.4) have matured out during the previous year and a sound communication was achieved between the departments in the beginning of the year 2008. But no application has yet been performed for the optimization and development of the functions within those processes.



Source: Hurriyet Emlak

Figure 5.4 : Basic product management and development workflow in HE

5.2.3. Team Work and Quality Circle

One of the most important incompetencies of Hurriyet Emlak portal's TQM is the quality circle concept and its application. Just because there is no such structure that provides supporting ideas and suggestions from other departments except business development about the quality and development of products and services, while the system should ideally have let all the departments to support the mentioned services and products. Moreover, other important responsibilities of quality circle which are the improvement of working environments and increasing the working standards of employees are not assigned to any group to be performed.

Thanks to the sensibility shown by department managers on important matters concerning team work practices such as building a synergy between the departments, maintaining a well organized structure and acknowledging the responsibility of working together, problems resulting from the absence of a quality circle in the portal can be eliminated substantially. Especially the structures within workflow that require cooperation of many department representatives for decision making, different departments and their varied opinions can be taken into account in a comparative manner during the designing of a new service or product. Thus the chance for optimum decision making is obtained.

5.2.4. Quality Culture

Another important reason for Hurriyet Emlak portal's quality insight is not sufficient to be considered as a TQM is that the quality culture concept has yet to be established in the company. All general structures in the portal can be followed and reported through both CRM and portal's software which ensures many activities to be recorded in a certain quality standard and the continuity of the processes. It is obvious that the main element for the maintenance of quality in the system is unfortunately not the quality culture but the

systematic infrastructure. The fact that all the processes of sales and marketing departments aren't operated on the system causes troubles. Business development and technical departments have their own quality culture mentalities somehow as they fulfill what it takes to maintain quality. On the other hand, sales and marketing department has to deal with problems emerging from the lack of quality concept about the operations they run outside the system which impair the communication inside the system and block the chance to benefit from prime cost reduces gained through a sound quality management.

Primary processes of sales department that run outside the system are "real estate agencies meetings" outside the big cities in Turkey, setting of product and services prices and granting promotions to member agencies (i.e. cameras, pre-paid credits, banners, etc.) Information flow in those processes cannot go on through processes such as retroactive data analysis, time and risk management, thus the desired efficiency from the projects and plans cannot be achieved.

Marketing department on the other hand has experienced serious troubles about the workflows the portal's marketing actions performed both on internet and television or newspapers. Specifically they have trouble determining the right time and date and frequency for advertisement or campaigns and thus never they can gain the desired efficiency expected from them. Besides, because they don't get into touch with the technical department before some important campaigns, they sometimes are subjected to problems resulting from unexpected traffic increases and eventually the quality of services suffers badly from all those inconveniences.

Actions and processes concerning customer satisfaction which is the main target for customer services department maintain very well thanks to the CRM system. The department also provides positive feedbacks from the portal's clients with their sensible approach about the tickets of sales and technical departments' customers. Trying to take their services to higher qualities and faster speed by analyzing the customers' questions and

preparing an automatically answering system, the department also contributes the online help system to get better by sharing their mentioned actions with product development department.

Business development and information systems departments have a separate platform operating between them for the production structure. Because of the fact they are producing oriented departments their structures are prudential, visional, proactive and not budging from quality in their processes working outside the system. The products are designed and developed as long term and multi functional. Because the processes at product development and software stages are quality and customer oriented and that situation provides various advantages to the portal itself as well.

5.2.5. Business Intelligence

The concept of business intelligence, which before was considered as reporting systems, has gradually started to be acknowledged as a way to generate bases for the next steps of applications by using information that help reaching systems independent from individuals. This concept is much obviously seen especially in portals and e-commerce systems. Provided by the environment's completely interactive state, many effects such as customer's behaviors, the searches they perform and transactions they create can all be examined together in order to guide decision making mechanisms for the future plans.

Gathering the results of reporting system to be interpreted and made ready to be reused for the maintenance of business intelligence system is a separate progress that requires more resources. Although Hurriyet Emlak portal's reporting systems are in good form in terms of operation, they lack the resources needed to establish a business intelligence concept and therefore it doesn't exist in the portal. Because of wrongly analyzing retroactive data and

impossibility of storing analysis results in the system, many decisions about campaigns and applications are assigned to individuals that block corporation information buildup.

5.2.6. Quality Control

Quality controlling structures in Hurriyet Emlak portal's processes and services and products are at least as important as quality oriented structures. Because it contributes the business model in many aspects such as measuring the quality of services provided to make sure if they are at the expected rate, finding out the possible problems in the system and solving them, running the processes at a faster speed and lower cost. If the quality control points in each department in the portal are examined closer it can be observed that even though the quality is not controlled throughout the whole processes, the key points for customer satisfaction are controlled in an extra careful manner.

Customer Care Department

The main function in customer care department is responding the incoming calls as inbound via e-mail or phone and forwarding them to the related unit if necessary. All of the processes in this department operate as integrated with the CRM system. Thus, it is made possible to report many activities performed by the staff members at the department. The processes controlled through weekly reports are as follows:

1) Average conversation time
2) Average ticket closure time
3) Average session closure time
4) Analysis of incoming complaints
    a) Complaint trends concerning the system
    b) Complaint trends concerning the content
    c) Complaint trends concerning the support service

The module that queries customer satisfaction in the ticket system would be added in May 2008, therefore neither a report nor a quality control can be made in that category.

Digital operator services are received from Dogan Musteri Hizmetleri Corp. via VOIP. All customer conversations are recorded through that operator service and the staff's manner in answered calls are regularly checked by a supervisor.

Sales department

As mentioned in quality culture section, not all the functions of the system operate inside the system. But especially the critical points for end users that need to be controlled regularly are operated systematically. Tele-sales department's outbound phone conversations are also controlled just like the inbound phone conversations of customer services department. Besides, activities of field sales and telesales departments' members are also controlled. The controls performed are as follows:

1) Appointment occurrence rate
2) Rate of visits/conversations that turn into revenues
3) Customer opinions about the post-sales information provided and customer complaints
4) Of the tickets assigned to customer representatives:
    a) Average closure time
    b) Average session closure time

Marketing department

In the main function of marketing department which is the publicity of the portal, unfortunately a quality control process doesn't exist. It is impossible to name the actions performed to measure and control the efficiency of promotional activities as a proper quality control. On the other hand those activity result evaluations can provide with new ideas for further activities and sometimes they can reveal some campaigns efficiency rates are not high enough so that those campaigns need to be stopped.

Marketing department is also responsible of consolidating the company's reports. The reports about all trends of the portal and its rivals, received customer complaints and satisfaction messages and portal performance that are used both internally and externally are standardized by this department. That is the way how the portal's self state and its situation against its rivals can be followed weekly and therefore a basis can be formed for the maintenance of quality.

Information systems department

Information systems department may be the most critical department inside the portal concerning quality. It is responsible of making sure that the designed projects will supply the needs and desires, increasing customer satisfaction and making sure the portal deploys without errors as it stands at the last checkpoint of that deployment process. By its nature it has to make sure the activities performed can be measured and accounted and held in a retroactive manner as these are the prerequisites for a task so hard attained to the department. Quality control points in the department can be examined under two titles:

System Maintenance and performance

There is no doubt that the most important factor affecting the portal's quality directly is the quality control and performance of the servers that are responsible of the portal's servicing. Portal's information systems department is extra careful about that matter. It is extremely important that emergency procedures are determined and a fine structure is established to back up the servers. Besides, to avoid the biggest problem in archiving systems which is "inability to reload from the archived files", regular controls are performed and the risk related to data stored is kept at minimum while the data belonging to customers are backed up safely enough. Other points controlled by the system department are as follows:

i. Controlling of the traffic in all the servers of the portal instantaneously
ii. Controlling the performance of servers and their warning system

iii. Controlling external connections to servers and their warning system

Development and control

The quality in information systems department is controlled at software development, test and error management stages and effective and quick solution methods are created within those processes. Below is a list of work items created during all demands and projects at software development stage:

i. (5) Very urgent
ii. (4) Urgent
iii. (3) Important
iv. (2) Normal
v. (1) Low priority

The developers work on the tasks assigned on them with the above seen priority ranking. If there is an activity in the system specified as "(5) Very urgent", it is obliged to be taken care of first. By that method important problems in the system are solved quickly and the service turns to normal. In this process there is also a structure that measures the software specialists' performances in the tasks assigned on them depending on which group the activity belongs to and the importance of the group.

