A STATISTICAL APPROACH TO WEB USABILITY ANALYSIS

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ABSTRACT

A survey is conducted on 35 experienced Internet users to asset the usability of Turkish e-Commerce Web sites. The data is collected using a 28 questions survey consisting of three categories. ANOVA method is used for the analysis of the survey data. The analysis indicate that the first category that includes questions about the usability of Web sites include three subcategories for both of the web sites as far as the usability is concerned. According to the survey, in general, even advanced Internet users find Turkish e-Commerce sites slightly useable.

ÖZET

35 kişi üzerinde gerçekleştirilen bir anket ile Türkiye'deki e-ticaret sitelerinin bir kullanılabilirlik değerlendirilmesi yapılmıştır. Üç ayrı kategori ve toplam 28 sorudan oluşan bir anket ile veri toplanmıştır. Toplanan veriler ANOVA istatistiksel yöntemiyle analiz edilmiştir. Analiz sonuçları, anketin temelde kullanılabilirlik sorularından oluşan ilk kategorisinde, araştırma konusu olan her iki site için üç ayrı alt kategori olduğunu göstermiştir. Yapmış olduğumuz ankete istinaden genel olarak bakıldığında tecrübeli Internet kullanıcılarının dahi Türk e-ticaret sitelerini ancak çok az kullanışlı bulduğunu görüyoruz.

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LIST OF SYMBOLS / ABBREVIATIONS

ATAG	Authoring Tool Accessibility Guidelines
UAAG	User Agent Accessibility Guidelines
WAI	Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines

1 INTRODUCTION

Until a few years ago, the word ‘usability’ was seldom used. The reason for that can be explained as; most people would find it difficult to define usability. Interestingly, it was hard to define and also explain usability but most of the people have the ability to recognize the lack of usability when they deal with the problems in their daily life.

As we move from the people towards to the organizations, the situation will not be changing at all. An organization’s Web site is a gateway to its information, products and services. Respect to these, the Web sites must be developed for the user needs. Unfortunately, Web site designs are mostly driven by technology or a business structure. As a result of that, we are using the word ‘usability’ seldom again [1].

However, in recent years Web site owners and developers have gradually begun to acknowledge and address the issue of usability. The key to Web site usability is ensuring that the site is both useful and usable for the intended users. With respect to these developments, the question ‘what is usable’ can be asked immediately. There is a general agreement that, a usable Web interface is one that is accessible, appealing, consistent, clear, simple, navigable and forgiving for the inexperienced users [2].

This paper will be observing the usability issues as they will be applied to the Web, provide an overview of different usability techniques that can be used in Web usability analysis and finally will be giving you a statistical result about the Web usability.

2 WEB USABILITY

2.1 What is Web Usability?

Usability is the measure of the quality of a user's experience when interacting with a product or system — whether a Web site, a software application, mobile technology, or any user-operated device [3].

Usability is a combination of factors that affect the user's experience with the product or system, including:

Ease of Learning	How fast can a user who has never seen the user interface before learn it sufficiently well to accomplish basic tasks?
Efficiency of Use	Once an experienced user has learned to use the system, how fast can he or she accomplish tasks?
Memorability	If a user has used the system before, can he or she remember enough to use it effectively the next time or does the user have to start over again learning everything?
Error Frequency and Severity	How often do users make errors while using the system, how serious are these errors, and how do users recover from these errors?
Subjective Satisfaction	How much does the user like using the system?

Table 2.1. Combination Factors of the Usability

2.2 Why is Usability Important?

Web users are notoriously impatient and can easily get frustrated if they can not find what they are looking for in a Web site. As a result of that, they will quickly move to

another site and will unlikely to return. Most of the researches show that people can not find the information they seek on Web sites about %60 of the time [3, 4]. This situation can lead to wasted time, reduced productivity, increased frustration, and loss of repeat visits and money. Also in the manner of other sources reports, there are about forty-three million Web sites, and no one knows which ones are usable. The best sites, which are usable only %42 of the time, and none that have been studied are usable a majority of the time [5, 6].

Because of bad site design, the most important loses are as follows:

- Losing approximately %50 of the potential sales from a site as people can not find what they need
- Losing repeat visits from %40 of the users who do not return to a site when their first visit resulted in a negative experience.
- These examples express how important can usability be important for Web site.

2.3 What is the Difference between Usability Engineering and Usability Testing?

Usability engineering is a methodical approach to producing a Web site or any user interface [1, 7]. It is a practical and systematic way to deliver a product that works for users. Usability engineering involves several methods, each applied at appropriate times, including gathering requirements, developing and testing prototypes, evaluating design alternatives, analyzing usability problems, proposing solutions, and testing a site (or other interface) with users.

Usability testing is part of the process of usability engineering. Usability testing includes a range of methods for having users try out a site (or other system). In a typical usability test, users perform a variety of tasks with a prototype (or other system) while observers record notes on what each user does and says. Typical tests are conducted with one user at a time or two users working together. Testing may include collecting data on the paths users take to do tasks, the errors they make, when and where they are confused or frustrated, how fast they do a task, whether they succeed in doing the task, and how

satisfied they are with the experience. The goal of most usability testing is to uncover any problems that users may encounter so those problems can be fixed.

2.4 What Steps are involved in Usability?

In this part several aspects of usability are discussed.

2.4.1 Planning the Web Site

There are three steps in order to get started for planning the Web site:

- Why we are developing a site
- Who should come to our site
- When and why those people might come

In answering these questions, we establish our objectives for the site. The specific objectives depend, of course, on our organization and our audience.

We should also think about usability objectives for the site. General usability objectives can be listed as follows:

- Easy to learn
- Efficient to use
- Easy to remember on subsequent visits
- Satisfying, with a minimum number of errors as users go through the site

All the usability objectives are important for most sites, but we may emphasize different ones for different audiences and situations. For example, in a site that is aimed at members of the general public who may only visit once in a while, we should build a site where almost no learning needs to take place to use it efficiently [8].

2.4.2 Collecting Data from Users

Because the design is to be based on user needs, data must be collected about those needs and how well an existing Web site (if there is one) is meeting those needs.

There are a variety of ways to collect that data, including feedback forms and system metrics (log data on an existing site), and usability testing of the existing site.

2.4.3 Developing Prototypes

It is easier for a user to react to an existing example than to theorize what would work best. Useful results can be obtained by building a prototype site, with a minimum of text content and no graphics, for a first round of usability testing. The prototype can then be used to elicit user comments and observe the prototype's ability to lead the users through the tasks they need to perform. It can be built on paper or with simple HTML [9].