There is also a structure that instantaneously controls the errors generated by services during operation in the system. Through that system any problem encountered in any page of the portal immediately forwarded to the information systems department with an automatically created ticket. That ticket is directly created under the category (5) Very urgent. Thanks to this structure in the system:

i. The rate of daily occurring errors
ii. Average closure times of errors

iii. The rate of errors occurring under responsibility of a developer
iv. The rate of errors reported after projects

can be calculated.

Moreover, at the test stage which exists in all project development processes, alongside with test scenarios customized for each project, the services that has reached their stable versions in previous releases are controlled in order to make sure the new demand or project is not clashing and creating errors with the previous releases. If so, it is returned back to the software department to be fixed.

5.2.7. Proactive Approach

One of the most important features for the portals in internet sector to be able to keep up is the proactive way of thinking. It is required in a field where development rate is extremely fast to form work models, services and strategies in a visional and proactive approach and maintain with that philosophy. Truth be told, e-business companies in Turkey are following one step behind the sector in Europe and the USA trying to implement their achievements and models in Turkey as well as they plan their future strategies depending on the trends abroad. Thus most of the times it is hard to determine whether their approaches are proactive or they are just results of investigation and implementation. But it is also a must, a material of existence in the sector to follow the global trends and sometimes direct the business model according to those trends for a progressive future planning.

The foundation philosophy of Hurriyet Emlak portal is parallel with that approach model. The applications to adopt the “residence – commercial – projects” segmentation from abroad into the sector in Turkey performed during the time when the portal first launched were considered handy and well accepted by the sector. Besides, the portal management board’s decision to carry on all the services as web based during when the communication

infra structure has been starting to settle and use of ADSL has been starting to spread in Turkey gained them the appreciation of real estate offices and made them differ from other portals thanks to the board's vision. Instead of offline applications that provide synchronization in PCs, adopting a new system of quality and speed while developing web and mobile applications has proved they give importance to accessibility of data and they benefited from the decisions they made substantially.

It must be noted that proactive approach not only helps building strategies but also brings about solutions for difficulties in the sector. Management staff of the portal also used that method of approach in order to maintain quality of content in the portal and with that philosophy again they turned promotional activities into effective campaigns. By providing with digital cameras the member real estate agencies, the average image number in the ads were increased from 2.3 to 7.6 and 80 percent of the ads portfolio were turned out to become imaged ads. Services such as the "click and upload" service that makes the images to be uploaded 25 times faster than normal and the web hosting service that operates in synchronization with the real estate agencies' portfolios in the portal have come to existence owing to that proactive approach and have succeeded. Besides, with proactive approach the technical investments were predicted and performed on time and the resources and infra structure that is able to carry the future growth capacity were prepared beforehand.

Hurriyet Emlak portal's management staff is obviously very successful by means of practicing a proactive approach.

5.2.8. Participative management

The decision making processes between departments allow the participation of all personnel working in the company to the decision even though it is made in an indirect

way. Each department determines their opinion with the participation of chiefs and specialists from their own structure and reports the decision about the matter to the department manager beforehand a decision making. Thus, many strategic decisions are made with contribution of all departments and their managers.

For instance, the sales department in their meetings for two weeks queries about the sales and satisfaction facts of real estate agencies from the field and corporate sales staff and they determine some important points concerning prices and demands. That information gathered through chiefs are evaluated by the sales department managers asking for more detailed information from the staff sometimes.

The relation between the IT and the business development departments is even more important. As mentioned earlier in Continuous Development section, maximum participation is assured in all stages of product management and development. Especially at the functionality analysis stage of products, the documents prepared with the participation of whole department are evaluated together with functionality design documents at the portal managers' meeting and necessary additions or extra requests are decided. On the other hand, during the architectural design the developers' staff come together and discuss about the architectural design in the scope of requirement documents. At this stage predictions about the products' advancement and progress are tried to be made and the architecture is directed according to the conclusions. Also the distribution of maintenance tasks which are under responsibility of this department is assigned to employees by sub-department chiefs (supervisors) and team leaders.

At weekly portal management meetings, information and suggestions coming from the departments are evaluated and necessary steps are taken for the suggestions that are worthy of becoming projects. By this means any suggestion or information coming from the company's lowest rank can be evaluated at the highest rank and the result is returned to the original owner of the idea.

5.2.9. Continuous Education

Dogan Yayin Holding, in order to help the companies it holds reach their targets, has been organizing large scale education seminars to assure the employees knowledge and awareness is high enough to be able to carry their companies to their targets. According to the requests of personnel or department managers, employees can attend the seminars held throughout the year. This structure provides the holding's employees with a chance of regular education in accordance with their working fields.

Nevertheless, there are striking inadequacies about portal workers' education about portal's products and services. Both the new projects and the projects that are going on lack regular information and education flows about the important changes made on those projects and it causes the portal employees are either misinformed or insufficiently informed about the projects. Besides, this situation also causes incompetency about the newcomer personnel's education, making it take longer time for them to become well informed about the portal's products and services and to start their duties effectively.

5.2.10. Long Term Success

It is a well known fact that witnessing TQM's results is a time taking process. Therefore, before starting to implement TQM in a company, this period of time should be considered and supported by the management board. It requires that the managers should regard the success expected after a TQM as a long term progress. This perspective is another reason why a proper TQM in Hurriyet Emlak portal cannot be mentioned about yet.

Hurriyet Emlak portal management has their own short term and aggressive targets as any other company that constitutes Dogan Holding. That situation prevents the portal from fixing its deficiency for a proper TQM, letting it only to maintain its existing state. Maybe the most important obstacles in that aspect are the projects emerging after foreign demand in Turkey real estate sector and the searches for new sectors.

5.2.11.Awards of Innovation and Success

The suggestions brought by employees and projects designed after those contributions are evaluated at "Dogan Yayin Holding Creativity Awards" night and contributors of those projects are rewarded. At the end of each year all the companies of the holding present their candidate projects which they regard as successful and the winning teams are awarded according to the categories they belong to with notebooks, vacations or cars. The categories mentioned are as follows:

i. The Most Creative Newspaper Project
ii. The Most Creative TV-Radio Project
iii. The Most Creative Magazine Project
iv. The Most Creative Book Project
v. The Most Creative Internet Project
vi. The Most Creative PR-Communication Project
vii. The Most Creative Sales Project
viii. The Most Creative Product-Brand Development Project
ix. The Most Creative Social Commitment Projects
x. Evaluation Committee Award
xi. The Most Creative Novice Employee
xii. The Most Creative Employee

This practice has become extremely effective as it has been regarded as a prestigious event by the holding's employees. Besides having the personnel working at the portal aim such targets, the kind of event which regards the companies as teams in competition with each other's under the mentioned categories affect the employees in an extremely positive manner.

6. MEASURING QUALITY IN E-COMMERCE

Quality of system must be measurable at the end of the day. So, applicable measurement system should be defined for e-commerce systems to check their quality level in the market. It gives a lot of advantages for companies to control their position and acting for improvement and investment. Analytic Hierarchy Process (AHP) can be used for this mechanism.

6.1. METHODOLOGY: FUZZY BASED DECISION MAKING

According to Zeng *et al.* (2007), influential factors can be decomposed by brainstorming or checklist techniques, scored by fuzzy reasoning membership functions and weighed by analytic hierarchy process (AHP). The AHP is a popular decision making technique that has proven easy to understand and plausible for prioritizing alternatives among multi-criteria and multi-attributes. The use of AHP need not involve troublesome mathematics but decomposition, pair-wise comparison and priority vector creation. However, one drawback of the current AHP method is that it can only deal with definite scales in reality. Quality dimensions of e-commerce are complicated usually involving massive uncertainties and subjectivities. Therefore, a modified AHP method is proposed to create favorable property on its applications for measuring quality of system.

The principles and algorithm of a new quality assessment method are presented in this paper. The application of fuzzy reasoning techniques provides a systematic tool to deal with qualitative and quantitative data and information arising in the quality factors.. An illustrative example on quality measurement of system of Hurriyet Emlak is used to demonstrate the proposed method. The results of the quality factors assessment in the case study are represented as quality a weight which indicates that by using the proposed methodology the quality associated with e-commerce can be assessed effectively and efficiently.

6.1.1. New assessment of quality factors model (Zeng *et al.*, 2007)

A quality analysis should cover all aspects of quality dimensions in question and specify which quality dimensions are important for system. Therefore, it should include factors for each dimension to specify impacts of factors to system quality.

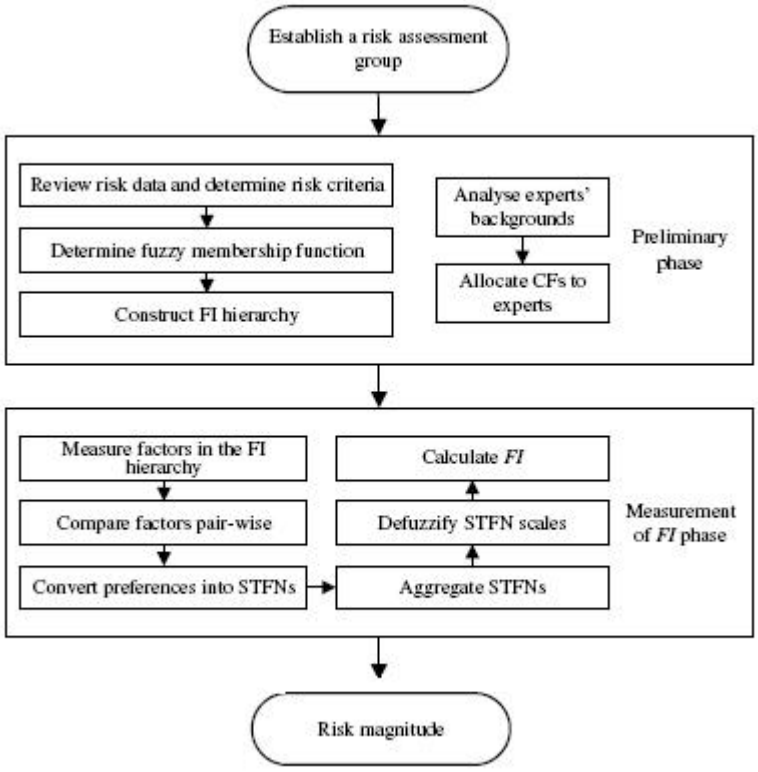
Fuzzy reasoning techniques have proven useful to handle ill-defined and complex problems arising in quality measurement of e-commerce to reach a reliable decision. An assessment of quality factors model based on fuzzy reasoning and AHP approach is proposed as shown in Figure 6.1. The algorithm of the quality model consists of three phases: Preliminary phase, measurement of factor index (FI) phase and, output modification phase. The details are described in the following subsections.

6.1.1.1. Preliminary phase

As quality data and information related to a particular e-commerce system are massive, assessment of quality factors starts with the establishment of a quality assessment group in which involves a range of experts with different background/discipline and essential experience regarding the e-commerce activity under consideration, e.g. general manager, sales manager, marketing manager etc. The quality assessment group undertakes the review of quality data and information, and determination of quality factors.

6.1.1.1.1. Review quality data and determine quality factors

The members in quality assessment group are required to review all information related to the quality under consideration. A further investigation is also needed to clarify some ideas and eliminate some doubts.



Source: Zeng *et al.* (2007)

Figure 6.1 : A fuzzy reasoning assessment of quality factors model.

6.1.1.1.2. Determine fuzzy MFs

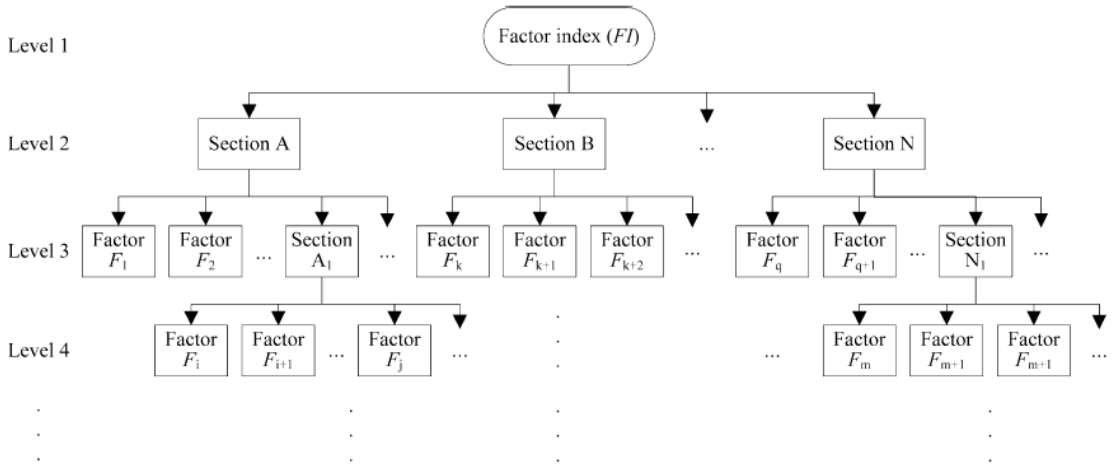
Fuzzy membership functions (MFs) usually stem from experimental data, perception of the linguistic terms and the simulation of reality, which are characterized by the defined linguistic variables and accommodated to the environment under consideration. If a variable can take words in natural languages as its value, it is called a linguistic variable, where the words are characterized by fuzzy sets defined in the universe of discourse in which the variable is defined. Several geometric mapping functions have been widely adopted, such as triangular, trapezoidal and S-shaped MFs.

6.1.1.1.3. Allocate CFs to experts

As different experts have different impacts on the final decision, CF (Contribution Factor) is therefore introduced into thee-commerce quality analysis model to distinguish experts' competence. CFs will be allocated to experts on the basis of their experience, knowledge and expertise. Assume *m* experts in the group, the *k*th expert E_k is assigned a contribution factor c_k, where $c_k \in [0, 1]$, and $c_1 + c_2 + ... + c_m = 1$. Fuzzy based decision making methodology can be used to calculate CFs of experts too. Obviously, it is necessary to review CFs when the topic or the circumstance has been varied.

6.1.1.1.4. Construct FI hierarchy

Many factors have impacts on an e-commerce activity and affect the quality. The members in the quality assessment group are required to provide and review relevant Project information and undertake an investigation on the e-commerce environment. The purpose of the FI (Factor Index) hierarchy is to decompose these quality factors into adequate details in which FI can be efficiently assessed. Several techniques can be used to generate a breakdown structure of influential factors regarding a quality, such as Brainstorming, Checklist, ''What if?'', and Failure Mode and Effect Analysis. A bottom-up approach is employed for FI analysis as shown in Figure 6.2. Level 1 shows the result of FI analysis that can be divided into n sections on the basis of the dimension of online service quality, e.g. section A, section B, . . ., section N at level 2. Each section can be further broken into quality factors in order to identify all possible factors. FI analysis can be carried out from levels 3 and 4, then progressed up to level 2 and finally FI analysis can be conducted.



Source: Zeng *et al.* (2007)

Figure 6.2 : A general structure of FI hierarchy.

6.1.1.2. Measurement of FI phase

Members in the quality assessment group are asked to evaluate each factor at the bottom level of the FI hierarchy under the agreed score system. A modified fuzzy AHP method is applied to work out the priority weights of quality factors. FI can be obtained by the composition of the scores and the related weights of quality factors in the hierarchy process. In a typical AHP method, experts have to give a definite number within a 1–9 scale to the pair-wise comparison so that the priority vector can be computed. Assume two factors of F_1 and F_2, if F_1 and F_2 are equally important, then it has a scale of 1; if F_1 is weakly more important than F_2, then it has a scale of 3; scales of 5, 7 and 9 are used to describe strongly more important, very strongly more important and absolutely more important, respectively. Even scales of 2, 4, 6 and 8 are used to compromise slight difference between two classifications. The corresponding reciprocals 1, 1/2, 1/3, . . ., 1/9 are used for the reverse comparison, i.e. F_2 comparing to F1. However, factor comparisons often involve certain amount of uncertainty and subjectivity. For example, an expert E_1 knows factor F_1 is more important than factor F_2, however, the expert cannot give a definite scale to the comparison because the expert is not sure about the degree of importance of F_1 over F_2. The expert probably provides a range of 3–7 to describe these two factors, e.g. F_1

is between weakly more important to very strongly more important than F_2. Sometimes, experts cannot compare two factors due to the lack of adequate information. In this case, a typical AHP method has to be discarded due to the existence of fuzzy or incomplete comparisons. A fuzzy AHP approach may therefore be expected. A Fuzzy AHP is an important extension of the typical AHP method which was first introduced by Laarhoven Pedrycz. A modified fuzzy AHP is hereby proposed to use standardized trapezoidal fuzzy number (STFN) to capture and convert experts' fuzzy information and subjective judgment. In this method, fuzzy aggregation is used to create group decisions, and then defuzzification is employed to transform the STFN scales into crisp scales for the computation of priority weights. The group preference of each factor is then calculated by applying fuzzy aggregation operators, i.e. fuzzy multiplication and addition operators. There are seven steps to calculate FI that are described as below.