2.4.4 Collecting, Writing, or Revising Content

Based on what users need, we must put content into the site. As we consider information that we already have, think about how useful and understandable it is. Reading from a computer screen is slower than reading from paper. Most people want to quickly scan information and read only small sections. If the information we have is in long paragraphs, we have to consider revising it. Break it into small chunks with many headings. Cut out unnecessary words. Use lists and tables so people can find information quickly.

2.4.5 Conducting Usability Tests

Usability testing is an iterative process. The goal of usability testing is to ascertain what will help users accomplish their tasks and what may impede them. Using the prototype as a starting point, the usability testers build a set of scenario tasks they will ask users to attempt. As detailed information about user success is gathered and reported, the prototype can be modified and additional aspects of that prototype tested.

Usability testing can be done inexpensively or more formally, depending on the size and budget of the site under development. As the testing team becomes more experienced, testing can be accomplished more quickly.

2.4.6 Continuing to Assess the Site after It is

When the site has been implemented, it is incumbent on the developers or the owners of the content to assess its performance by analyzing reports, usage logs, and other data sources for the site and by continuing to gather user feedback on usability.

2.5 What is a Usability Test Like?

The focus of a usability test is the user's experience with a site. The site may exist only as a paper prototype, or it may be a real working prototype or a site that has already been launched. The earlier we start to have users try out the site, the faster and easier it will be to develop the site you want.

During a usability test, specialists are working with the designers and developers of the site watch users working through tasks with the site and gather other feedback. The purpose is always to see what is working well and what is not working well — with the goal of improving the site. The result of usability testing is a set of recommendations for improving the site.

2.6 How Many Participants are Needed for a Usability Test?

Actually, here the true answer will be; it depends. A typical range is from 8 to 16 users in each test [10]. If each user works with us for an hour, that means one or two days of testing. We might need only three people to help us find serious problems, if we:

- are doing paper prototypes or are in early development
- plan several rounds of testing throughout development
- have a fairly homogenous user population

If we have different potential user groups (for example, physicians, doctors, researchers, engineers), try to include representatives of all these groups. If we are likely to have users with a range of Web or computer experience, try to include both less experienced and more experienced users. Those considerations may push the number of people we need from three to six or nine or twelve.

If we want to conduct formal quantitative testing on our products or systems, we'll need more people to derive statistical results. For diagnostic usability testing, five users are usually enough to uncover the major problems in a product.

If we do iterative (repeated) usability testing over the course of developing the Web site, many users will participate in testing one or another version of the emerging site. Thus, while we may have fewer than ten participants in each usability test, we may have fifteen to thirty people who have tested some version of the site before it is launched.

2.7 Why should We Do Iterative Usability Testing?

Although, such an analysis is important we won't be dealing with the iterative test because of lack of time. Firstly, we have to accept that a few small tests are more valuable than one large test at the end. That does why making more few tests a couple of large tests will be more convenient. Some of the advantages are listed as follows:

- The sooner we find problems, the less expensive it is to fix them.
- Finding and fixing problems early means less rework. That not only saves money, it reduces designers' and developers' frustration.
- We can test branding (Do people realize whose site it is?), navigation (Can people find what they need?), and organization of the home page before you have developed all the content or coded the entire site.
- We can test many design issues with paper prototypes and then test again when we have a working site.
- We can test one part of the content and learn valuable lessons to apply to other parts that aren't yet developed.
- Changes are more likely to get made early in the development process. Cost, time, and human reluctance usually lead to ignoring problems that are found if you test only at the end.
- Testing once isn't enough to be sure you have a usable site. Use iterative testing to see whether the way you fixed an earlier problem really works for users.

3 INTRODUCTION TO WEB ACCESSIBLITY

3.1 What is Web Accessibility?

Web accessibility means that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web [11]. Web accessibility also benefits others, including older people with changing abilities due to aging.

Web accessibility encompasses all disabilities that affect access to the Web, including visual, auditory, physical, speech, cognitive, and neurological disabilities.

Millions of people have disabilities that affect their use of the Web. Currently most Web sites and Web software have accessibility barriers that make it difficult or impossible for many people with disabilities to use the Web. As more accessible Web sites and software become available, people with disabilities are able to use and contribute to the Web more effectively.

Web accessibility also benefits people without disabilities. For example, a key principle of Web accessibility is designing Web sites and software that are flexible to meet different user needs, preferences, and situations. This flexibility also benefits people without disabilities in certain situations, such as people using a slow Internet connection, people with "temporary disabilities" such as a broken arm, and people with changing abilities due to aging.

3.2 Why Web Accessibility is Important?

The Web is an increasingly important resource in many aspects of life: education, employment, government, commerce, health care, recreation, and more. It is essential that the Web be accessible in order to provide equal access and equal opportunity to people with disabilities. An accessible Web can also help people with disabilities more actively participate in society.

The Web offers the possibility of unprecedented access to information and interaction for many people with disabilities. That is, the accessibility barriers to print, audio, and visual media can be much more easily overcome through Web technologies [11].

3.3 Making the Web Accessible

Much of the focus on Web accessibility has been on the responsibilities of Web developers. However, Web software also has a vital role in Web accessibility. Software needs to help developers produce and evaluate accessible Web sites, and be usable by people with disabilities.

One of the roles of the Web Accessibility Initiative (WAI) is to develop guidelines and techniques that describe accessibility solutions for Web software and Web developers. These WAI guidelines are considered the international standard for Web accessibility. Making a Web site accessible can be simple or complex, depending on many factors such as the type of content, the size and complexity of the site, and the development tools and environment.

Many accessibility features are easily implemented if they are planned from the beginning of Web site development or redesign. Fixing inaccessible Web sites can require significant effort, especially sites that were not originally "coded" properly with standard XHTML markup, and sites with certain types of content such as multimedia.

3.4 Essential Components of Web Accessibility

3.4.1 Introduction

It is essential that several different components of Web development and interaction work together in order for the Web to be accessible to people with disabilities [12]. These components include:

- Content - the information in a Web page or Web application, including:
    1. Natural information such as text, images, and sounds

2. Code or markup that defines structure, presentation, etc.

- Web browsers, media players, and other "user agents"
- Assistive Technology, in some cases - screen readers, alternative keyboards, switches, scanning software, etc.
- Users' knowledge, experiences, and in some cases, adaptive strategies using the Web
- Developers - designers, coders, authors, etc., including developers with disabilities and users who contribute content
- Authoring Tools - software that creates Web sites
- Evaluation Tools - Web accessibility evaluation tools, HTML validators, CSS validators, etc

3.4.2 How Components Relate?

Web developers usually use authoring tools and evaluation tools to create Web content. People ("users") use Web browsers, media players, assistive technologies, or other "user agents" to get and interact with the content [12].

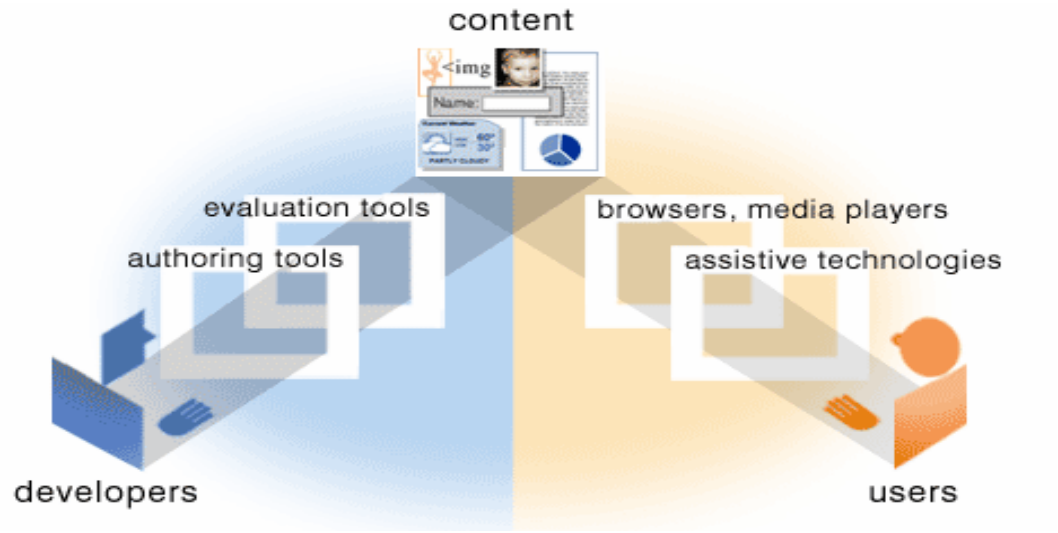

Figure 3.1. Content of the Web Site

3.4.3 Interdependencies between Components

There are significant interdependencies between the components; that is, the components must work together in order for the Web to be accessible. For example, for alternative text on images:

- Technical specifications address alternative text (for example, HTML defines the alternative text attribute (alt) of the image element (img))
- WAI guidelines - WCAG, ATAG, and UAAG, define how to implement alternative text for accessibility in the different components
- Developers provide the appropriate alternative text wording
- Authoring tools enable, facilitate, and promote providing alternative text in a Web page
- Evaluation tools are used to help check that alternative text exists
- User agents provide human and machine interface to the alternative text
- Assistive technologies provide human interface to the alternative text in various modalities
- Users know how to get the alternative text from their user agent and/or assistive technology as needed

3.4.4 The Implementation Cycle

When accessibility features are effectively implemented in one component, the other components are more likely to implement them [12, 13].

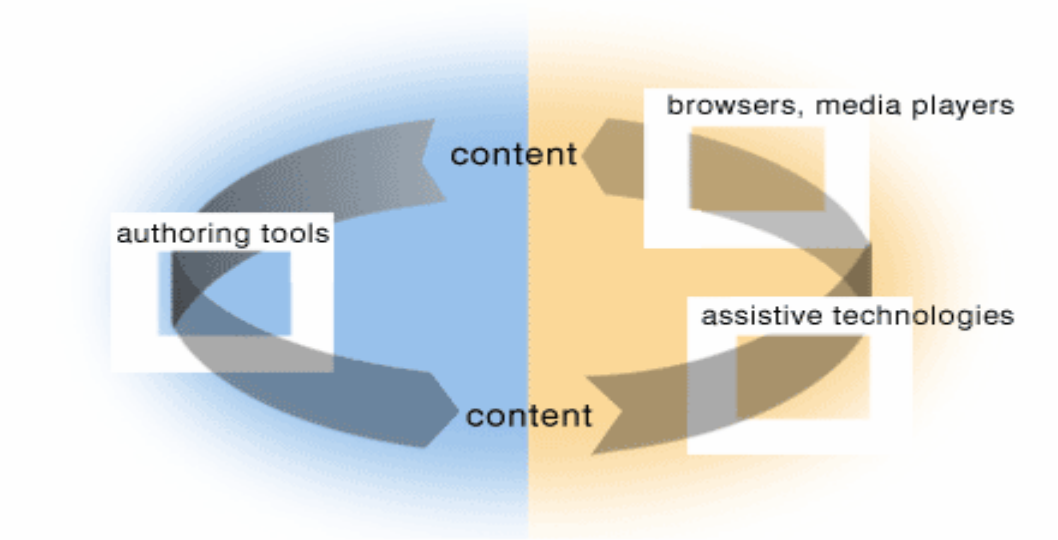

Figure 3.2. Implementation Cycle

- When Web browsers, media players, assistive technologies, and other user agents support an accessibility feature, users are more likely to demand it and developers are more likely to implement it in their content.
- When developers want to implement an accessibility feature in their content, they are more likely to demand that their authoring tool make it easy to implement.
- When authoring tools make a feature easy to implement, developers are more likely to implement it in their content.
- When an accessibility feature is implemented in most content, developers and users are more likely to demand that user agents support it.

3.4.5 When One Component is Weak

If an accessibility feature is not implemented in one component, there is little motivation for the other components to implement it when it does not result in an accessible user experience. For example, developers are unlikely to implement an

accessibility feature that authoring tools do not support and that most browsers or assistive technologies do not implement consistently[12, 13].