Step 1: Measure quality factors in the FI hierarchy.

Members in the qualiy assessment group are required to provide their judgments on the basis of their knowledge and expertise for each quality factor at the bottom level in the FI hierarchy. The experts can provide a precise numerical value, a range of numerical values, a linguistic term or a fuzzy number. In many circumstances, if adequate information is obtained and the quality factor is quantitative measurable, an expert is likely to provide a precise numerical value or a possible range of numerical values.

Step 2: Compare quality factors pair-wise

Members in the quality assessment group are then required to compare every factor pair-wise in their corresponding section structured in the FI hierarchy and calibrate them on either a crisp or a fuzzy scale. A 1–9 scale is employed to classify the pair-wise comparison.

In the modified fuzzy AHP method, experts are encouraged to give fuzzy scales while they are not sure about the exact numerical values or leave some comparisons absent as they cannot compare two factors at all. For example, experts can use the following classifications:

– A linguistic term, e.g. ‘‘about 7’’.

– A range, e.g. (3, 7), the scale is likely between 3 and 7.

– A fuzzy number, e.g. (3, 6, 8), the scale is between 3 and 8, most likely 6 or (3, 5, 7, 8), the scale is between 3 and 8, most likely between 5 and 7.

– 0, e.g. the expert cannot compare the two factors at all.

Step 3: Convert preferences into the STFN

As described in steps 1 and 2, because the values of quality factors provided by members in the quality assessment group are crisps, e.g. a numerical value, a range of numerical value, a linguistic term or a fuzzy number, The STFN (Standardized trapezoidal fuzzy number) is employed to convert these experts' judgments into a universal format for the composition of group preferences.

Let U be the universe of discourse, U = [0,u]. A STFN can be defined as A* = (a^1, a^m, a^n, a^u), where $0 \le a^1 \le a^m \le a^n \le a^u \le u$ as shown in Figure 6.3, and its MF is

$$\mu_{A^*}(x) = \begin{cases} (\mathrm{x} - a^1) / (a^{\mathrm{m}} - a^1) & \text{for } a^1 \le x \le a^m \\ 1 & \text{for } a^{\mathrm{m}} \le x \le a^n \\ (a^u - x)/(a^u - a^n) & \text{for } a^1 \le x \le a^m \\ 0 & \text{for } o\text{therwise} \end{cases} \quad (1)$$

A MF indicates the degree of preference. It should be noted that a numerical value, a range of numerical values and a triangular fuzzy number can be converted as simplified

STFNs, for example, when $a^1 = a^m = a^n = a^u$, a STFN is a numerical value; when $a^1 = a^m$ and $a^n = a^u$, a STFN is a range of numerical values; when $a^m = a^n$, a STFN becomes a triangular fuzzy number. When members in the quality assessment group cannot

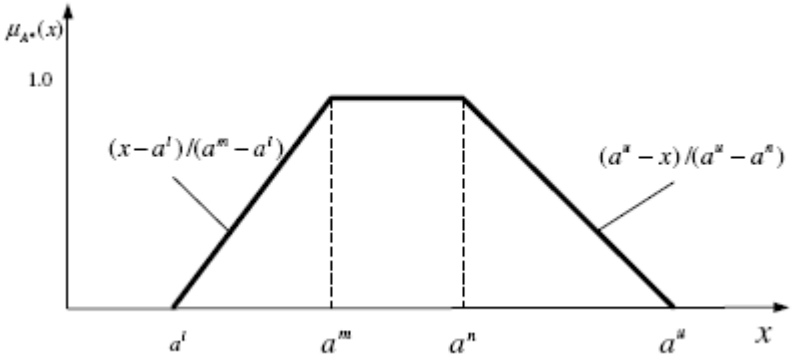
provide their judgments for a specific comparison, then a 0 value can be used and the corresponding STFN is (0, 0, 0, 0).

A series of STFNs can be built to correspond to the scores and the scales of the defined quality factors in the FI hierarchy. Each STFN represents a preference provided by members in the quality assessment group on the basis of available information and subjective judgments.

Step 4: Aggregate individual STFNs into group STFNs.

The aim of this step is to apply an appropriate operator to aggregate individual preferences made by individual expert into a group preference of each quality factor. The aggregation of STFN scores is performed by applying the fuzzy weighted trapezoidal averaging operator, which is defined by

$$S_i^* = S_{i1}^* \otimes c_1 \oplus S_{i2}^* \otimes c_2 \oplus .... \oplus S_{im}^* \otimes c_m \qquad (2)$$



Source: Zeng *et al.* (2007)

Figure 6.3 : MF of the STFN

where S_i^* is the fuzzy aggregated score of the $S_i^* = F_i, S_{i1}^*, S_{i2}^*, ..., S_{im}^*$ are the STFN scores of the F_I measured by *m* experts $E_i, E_2, ..., E_m$, respectively, $\otimes$ and $\oplus$ denote the fuzzy

multiplication operator and the fuzzy addition operator, respectively, and $c_1, c_2, ..., c_m$,are CFs allocated to experts, $E_1, E_2, ..., E_m$ and $c_1 + c_2 + ... + c_m = 1$.

Similarly, the aggregation of STFN scales is defined as

$$a_{ij}^* = a_{ij1}^* \otimes c_1 \oplus a_{ij2}^* \otimes c_2 \oplus .... \oplus a_{ijm}^* \otimes c_m \tag{3}$$

where a_{ij}^* is the aggregated fuzzy scale of F_i comparing to $F_j, i, j = 1,2,..., n; a_{ij1}^*, a_{ij2}^*, ..., a_{ijm}^*$ are the corresponding STFN scales of F_i comparing to F_j measured by experts $E_1, E_2, ..., E_m$, respectively.

It should be noted that the aggregation should discard the absent scale while it comes with nonzero scales provided by other experts under the same comparison. This process can be defined as:

$$a_{ij}^* = \frac{a_{ij1}^* \otimes c_1 \oplus a_{ij2}^* \otimes c_2 \oplus .... \oplus a_{ijm}^* \otimes c_m}{1 - \sum c_r} \tag{4}$$

where c_r is the CFs of experts who provide zero scales.

If all experts cannot weigh a particular comparison, this comparison should left absent and derive the priority weight.

Step 5: Defuzzify the STFN scales

In order to convert the aggregated STFN scales into matching crisp values that can adequately represent the group preferences, a proper defuzzification is needed. Assume an aggregated STFN scale $a_{ij}^* = (a_{ij}^1, a_{ij}^m, a_{ij}^n, a_{ij}^u)$, the matching crisp value a_{ij}^* can be obtained by

$$a_{ij}^* = \frac{a_{ij}^1 + 2(a_{ij}^m + a_{ij}^n) + a_{ij}^u}{6} \tag{5}$$

where $a_{ii}^{*}=1, a_{ji}^{*}=1/a_{ij}^{*}$.

Consequently, all the aggregated fuzzy scales $a_{ij}^{*}(i,j=1,2,...,n)$ are transferred into crisp scales a_{ij}^{*} within the range of [0,9].

Step 6: Calculate the priority weights of quality factors.

Let $F_1, F_2, ..., _n$ be a set of quality factors in one section, a_{ij}^{*} is the defuzzified scale representing the quantified judgment on F_i comparing to F_j. Pair-wise comparison between F_i and F_j in the same section thus yields a n-by-n matrix defined as follows

$$\lambda = a_{ij} = \begin{array}{c} \\ F_1 \\ F_2 \\ \dots \\ F_n \end{array} \begin{array}{c} \begin{array}{cccc} F_1 & F_2 & \dots & F_3 \end{array} \\ \begin{bmatrix} 1 & a_{12} & ... & a_{1n} \\ 1/a_{12} & 1 & ... & a_{2n} \\ ... & ... & ... & ... \\ 1/a_{1n} & 1/a_{2n} & ... & 1 \end{bmatrix} \end{array}, i,j=1,2,.....n \tag{6}$$

where $a_{ii}=1, a_{ji}=1/a_{ij}$.

The priority weights of factors in the matrix A can be calculated by using the arithmetic averaging method

$$w_i = \frac{1}{n}\sum_{j=1}^{n} \frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}} i,j=1,2,....,n \tag{7}$$

where w_i is the section weight of F_i. Assume F_i has *t* upper sections at different level in the FI hierarchy, and $w_{\text{sec}tion}^{(i)}$ section is the section weight of the *i*th upper section which contains F_i in the hierarchy, the final weight $w_i^{'}$ of F_i can be derived by

$$w_i^{'} = w_i \times \prod_{i=1}^{t} w_{\text{sec}tion}^{(i)} \tag{8}$$

All individual upper section weights of $w_{\text{sec}tion}^{(i)}$ can also be derived by Eq. (7) to prioritize sections within the corresponding cluster in the FI hierarchy.