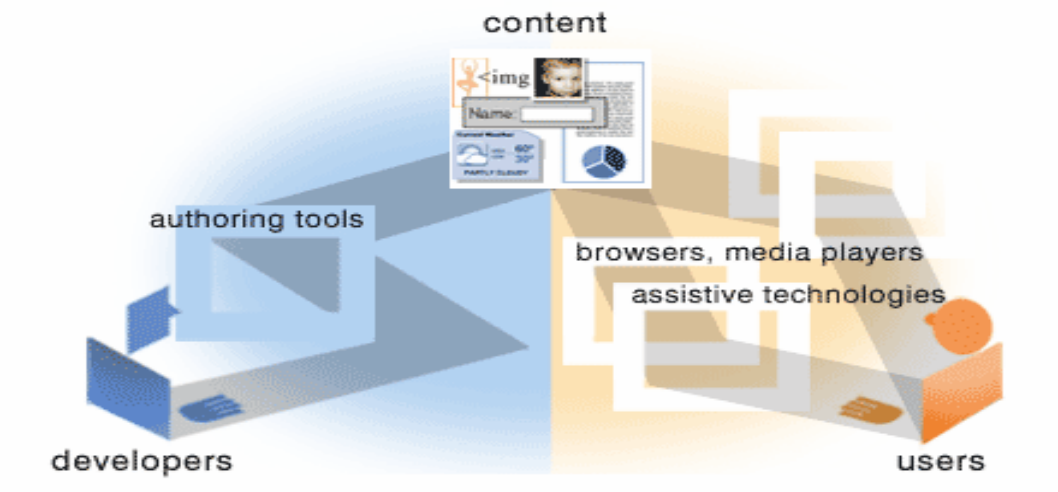

Figure 3.3. Contents view both from Developers and Users

If one component has poor accessibility support, sometimes other components can compensate through "work-arounds" that require much more effort and are not good for accessibility overall. For example,

- Developers can do more work to compensate for some lack of accessibility support in authoring tools; for example, coding markup directly instead of through a tool
- Users can do more work to compensate for some lack of accessibility support in browsers, media players, and assistive technology and lack of accessibility of content; for example, using different browsers or assistive technologies to overcome different accessibility issues.

However, in most cases the works-arounds are not implemented and the result is still poor accessibility. Additionally, sometimes poor accessibility support in one component cannot be reasonably overcome by other components and the result is inaccessibility, making it impossible for some people with disabilities to use a particular Web site, page, or feature.

4 OPTIMAL WEB DESIGN

4.1 How should Information be Positioned in a Typical Web Site?

The organization of information within websites is vital to its overall usefulness. In fact, a study by Morkes and Nielsen (1997) found that their experimental website scored higher in usability when text was [14]:

- Written concisely (58%)
- Easily scannable (47%)
- Written in an objective instead of a promotional style (27%)

than web pages in their control condition. That is, viewers tend to move quickly from page to page. Instead they usually scan for information that is of direct interest to them. Accordingly, it is suggested that text should be:

- Very succinct
- Include only one key idea per paragraph
- Use highlighted keyword or phrases, and
- Use bulleted lists when possible

Analyzing users' expectations of where they expect specific web objects to be located revealed that generally,

- Internal web links were expected to be located on the upper left side of the browser window (Figure 4.2).
- External web links were expected to be located on the right side or lower left side of the browser window (Figure 4.3).
- The "back to home" link was expected to be located at the top-left corner and the bottom-center of the browser window (Figure 4.4).
- The internal search engine was expected to be located at the top-center of the screen (Figure 4.5), and

- Advertisement banners were expected to be located at the top of the browser window (Figure 4.6)
- The login/register button was expected to be located at the upper-left corner of a web page (Figure 4.7).
- The shopping cart (basket) was expected to be located at the top-right corner of a web page (Figure 4.8).
- The help button was expected to be located at the upper-right side (Figure 4.9).
- Links to specific merchandise items were expected to be located at the left upper-center of a web page (Figure 4.10), and
- The account/order button was expected to be located at the upper-right of a web page (Figure 4.11).

The figure below shows the combined location expectations for the ten web objects.