6.2. WEIGHTS OF QUALITY FACTORS FOR HURRIYET EMLAK

A case example of quality assessment on e-commerce is presented to demonstrate the application of the proposed quality assessment methodology.

Hurriyet Emlak board decided that quality of system should be improved. According to that aim board has to know investment point to improve quality of current system efficiently. In order to find out these points, quality factors needed to be assessed by for customer satisfaction and reducing cost of system, it means increase quality.

The quality assessment term has identified a number of issues which can lead to the impact of system quality of e-commerce, such as quality dimensions of e-commerce systems which are defined in section 4.2.3. Online service quality measures and factors of each measure.

6.2.1. Preliminary phase

6.2.1.1. Establishment of a quality assessment group

Five experts with high qualification regarding this subject are selected to form a quality assessment group for undertaking the quality assessment by using the proposed quality assessment methodology. CFs are assigned to experts on the basis of judgments of team members about other members as shown in Table 6.1. Same fuzzy decision making methodology used to calculate CFs of experts. Judgment of experts' weights is added to Appendix A.

Table 6.1 : Experts and their weights according to backgrounds

No	Experts	Name Surname	Background	CFs
1	E_1	Elif Bakiler	Marketing Manager	$C_1 = 0.19$
2	E_2	Erol Demirtaş	General Manager	$C_2 = 0.19$
3	E_3	Tolga Şen	IT Manager	$C_3 = 0.26$
4	E_4	Asst.Prof.Dr. Ahmet Beşkese	Quality Specialist	$C_4 = 0.28$
5	E_5	Ahmet Kurşunlu	Sales Manager	$C_5 = 0.08$
	Total			$C_1 + C_2 + C_3 + C_4 + C_5 = 1$

Source: Hurriyet Emlak

6.2.1.2. Determination of quality factors and fuzzy MF

Five experts have agreed that double 9 levels of linguistic terms to describe FI from 1/9 to 9 for comparing main quality dimensions and their sub factors which are listed in Table 6.2.

Table 6.2 : Quality dimensions and factors of e-commerce

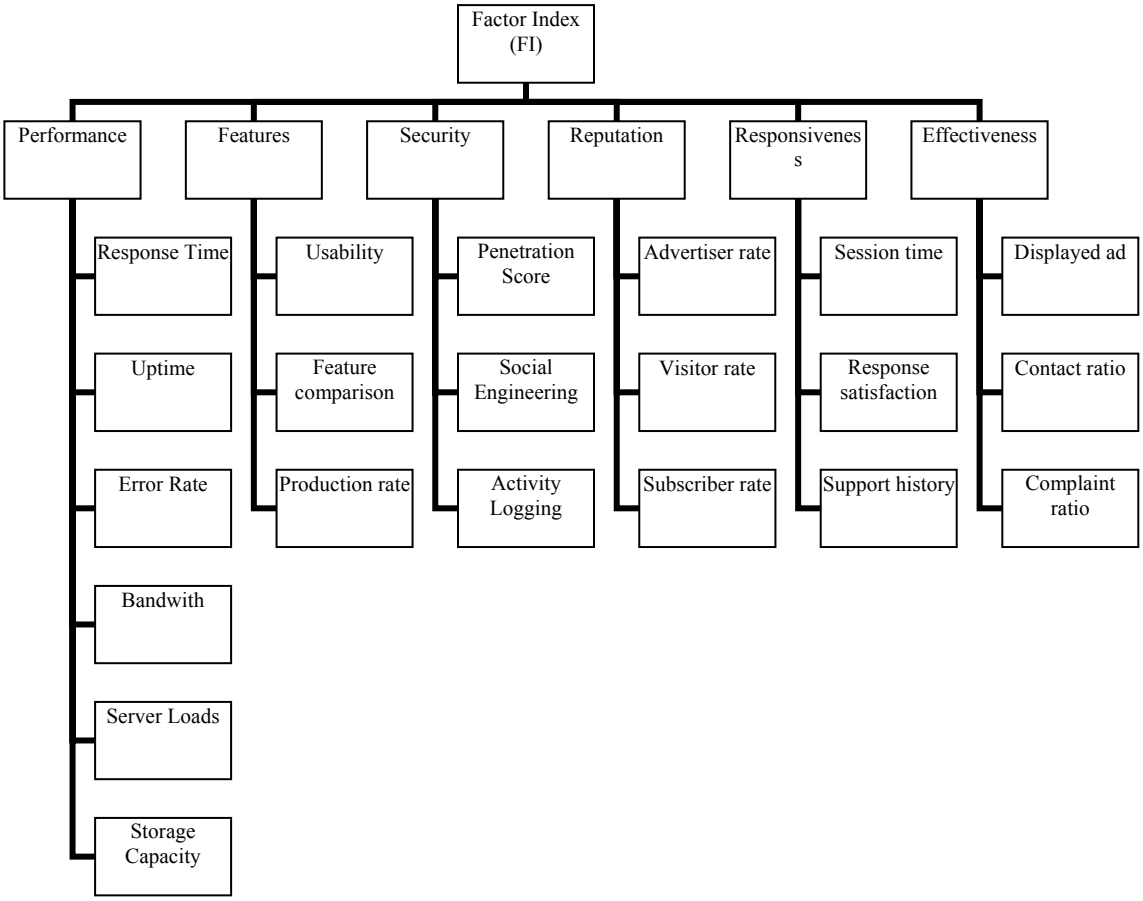
No	Factor	Quality Group	Metric	Descriptions
1	Response time	Performance	Average response time for pages	It shows system capacity for under heavy loads
2	Uptime	Performance	Up hours /minutes	Indicates quality of support of system
3	Error rate	Performance	Number of errors / Total request per day	Shows quality of development and deployment processes in system

4	Server loads	Performance	Average load averages of servers	It shows capacity of servers for unexpected traffics
5	Bandwidth	Performance	Current bandwidth usage / Up limit of bandwidth	Key point for all performance parameters
6	Storage capacity	Performance	Critical free spaces of server's type / Free space of storages	Critical levels of free storage space should be defined for each server type
7	Usability	Features	Usability rate of application	It shows quality level of modules and navigation of system
8	Production rate	Features	Sum of points of closed tasks / Total points in iteration	Key indicator of production rate of product and software development
9	Feature comparison	Features	Number for features / number of features of rivals in sector	Features should be unique and weight may apply.
10	Penetration score	Security	Penetration score of security test of system	Indicator of system security base on internal and external threats
11	Social Engineering	Security	Social security process quality	Social security process quality
12	Activity Logging	Security	Logging system and capacity	Key indicator of traceability of transactions
13	UV rate	Reputation	Monthly UV	Unique Visitor (UV) shows preference of visitors
14	Advertiser rate	Reputation	Number of ads	It shows preference of advertisers
15	Subscriber rate	Reputation	Number of active subscribers	It shows reputation of system based on power sellers

Source: Hurriyet Emlak

6.2.1.3. Construction of FI hierarchy

On the basis of an investigation of the e-commerce environment, the quality assessment group constructs a FI hierarchy as shown in Figure 6.4, which consists of six dimensions, i.e. performance, features, reputation, responsiveness, effectiveness and security, factors dimensions. Each section has a number of major quality factors. For example, under the feature dimension, there are three major quality factors will affect the quality of system. They are 'Usability', 'Feature comparison', and 'Production rate'.



Source: Hurriyet Emlak

Figure 6.4 : E-Commerce Quality Factor Indexes

6.2.2. Measurement of FI phase

Each quality factor at the bottom level of the FI hierarchy is evaluated by members in the quality assessment group under the defined terms and a score system. Experts can provide a precise numerical value, a possible range of numerical value, a linguistic term, or a fuzzy number subject to their knowledge and the available information. Then these evaluations are converted into STFNs as defined in Eq. (1). In this case study, all fuzzy numbers provided by experts and STFNs are added as Appendix B-F.

The pair-wise comparisons of features dimension and the corresponding STFNs are shown in Table 6.3. It should be noted that $a_{ji} = 1/a_{ij}$. Table 6.3 only shows a_{ij}.

The aggregation of STFN scales can be calculated by Eq. (3). For example, the STFN scale of comparing 'Usability' with 'Feature comparison' can be aggregated by

$$\begin{aligned} a^*_{12.} &= (4,4,7,7) \otimes 0.19 \oplus (4,4,4,4) \otimes 0.19 \oplus (3,3,4,4) \otimes 0.26 \oplus (2,2,3,3) \\ &\quad \otimes 0.28 \oplus (3,3,5,5) \otimes 0.08 \\ &= (3.0946, 3.0946, 4.3734, 4.3734) \end{aligned}$$

Table 6.3 also shows all aggregated STFN scales under each category. It is noted that the aggregation should discard the 0 inputs if non-zero inputs are provided to the same comparison by other experts. In this case, Eq. (4) is applied to calculate the scale aggregation.

By using Eq. (5), the STFN scale of comparing 'Attitudes and motivations' with 'Training' can be defuzzified as

$$a^*_{12} = \frac{3.0946 + 2 \times (3.0946 + 4.3734) + 4.3734}{6} = 3.9750$$

Once are $a_{ij}(i, j = 1,2,....,n)$ obtained by using Eq. (4) and (5), a pair-wise comparison matrix can be established, Eq. (6)

$$A = a_{ij.Features} = \begin{Bmatrix} 1 & 3.7341 & 3.2252 \\ 1/3.7341 & 1 & 1.8763 \\ 1/3.2252 & 1/1.8763 & 1 \end{Bmatrix}$$

Consequently, the aggregated fuzzy scales of feature dimension are defuzzified and their dimension weights can be calculated by Eq. (7)

$$w_{Feature} = \{0.6238, 0.2224, 0.1539\}$$

Similarly, one can prioritize all dimension and their factors in the FI hierarchy. The final weights of quality factors are obtained by using Eq. (8). For example, the final weight of 'Usability' in features dimension is calculated

$$w_{Usability} = w_{Usability} \times w_{Features} = 0.6238 \times 0.1730 = 0.1079$$

All dimension and factors weights in Huriyet Emlak quality factor index are showed in figure 6.5.

6.2.3. Comments for case study's results

According to results as shown in Figure 6.5, weights of quality dimensions are well distributed to 6 dimensions. Most important dimension is performance which has highest weight with 27 percent. It means, serviceability is most critical criterion for overall system quality. Performance is the basis of an e-commerce site since it is completely an electronic system. Other three dimensions which are features (17 percent), security (19 percent), and responsiveness (16 percent) are approximately in same importance level for system quality. Security is very important like performance of system. That's why impact of that dimension's weight is highest in this second group. Despite of the fact that responsiveness is crucial for all business models; it has the lowest weight in the second group. Experts

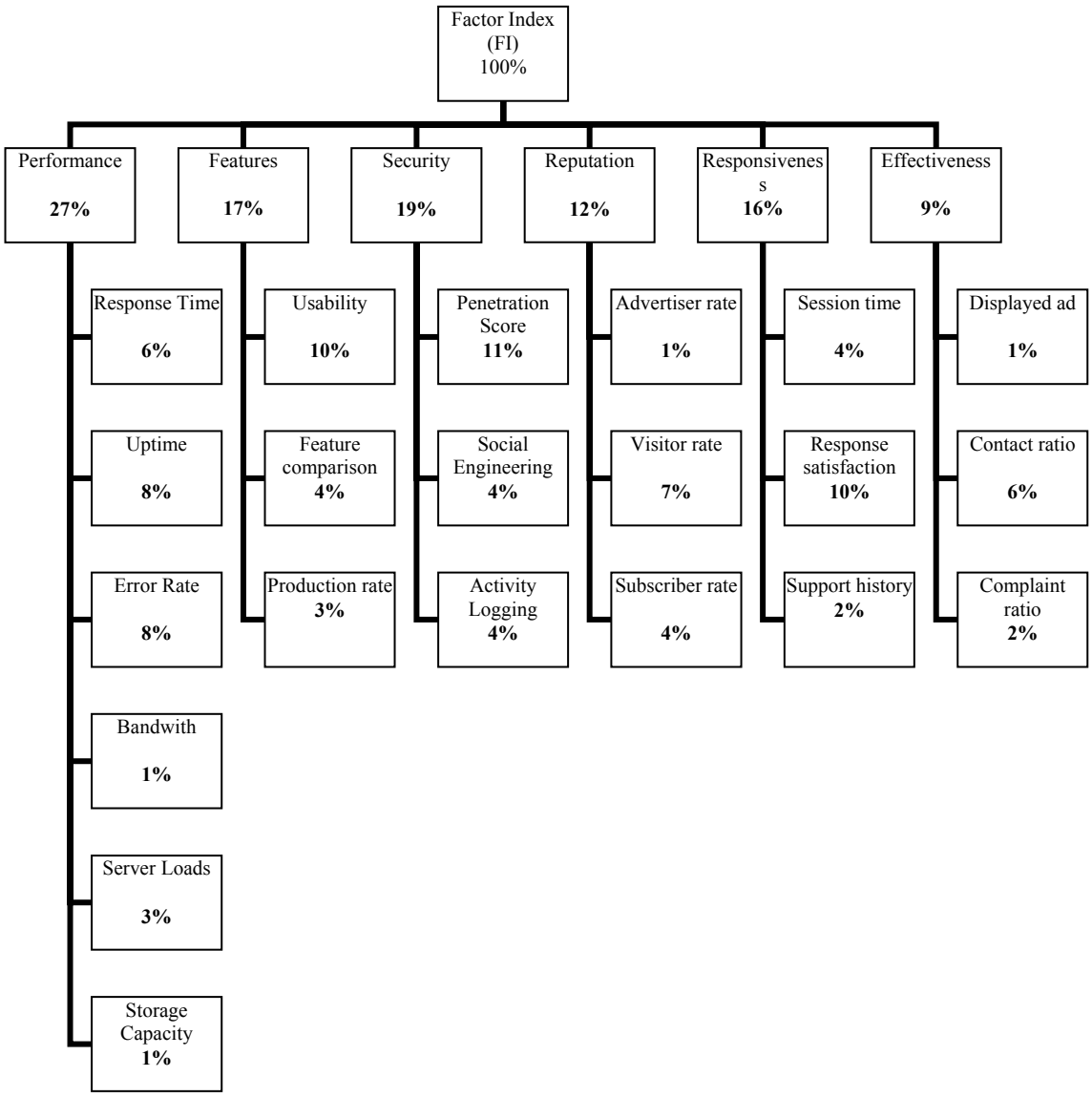
commonly think that, an e-commerce site should clarify every action and steps of portal functions with online help systems. So that reason can cause this situation. Last group consists of Reputation (12 percent) and Effectiveness (9 percent). It shows marketing and sales oriented dimensions need enough resources to contribute to system quality. So these two dimensions are less critical than others.

If we look for most important factors which have weight over 5 percent, we see that all dimensions have at least one critical factor on system's total quality. It indicates that, company board can make efficient investments for increasing the system's quality in all dimensions. Otherwise, these most important eight factors' total weight is 66 percent. So if board of company is sensitive to these factors, system guarantees approximately 80 percent quality score.

Table 6.3 : Fuzzy aggregation of features factors scale

Parameters	Experts	Usability				Feature comparison				Production rate			
		Scale	Converted STFN			Scale	Converted STFN			Scale	Converted STFN		
Usability	E1					4 7	4 4 7 7			3 4	3 3 4 4		
	E2					4 4	4 4 4 4			3 3	3 3 3 3		
	E3					3 4	3 3 4 4			3 4	3 3 4 4		
	E4					2 3	2 2 3 3			3 3	3 3 3 3		
	E5					3 5	3 3 5 5			2 4	2 2 4 4		
	Aggregation	1					3,09	3,09	4,37 4,37			2,92	2,92 3,53 3,53
	Factor						**3,7341**					**3,2252**	
Feature comparison	E1									4 5	4 4 5 5		
	E2									1/5 1/5	1/5 1/5 1/5 1/5		
	E3									1/3 1/3	1/3 1/3 1/3 1/3		
	E4									2 2	2 2 2 2		
	E5									3 5	3 3 5 5		
	Aggregation					1					1,70	1,70	2,05 2,05
	Factor										**1,8763**		
Production rate	E1												
	E2												
	E3												
	E4												
	E5												
	Aggregation									1			
	Factor												

Source: Hurriyet Emlak



Source: Hurriyet Emlak

Figure 6.5 : E-Commerce Quality Dimensions' and Factors' Weights for HE

7. DISCUSSION AND FURTHER RESEARCH

Like every other sector, in e-commerce sector which has been on the rise in the world trade system in the last decade; endorsement, transaction, traffic and rivalry must be the reasons to create customer satisfaction and costs in the sector should be reduced while continuous development is maintained. It is revealed when the need for continuous development and customer satisfaction are taken into account that the e-commerce sector needs quality much more than the other sectors do. Therefore the required method to practice and sustain the quality philosophy in the sector is TQM.