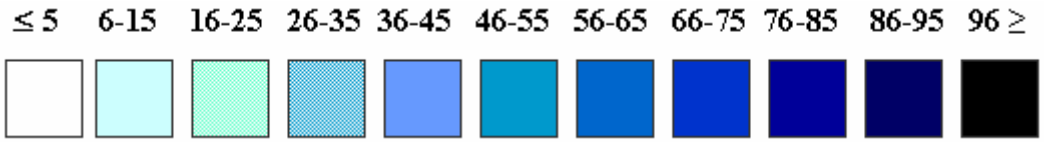

Figure 4.1. Location of the ten web objects

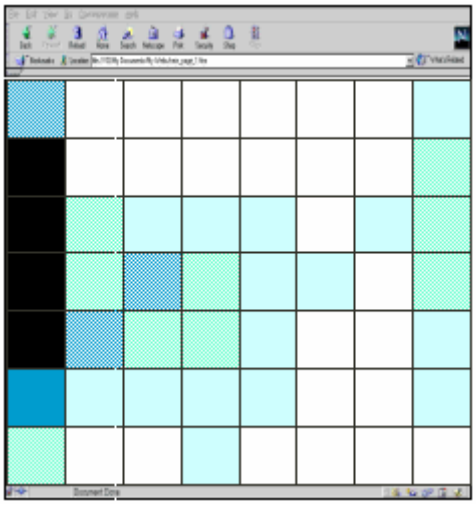

Figure 4.2. Location for internal web page links

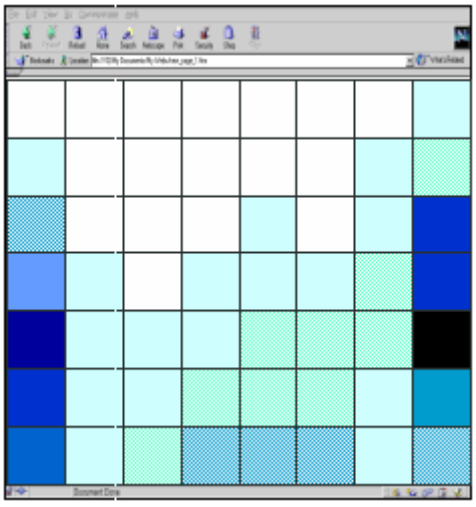

Figure 4.3. Location for external website links

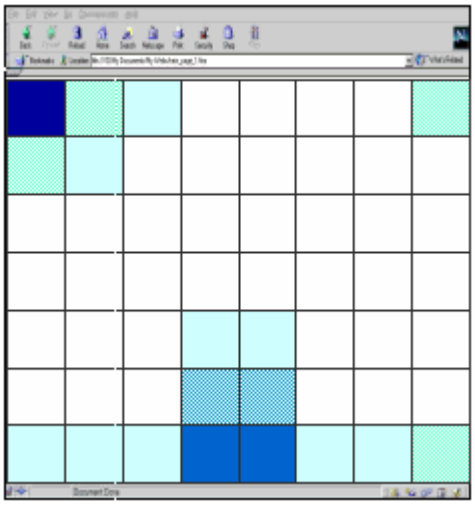

Figure 4.4. Location for "back to home" link

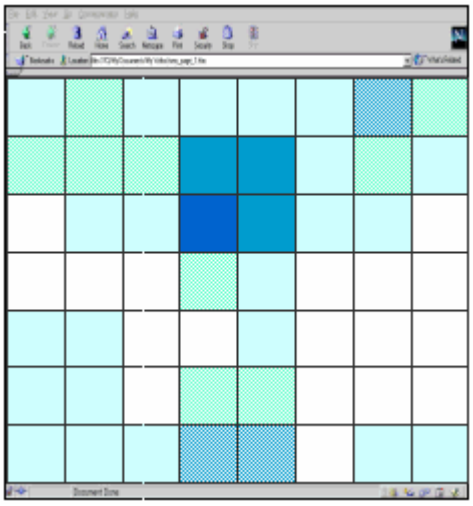

Figure 4.5. Location for internal search engine

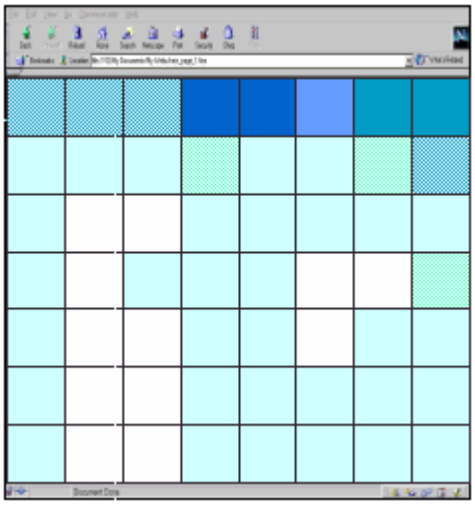

Figure 4.6. Location for advertisement banners

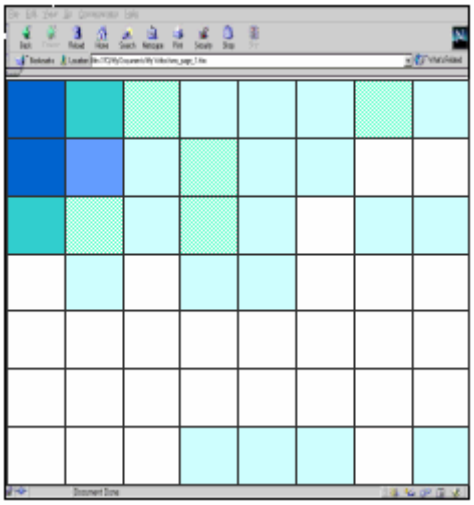

Figure 4.7. Location for the login/register button

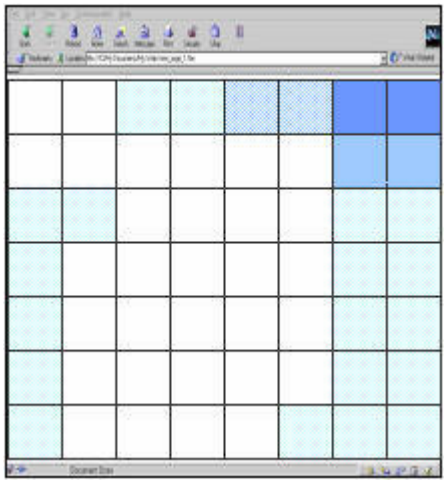

Figure 4.8. Location for the shopping cart (basket) button

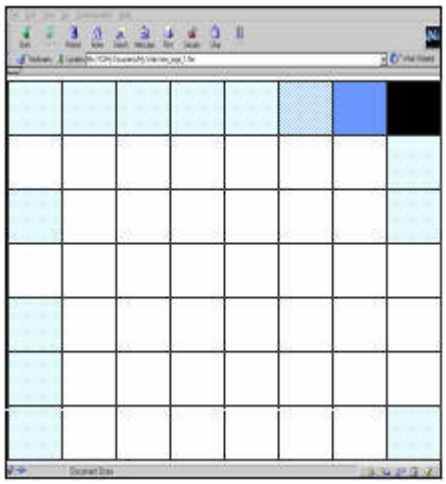

Figure 4.9. Location for the help button

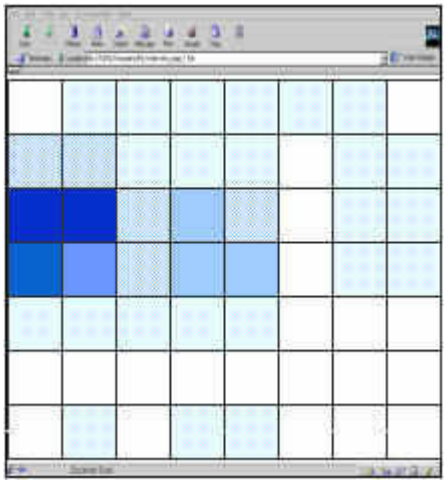

Figure 4.10. Location for links to merchandise items

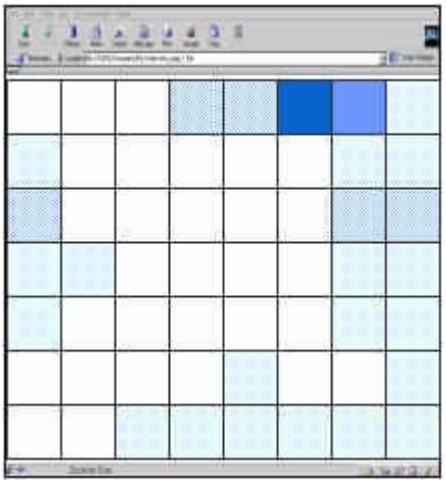

Figure 4.11. Location for the account/order button

Users often miss important pieces of information simply because it is not seen. This often occurs because they forget or are unwilling to scroll in a particular direction (especially horizontally), and thus do not see the information that is located outside of the primary viewing area. To reduce this problem, important website information should always fit within the typical horizontal viewing area of the screen. To do this, the rule is still to design for lower resolution settings.

Average Computer Screen Resolution January 2004	
Resolution	% of Users
640 x 480	8.9%
800 x 600	49.5%
1024 x 768	22.5%
1280 x 1024	2.0%
Unknown	14.8%
(MyComputer.com, 2004)	

Table 4.1. Average Computer Screen Resolution

According to the table 3.1 Web surfers by MyComputer.com, 800 x 600 currently is the most frequently used computer screen resolution. The actual usable size to avoid any scrolling at this resolution is 595 x 295 pixels (the safe width for printing at this resolution is 535 pixels). Most users however have their resolution set at 800 x 600 (31%). To avoid scrolling here, the usable size is 750 x 425 pixels. A compromise would be to place the most important information within areas that are visible at lower resolution settings, while placing less important information in areas visible at higher resolution settings.

In addition, when users do scroll, they may not see the information because it is placed in a typically low information-priority area, such as the bottom of a page (Nielsen, 1999) or placed in an area where users typically would not expect it to be placed. Fluid layouts are significantly preferred to both centered and left-justified layouts. In most of the researches participants indicated they perceived the fluid layout (which the margins are not fixed at any particular width) as being the best suited for reading and finding information, as well as having a layout that is most appropriate for the screen size (for both small and large screens). They also indicated that the fluid layout looked the most professional, and consequently preferred it to other layout conditions. Conversely, the consistently least preferred condition was the left-justified layout. A possible reason for

the lack of preference for this layout is that users had to horizontally scroll in order to see all the information on the page. As discussed above, users particularly dislike to horizontally scrolling.

4.2 How Web Site's Structure can be More Navigable?

People often become lost within the structure. The reason for that is, there have been always mistakes about the structure of a website[15]. The major ones will be listed as follows:

First difficulty is disorientation or "lost-in-hypertext problems, which rises from an unfamiliarity with the structure or conceptual organization of the site. Here, users have difficulty deciding which node (which is typically one web page) to view next because they are unable to visualize where the information they are looking for could be. The decision concerning which node to view next first involves understanding one's current location within the site, then selecting the proper route. However, users may not even know their current location within a site.

A proper way to reduce this problem is to organize the site according to the typical user's mental model of how a site should be organized. This can be done by having representative users sort cards into several categorical piles in which each card represents the information that would be placed on the actual website. Each pile should indicate the information that would be clustered within each category and subcategory. Also the use of navigational aids such as color coding and consistent logos and banners should also reduce disorientation.

The second difficulty is the embedded digression problem. This occurs when users pursue digressive paths within websites and lose their place or forget to return to their original document. This can be lessened by reducing the number of links embedded in text by placing them instead at the end or on the side of the document.

The third difficulty is the "art museum" problem. This refers to the lack of memory for the navigational details of a significant part of the site because the viewer is

overwhelmed by the sheer amount of information. For instance, as when a patron visiting a museum cannot hope to remember the details of all the art work because of their great number, a large number and variation of navigational information (such as the various nodes they have visited) may consequently overwhelm the user. This often can have the effect of reducing a person's recall of the pages they have visited.

This can be lessened by reducing the amount of information presented at one time and properly organizing the navigational structure of the site. Other ways to get rid of this problem can be the use of sitemaps. Sitemaps may, (if done properly), present the structure of a site in a more cognitively manageable way by showing a site's main structure and the various link to that structure.

5 METHODS FOR DESIGNING USABLE WEB SITES

5.1 Planning the Site

In order to run a Web site, the first thing you have to is to plan a Web site. Planning is really critical because it helps us focus our objectives. It also helps our plan for usability activities that are part of the process of developing a successful site.

5.1.1 What is the Reason for Developing Web Sites?

The first reason to develop a web site is to reflect the company we have or the agency we have or probably the most important one, to reflect ourselves. In order to achieve this, information architects, designers, developers, and usability specialists should meet with project managers, content owners (subject matter specialists), and users to establish objectives for the site.

The first thing has to be done is to set measurable objectives. We have to consider our Web site as our business. We have to develop measurable objects. So that means we have to be asking questions to ourselves as follows:

- How will I know if the site is successful?
- What will the consequences be if the site is not successful?

In this case, one of the most important thing is that, we must not limit ourselves to the objectives like "giving out information" or "being a place for people to come to download documents." Although, these objectives will be a good starting point, they won't be good enough to get success in the near future. In addition, we must not rely on "hits per page" subject. There is no way that if a hit is someone who wanted to be on that page or someone who really understand the information that is given in the website. As a result of that, hits per page will not be a good manner to approach in this kind of situations.

Instead of hits per page mentality, we can link the objectives to business goals. The objectives can be as follows:

- We will reduce phone calls related to healthcare benefits by 50% by putting our benefits information on the Web.
- We will increase email requests for scholarship information through our Web site by 30% within the next year.
- We will be the first place that people think of when they want information on cancer prevention — as measured by increased traffic on the site and by a public survey six months after we launch.

5.1.2 Who Should Come to the Site?

If we try to explain generally, a public Web site is available to everyone. But, we are not interested with everyone and as a result of that everyone is not necessarily the best definition of the audiences for our site. That's why we have to be thinking really carefully to choose the audiences to attract to our site.

The first thing we must do will be deciding our target audiences. Sometimes it is useful to think of your target audiences by roles in relationship to the site. A classic division for e-commerce sites is "browsers" and "buyers." For another site, targeted audiences might be divided by type; for example:

- Researchers outside the agency
- Researchers inside the agency
- Other staff in the division
- Non-research staff elsewhere in the agency

For other situations, it may be useful to categorize audiences by profession, age, gender, or other characteristics. The categories that are meaningful are ones that will lead us to think about what content to include and how to organize that content.

We do also keep user characteristics in mind while designing. That gives us to build a mental portrait of typical users in each group. For example, relevant characteristics for researchers might as follows:

- Busy
- Detail-oriented
- Knowledgeable about research and their subject matter
- May or may not be very experienced on the Web

Relevant characteristics for cancer patients and their families might be:

- Anxious
- Highly motivated to get information
- May not know medical terminology

5.1.3 When and Why They Will Come?

In the first planning question, we focused on "Why are you developing a Web site," and we try to find out our goals for the site or whether our companies goals. We do also keep in mind that, users have their own goals. Users also have goals. Most users come to Web sites because they have something to look for, in other words they need something.