When the quality criteria of e-commerce systems are observed, it can be seen that they are based on rivalry. Especially the quality criteria such as reputation, serviceability, features and performance which are hard to satisfy and TQM's role in gaining the advantages those criteria provide to the system should be well apprehended by the managers and much attention must be paid to run the TQM components that match the criteria mentioned above.

One of the most striking points of this study is the differences of interpretation for TQM in e-commerce sector. In e-commerce sector unlike other sectors the product is centric and singular. This fact brings about advantages and disadvantages as well. While the variability of the product for customer groups is technologically low priced and effortless, the management of the product is difficult at the same degree. On the other hand; alongside with that centric structure, data and data quality are the main assets that form the basis of TQM in e-commerce systems. The better the quality and management of data the easier customer satisfaction is reached and continuous development maintained at lower costs. Especially the ability to improve internal processes is directly connected with quality and availability of the data in the system. Integration of such data collectivity with a centric

CRM system can provide extremely good results. Thanks to the CRM structure processes that directly affect customer and visitor satisfaction can be reformed.

One of the most important factors affecting quality in long term is product management. When the portals that target continuous development fail to form proper documentation for the products they develop, they end up sheering away from their targets in the long term. In order to be able to maintain the quality in cases of changes in the system in hand or its integration with different modules, the detail mentioned above should be regarded carefully. Thus, a proactive approach should be embraced both in product management and development stages. Therefore the production can continue fast, efficient and with standard quality.

On the other hand, proposed methodology for measuring quality of e-commerce system is so useful for sector portal to compare themselves with the others. Case study showed that companies must consider all online service quality dimensions to improve their quality standards. Eight key factors that mentioned in last section are very important on quality improvement projects.

Because of the fact that TQM focuses more on the processes in production and services fields and the production itself, it would be appropriate to study and examine the data quality in e-commerce systems. Also evaluation of life cycle in the product development stage by “quality” point of view and assessment of its critical contribution in continuous development would be nourishing.

REFERENCES

Articles

Al-Mashari, M.,(2002), "Electronic Commerce: A Comparative Study of Organizational Experiences", *Benchmarking: An International Journal*, Vol: 9, No: 2, pp. 182-189

Almaraz, J.,(1994) "Quality Management and the Process of Change", *Journal of Organizational Change Management*, Vol. 7 No. 2, pp. 6-14.

Barnes, S.J., Vidgen, R.T.,(2002) "An Integrative Approach to the Assessment Of E-Commerce Quality", *Journal of Electronic Commerce Research*, Vol. 3, No. 3, pp: 114 - 127

Chou, D.C.,(2001) "Integrating TQM Into E-Commerce", *Information Systems Management*, Vol: 18: No: 4, pp: 1-9

Gounaris, S.,(2005) "Measuring service quality in b2b services: an evaluation of the SERVQUAL scale vis-a` -vis the INDSERV scale", *Journal of Services Marketing* Vol:19, No: 6, pp 421–435

Gurau ,(2007), "An exploratory study of the level of satisfaction of client organisations", *International Journal of Emerging Markets*, Vol. 2 No. 1, 2007 pp. 39-53

Hasebrook, J.,(2000) "Learning in the Learning Organization" *Journal of Universal Computer Science*, Vol. 7, No. 6, pp. 472-487

Ho, S.K., Wearn, K.,(1995) "A TQM model for higher education and training", *Training for Quality* , Vol 3, No 2, · pp. 25–33

Iles, J., Healy, M.,(2004), “Quality management and e-commerce: the role of codes of conduct governing the use of technology”, *TQM Magazine*, Vol.16, No.5, pp.354-358

Lin, C., Huang, Y., Tseng S.,(2007) “A Study of Planning and Implementation Stages in Electronic Commerce Adoption and Evaluation: The Case of Australian SMEs”, *Contemporary Management Research* , Vol.3, No.1, pp 83-100

Lin, H.F.,(2007), “The Impact of Website Quality Dimensions on Customer Satisfaction in the B2C E-commerce Context”, *Total Quality Management*, Vol. 18, No. 4, pp: 363–378

Madaleno R., Wilson H., Palmer R.,(2007), “Determinants of Customer Satisfaction in a Multi-Channel B2B Environment”, *Total Quality Management*, Vol. 18, No. 8, pp: 915–925

Madu C.N., Madu C.N.,(2002) “Dimensions for E-quality”, *International Journal of Quality & Reliability Management*, Vol 19 No 3, pp. 246-258

Mohanthy R.P., Seth D., Mukadam S.,(2007) “Quality Dimensions of E-Commerce and their Implications”, *Total Quality Management* , Vol. 18, No. 3, 219–247

Rajmohan, P., Panchanatham,(2007) “Electronic Feasibiliy Model for Investments in Electronic Commerce Systems”, *International Journal of the Computer*, Vol:15, No:2, pp:20-26

Ramaswamy, M & Selian, A.N.,(2007) “On The Dımensions of E-Government Interactions”, *Issues in Information Systems*, Vol:8, No:2, p.148

Sousa, R., Voss C.A.,(2002) “Quality management re-visited: a reflective review and agenda for future research”, *Journal of Operations Management*, Vol 20, No 1, pp 91-109

Tari, J.J., Molina, J.F., Casteyon J.L.,(2007) "The relationship between quality management practices and their effects on quality outcomes", *European Journal of Operational Research*, Vol: 183, Vol: 2, pp: 483-501

Taveira, A.D., James C.A., Karsh, B.T., Sainford F.,(2003) "Quality management and the work environment: an empirical investigation in a public sector organization", *Applied Ergonomics*, Vol:34, No:4, pp:281-291

Tunca, M.Z.,Sutcu, A.,(2006) "Use of statistical process control charts to assess web quality: an investigation of online furniture stores", *Int. J. Electronic Business*, Vol. 4, No. 1,pp:40-55

Van Riel, A.C.R., Semeijn J., Janssen, W. ,(2003) "E-service quality expectations: a case study", *Total Quality Management*, Vol. 14, No. 4, pp: 437–450

Zeng,An,Smith,(2007), "Application of a fuzzy based decision making methodology to construction project risk assessment",*International Journal of Project Management*,Vol:25,p.589-600

Zhao, J., Truell A., Alexander M., Davis, R.,(2007), "E-Governement to Usiness Service Quality and User Satisfactıon: An Assessment of the U.S. State G2B Web Portals", *Issues in Information Systems*, Vol:8, No:2, p.140

Books

Müller A., Bradford F., Saal I., Koeckeritz M.,(2007), "Germany: E-Commerce", *US Commercial Service*, pp: 1-7

Ciampa, D.,(1992) “Total Quality-A Users Guide for Implementation”, *Addison-Wesley*, pp:113-114

Clancy, K., Krieg P., Hartley K.,(2006) “Birds on Hippos: Take a Lesson from Nature, and Go from "Just Another Vendor" to a Real Business Partner with Knowledge Leadership”, *Marketing Management*, November/December 2006

Dale, B., Bunney H.,(1999) “Total Quality Management Blueprint”, *Blackwell Publishing*, ISBN 0631195777, p:34

Goel, R.,(2007), “E-commerce”, *New Age Publishing*, ISBN 8122420443, USA, p:16

Goetsch, D., Davis S.B.,(2006) “Quality Management – Introduction to Total Quality Management for Production, Processes and Services”, *Prentice Hall*, ISBN: 013189298, New Jersey, USA, pp:198-212

Morath, P.,(2000), “Success @ E-business”, *McGraw Hill*, ISBN: 0077096258, Berkshire, England, pp:191-209

Oliveira L.C.B., Joia LA., (2005) “A Model for Evaluating B2C E-Commerce Websites: Application in the CD E-Retailing Industry in Brazil”, *In Proceedings of the Thirteenth European Conference on Information Systems*, Germany, pp 254-265

Soverbutts, D.,(2004) “TQM Consultant - Training Article”, *PHS Management Training*, pp:1-8

Stefani, A., Xenos, M.,(2008) “E-commerce system quality assessment using a model based on ISO 9126 and Belief Networks”, *Software Qual J (2008)* ,16:pp:107–129

Watson, R.T, Berthon P., Pitt, L.F., Zinkhan, G.M.,(2007) "Electronic Commerce: The Strategic Perspective" *Creative Commons Attribution Publishing*