So in order to get the audiences to attract to your web site, write several scenarios. To design a Web site that works for users, it helps to write several specific scenarios of when and why users will (or should) come to the Web site.

Here are some examples of scenarios:

Jenny, whose husband was just diagnosed with prostate cancer, comes to the site to find out what the latest research says about the pros and cons of alternative treatments.

Dr. Rachel, a family practitioner, wants to convince her patient, who has two small children, to stop smoking. She thinks that hard evidence about the harmful effects of second-hand smoke may be very persuasive for this patient. She is looking for something that gives the research evidence in a form that is short enough and understandable enough for her busy patient who is not medically trained.

5.2 Collecting Data from Users

In order to choose a site that will work for us in the analysis we have to know a lot about audiences. We will have different types of users; and all we want is to make them use our Web site.

5.2.1 What to Consider About Users?

In the last part, we talked about the assumptions we made about our users. Assumption is a good method but if all the assumptions we made were wrong, what will happen? In order to prevent loss of assumption, we have to verify our assumptions. The only way for that will be to get out and meet with them, then try to work with them. In this case, their desires can be obtained such as:

- Needs for information
- Ways of thinking about, grouping, and organizing information
- Expectations about your site
- Levels of knowledge about the subject matter
- Levels of experience with the Web and similar types of sites

As a result of that, we will gather many information about our users and learn what makes a Web site work or not work for them.

5.2.2 Understanding and Comparing Techniques for Gathering Data from Users

The following is an overview of data-gathering techniques, what they are, and how they differ. Details of all these techniques can be found in the literature [11].

Technique	Characteristics
Early usability tests	Users usually come to you You usually develop the scenarios Small numbers: one or two users at a time Total numbers: five to 12 users You observe and listen to actual behaviors May be formal or informal, quantitative and/or qualitative results Tester and user need not be at same location
Contextual interviews	You go to the user's home or work site Users do their own work (different scenarios with different users) Small numbers: one or two users at a time Total numbers: five to 12 users You observe and listen to actual behaviors You see users' environments and the technology users have Usually informal dialogue with user, qualitative results Interviewer and user are physically at same location
Online surveys	May have large number of responses Get users' self-report Good for wish lists, attitudes, experiences; not for actual behaviors Usually mostly closed questions (yes/no, multiple choice, short answer) May include open-ended questions, but they require more analysis Users may be located anywhere May be single-survey or iterative series

Individual interviews	Face to face, by telephone, through instant messaging or other computer-aided techniques Small numbers: one user at a time Total numbers: usually five to 15 users Rich data — you can follow up on questions Can include both closed and open-ended questions Self-report; good for attitudes, experiences, wish lists Not good for actual behaviors
Focus groups	Small group discussion Moderated by trained facilitator Usually everyone is in same location Self-report; good for attitudes, experiences, wish lists Not usually good for actual behaviors, but can combine with some aspects of behavioral usability testing Discussion influenced by group dynamics (for good or bad) Can be done as an electronic meeting, which allows for anonymity and reduces the effect of group dynamics
Card sorting	Usually used after gathering information with one or more of the other techniques Each card represents a possible topic on the site Need a start on content topics — so have some cards to sort Usually small numbers: one or two users at a time Typical total numbers: five to 12 users You usually observe and take notes as users talk about what they are doing Can be done remotely with a Web-based tool — so can be large numbers

Table 5.1. Data Gathering Techniques

5.3 Early Usability Tests

If we already have a Web site, we can find out what works well for our users and what does not. If we do not yet have a site, we can use a competitor's site or one that has similar purposes.

We can learn a great deal that will help we build a new site — what to keep, what to expand on, what to change, how to avoid others' mistakes.

A usability test can be done quickly and inexpensively. What a usability test reveals about what users actually do is usually more valuable than what you learn in interviews and focus groups where you ask users about themselves and their work.

What users say they do and what they actually do are often different — because people aren't always aware of how they work. When talking about our work, we all skip steps because we do them automatically. We often cannot remember exactly how we do or did something. Watching and listening as users work is the most informative way to see what people do — and to get what you need to build a successful site.

5.4 Contextual Interviews

Contextual interviews are like usability tests because we watch and listen as users work. They differ from usability tests in location, because in contextual interviews we go to the users. That way, we have the chance to see the user's environment and the actual technology the user has to work with.

To see the user's environment can be very handy. What is the social environment like? Are there people around to help the user? What is the physical environment like? Is the user on a slow modem? Does being online tie up a phone line so the user wants to be on and off the Web quickly?

Contextual interviews are more natural and realistic than usability testing. In a contextual interview, we watch and listen as the user does his or her own works. We don't usually impose tasks or scenarios on the user. In a usability test, on the other hand, we

usually have all users do the same scenarios, which give us comparative data from several people trying the same thing. We can, however, combine aspects of both:

Contextual interview: Take scenarios along and combine watching the user do his own work in his environment with asking the user to try a few of your tasks.

Usability test: Interview the user to find out the sorts of questions, issues, tasks he or she would do with the site. Let the user do his or her own task. Also have the user do some of your tasks to get data on tasks from all the users.

A contextual interview is usually informal. The observer listens to the user but may also ask clarifying questions and probe to gain greater understanding of what the user is doing and thinking. The results are usually qualitative rather than quantitative.

Usability testing in Web site development today is also often informal and is often conducted much like a contextual interview. However, usability testing can range from informal and qualitative to quite formal and quantitative.

5.5 What Makes an Interview Successful?

Select participants to represent the types of users we want to come to the Web site. (This is true of all the data-gathering techniques.)

- Decide what we want to learn. (This is also true for the other data-gathering techniques.)
- Write an "interview protocol" for the interviewer to follow. (In focus groups, the comparable document is called a "script." An interview protocol includes questions and probes to use to follow up on questions.)
- We can hire a skilled interviewer who will make interviewees feel comfortable, ask questions in a neutral manner, listen well, know when and how to probe for more details, and keep track of time unobtrusively.

- Allow the interviewer flexibility in using the protocol. (Although we want all the questions answered, this is not a survey but can be an opportunity to get a deep understanding of users.)
- Get permission to tape the sessions and have one or more people take good notes. (We are looking for answers to the questions and for insights about users that will help us build a Web site that meets their needs.)

6 Conducting and Using Usability Tests

6.1 What is Usability Testing

Usability testing encompasses a range of methods for identifying how users actually interact with a prototype or a complete site. In a typical approach, users — one at a time or two working together — use the Web site to perform tasks, while one or more people watch, listen, and take notes [17, 18].