Others

Padhi N.,(n.d.), "The Eight Elements Of TQM", [Retrieved on: 01.01.2008], http://www.isixsigma.com/library/content/c021230a.asp

ASA ,(n.d.) "The Many Flavors of E-Commerce", *Accounting Software Research*, [Retrieved on: 11.01.2008], http://www.asaresearch.com/ecommerce/ecommerce_types.htm

Austrealian Government ,(2004), "The Australian Government Information Management Office Archive", [Retrieved on: 10.05.2008], http://www.agimo.gov.au/archive/publications_noie/2002/07/online_auth/glossary

Chen, J.,(n.d.), "Innovation, Learning and E-Commerce", *Research Center for Innovation & Management Zhejiang University*, Hangzhou, China, pp:1-7

DTI ,(n.d.) "Total Quality Management (TQM)", *Department of Trade and Industry*, pp:1-5

Nisanoff, Daniel,(2008), "E-Commerce", [Retrieved on : 02.05.2008], http://www.siteplusmarketing.com/EBs/Electronic-commerce.pdf

E-commerce-Land,(2004), "History of Ecommerce", [Retrieved on : 10.05.2008], http://www.ecommerce-land.com/history_ecommerce.html

Gedik, P.,(2007), “Kalite Maliyetleri ve Kalite Maliyet Sistemi: Adana’da Toplam Kalite Maliyetini uygulayan Bir İşletmede Uygulama”, *Master Thesis, Department of Business Administration*, pp: 7-8

Ghandour, A.,(2007), “The Impact Of Leadership On E-commerce System: Success in Small and Medium Enterprises Context”, *Paper submitted to Small Enterprise 20th Conference, 23-26 September 2007*.

Greenberg, J.H., Dankel, D., Furht B.,(2004), “A Content Oriented Architecture For Consumer-To-Busıness E-Commerce”, *Proceedings of the 6th Int. Conference on Enterprise Information Systems, Port, Portugal, April 2004*, pp:1-2

Hanning Y, Jiangwei, Y., Kang, P.,(2007) “Risk Identıfication Of Electronic Commerce Project Based On Cloud control”, *IEEE*, [Retrieved on : 02.05.2008], http://ieeexplore.ieee.org/iel5/4339774/4339775/04340678.pdf

Heydenrych, G.J., Cloete, G.,(2007) “ERP Transition to e-Commerce: Training for a New Methodology”, *Proceedings of the 2007 Computer Science and IT Education Conference*, pp: 323-334

Johansson B.M., Axelsson K.,(2004), “Communication Media in Distance Selling - Business Interactions in a B2C Setting”, *In Proceedings of the Twelfth European Conference on Information Systems (ECIS), Finland*, pp:847-857

INFOSOURCE,(2007), “Business-to-Business E-Commerce Basics”, *efuturecentre*, [Retrieved on : 02.05.2008], http://www.e-future.ca/sask/pdf/b2b_basics.pdf

İçli, M.Y.,(2005), “A study on the application of e-commerce in Turkish mining industry” *A Thesis Submitted to the Graduate School of Natural and Applied Sciences of Middle East Technical University*, pp. 8-9

Jin-Xiang Z., Fang-hui, J., Li-sheng, W.,(2006), "Customer Satisfaction in E-commerce: an Exploration of its Antecedents and Consequences", *2006 IEEE International Conference on Management of Innovation and Technology*, pp:540-544

Kondo, Y.,(2002), "Customer Satisfaction – How I Can Measure It", *The 6th World TQM Conference, Saint Petersburg*, p.26

Lai, M.C.,(2003),"An Investigation into the Relationship between Total Quality Management Practice and Performance in a Taiwan Public Hospital", *Doctor of Philosophy Thesis, School of Business and Informatics, Faculty of Arts and Science, Australian Catholic University, Australia*

Laarhoven P.J.M., Pedrycz W. A.,(2003), "fuzzy extension of Saaty's priority theory", *Fuzzy Set Syst 1983*;11:229–41.

Muthu, S.,(1999) "Business Process Reengineering: A Consolidated Methodology", *Proceedings of The 4th Annual International Conference on Industrial Engineering Theory, Applications and Practice, November* , p.17-20

McElheran, K.S.,(n.d.) "Productivity Leadership and Strategic Investments in Innovation: The Adoption of E-Business Capabilities", *Kellogg School of Management at Northwestern University, Evanston*, pp:35-36

Nemli, E.,(n.d.) "Elektronik Ticarette Toplam Kalite Yönetimi", *Kalder* , [Retrieved on 08.02.2008], http://www.kalder.org.tr/page.asp?pageID=683&keyword=tky&CatID=&ContentID=754,

Nissen, M.,(n.d.) "The Commerce Model for Electronic Redesign", [Retrieved on : 10.05.2008], http://www.arraydev.com/commerce/jip/9702-01.htm

Palkovits, S., Lorente, J.M., Karagiannis, D.,(2003) "E-Learning and E-Government – An Approach for Process-based Training and Learning in the Public Administration", [Retrieved on:01.02.2008], pp:1-16, http://www.unizar.es/derecho/fyd/lefis/documentos/20021031_BOC_E_learning%20and%20E-Government.pdf,

Peterson, M.,(n.d.) "Leadership Styles", [Retrieved on 10.02.2008] , http://eziniearticles.com/?Leadership-Styles&id=207329

PHCC (1996) "Total Quality Management: A Continuous Improvement Process", *PHCC Educational Foundation*, [Retrieved on: 10.01.2008], pp: 1-30 , http://www.foundation.phccweb.org/Library/Articles/TQM.pdf,

Sachenko, A.,(2007) "Lecture 7 - Electronic Commerce Systems", *Scribd* ,[Retrieved on 03.05 2008], http://www.scribd.com/doc/396840/Electronic-Commerce-Systems

Saha, P., Zhao Y.,(2005) "Relationship Between Online Service Quality and Customer Satisfaction", *Lulea University of Technology, Master's Thesis*, pp:6-8

Semerci, M.,(2007) "Elektronik Ticaretin İşleyişi, Denetimi Ve Muhasebeleştirilmesi", *Kahramanmaraş Sütçü İmam Üniversity, Social Sciences Institue, Graduation Thesis*, pp:12-13

Speer, J.B.,(2000), "Legal Requirements in E-Commerce Testing", [Retrieved on: 02.02.2008],http://www.microsoft.com/technet/archive/itsolutions/ecommerce/plan/legalreq.mspx?mfr=true,

Swaid, S.I., Wigand, R.T.,(2007), "Key Dimensions of E-commerce Service Quality and Its Relationships to Satisfaction and Loyalty", *20th Bled eConference eMergence: Merging*

and Emerging Technologies, Processes, and Institutions June 4 - 6, 2007; Bled, Slovenia, pp:1-15

Topuz, R.,(2007) "İnternet Üzerinden Ürün Satış Ve Stok Takip İşlemlerinin Gerçekleştirilmesi E – Ticaret", *Selçuk University, Engineering and Architecture Department, Computer Engineering Graduation Thesis*, pp: 20-23

Turnbull, S.,(2008), "Electronic Commerce", *Economics Lecture 3, University of California*, pp 1-18

Vandaele D., Gemmel P.,(2005), "Impact of Support Services on End-users' Satisfaction", *Working Paper, Ghent University, Faculty of Economics and Business Administration*, pp:17-18

Wenger, E., Snyder, W.,(2000) "Learning in Communities", *Learning in the New Economy*, [Retrieved on 12.05.2008], http://www.linezine.com/1/features/ewwslc.htm

Williger, D.,(2008) "An Overview of the Different Types of Leadership in Existence", , [Retrieved on 10.02.2008], http://ezinearticles.com/?An-Overview-of-the-Different-Types-of-Leadership-in-Existence&id=815752

Yumuşak, İ.G.,(2004) "Elektronik Ticaretin Gelişmekte Olan Ülkelere Etkileri ve Türkiye Üzerine Bir Değerlendirme", *METU 5th International Economy Conference, Ankara*

Zgodadova, K.,(2007) "Organization and Total Quality Management", [Retrieved on: 02.01.2008], pp: 1-39, http://lipas.uwasa.fi/~tke/book1.pdf

APPENDIX

APPENDIX

A. Expert Judgment Scale
B. Main Quality Dimension Scale
C. Performance Quality Factor Scale
D. Feature Quality Factor Scale
E. Security Quality Factor Scale
F. Reputation Quality Factor Scale
G. Responsiveness Quality Factor Scale
H. Effectiveness Quality Factor Scale

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