6.2 Testing Goals

The goal of usability testing is to find out what is and is not working well on the site (or other product or service). In a usability test, you usually want to answer questions like these [19]:

- Do users complete a task successfully?
- If so, how fast do they do each task?
- Is that fast enough to satisfy them?
- What paths do they take in trying?
- Do those paths seem efficient enough to them?
- Where do they stumble? What problems do they have? Where do they get confused?
- What words or paths are they looking for that are not now on the site?

6.3 What are the Steps in Usability Testing?

We have developed a questionnaire to test the usability of two popular sites. In what follows a generic procedure is introduced for preparing a usability questionnaire. Although our survey conforms to this general guideline, it involves only those parts that are relevant to our simple survey.

Under each step, we list some questions or guidelines to consider in carrying out that step [2,17,18,19].

1. **Plan scope, issues, participants, location, and budget**
    - What are we going to test?
    - What concerns do we have about the site that we want to test?
    - Which users should participate in the test?
    - Where will we conduct the test? In a fixed laboratory? In a conference room or other space with a portable lab? In a conference room or other space but without any recording equipment? Remotely?
    - What is our budget for testing?
2. **Develop scenarios**
    - Select relevant tasks for users to try.
    - Prepare, try out, and refine scenarios for those tasks.

3. **Recruit test participants**
    - Recruit users who accurately represent your current or potential users.
    - Consider using a firm that specializes in recruiting for usability tests.
    - If you do it yourself, build a database of users for future tests.
4. **Conduct usability testing**
    - Have a trained facilitator interact with the user.
    - Have trained observers watch, listen, and take notes.
    - Make sure participants know that they are helping by trying out the Web site; the site is being tested, not them.
    - We must get participants to think aloud as they work.
    - We must let participants express their reactions.
    - We must not lead. We have to be sure to stay neutral in our words and body language. Also we have to be careful not to ask leading questions that may skew the participants' responses.
    - We have to take detailed, useful notes concentrating on observations of behavior rather than inferences.

5. **Make good use of the test results**

- Compile the data from all participants.
- List the problems that participants had.
- Sort the problems by priority and frequency of the problem.
- Develop solutions. Get expert advice if the solutions are not obvious.
- Fix the problems.
- Test the revised version to ensure you made the right design decisions.

7 ANALYSIS

In this chapter, first the usability survey is explained. Then details of the experiment are given, which is followed by a graphical presentation of the survey as a bar chart. Finally, the ANOVA test is employed to obtain some quantitative results.

7.1 The Survey

Subjects are selected using the method of simple random sampling [20]. Nearly all of the subjects are within the 0 – 25 age range. For the sake of collecting a "clean" set of data, subjects are especially chosen among computer literate people who have decent computer knowledge and skills, and who also have an experience in shopping from e-Commerce sites. Two mostly visited e-Commerce sites are selected for the survey as the benchmark sites. First each subject is told about the nature of the survey, then a specific task is given to the subject, who is supposed to finish the task within a set period of time, which is no longer than two minutes. In order to obtain consistent results, all subjects are asked to complete exactly the same task, namely, for the site hepsiburada.com: "Buy an mp3 player", and for the site kangurum.com: "Buy five different items, from five different categories". All of the subjects completed both the tasks of buying an mp3 player and the task of buying the items from kangurum.com. After the completion of both these tasks, the survey form is given to the subject who fills in two separate surveys for the sites that are used for benchmarking. So the survey represents the usability of the sites separately and also gives us a general idea about the usability of the e-Commerce sites in our country. Thus our main aim is to determine the general usability of the most visited e-Commerce sites of our country, on the other hand, we will be giving some individual details of the e-Commerce sites we used in our survey. The survey involves a 7-point Likert scale [21], in which increasing numbers mean the subject finds a site more and more usable. For instance 7 means the subject considers the site as totally usable with respect to the attribute asked by the question and one means just the opposite, that is the site is not usable in that respect. Strictly speaking the data is in the ordinal level [20]. A total of 35 people took our usability survey.

7.1.1 The Questionnaire

All subjects are given the following questionnaire, which took them on the average five minutes to complete.

1. WEB SİTE (E-İŞ) KALİTESİ (Web Sitesinin Kullanılabilirliği)

1:Kesinlikle Katılmıyorum 4: Kararsızım 7: Kesinlikle Katılıyorum

	1	2	3	4	5	6	7
1. XYZ Şirketinin Web Sayfası daima ulaşılabilir mi ?	☐	☐	☐	☐	☐	☐	☐
2. XYZ Şirketinin Web Sitesi hızlı bir Şekilde yükleniyor.	☐	☐	☐	☐	☐	☐	☐
3. XYZ Şirketinin Web Sitesinin nasıl kullanılacağını hatırlamak benim için çok kolay.	☐	☐	☐	☐	☐	☐	☐
4. XYZ Şirketinin Web Sitesine yaptırmak istediğim her şeyi kolayca yaptırabiliyorum.	☐	☐	☐	☐	☐	☐	☐
5. Benim XYZ Şirketinin Web Sitesi ile etkileşimim ve iletişimim açık ve anlaşılır.	☐	☐	☐	☐	☐	☐	☐
6. Genelde, XYZ Şirketinin Web Sitesinin kullanımının kolay olduğuna inanıyorum.	☐	☐	☐	☐	☐	☐	☐
7. Sitede dolaşmak çok kolay.	☐	☐	☐	☐	☐	☐	☐
8. XYZ Şirketinin Web Sitesinde, siparişin tamamlanması için gerekli olan aşamalar anlaşılabilir ve açıktır.	☐	☐	☐	☐	☐	☐	☐
9. XYZ Şirketinin Web Sitesinde arama motorunu kullanmak kolay mı ?	☐	☐	☐	☐	☐	☐	☐
10. XYZ Web Sitesinde yeni çıkmış ürünlere ulaşmak kolay mı ?	☐	☐	☐	☐	☐	☐	☐
11. XYZ Web Sitesinde indirime giren ürünleri bulmak kolay mı ?	☐	☐	☐	☐	☐	☐	☐
12. XYZ Web Sitesinde en çok satılan ürünleri bulmak kolay mı ?	☐	☐	☐	☐	☐	☐	☐
13. XYZ Şirketinin Web Sitesinde istenilen markalara kolaylıkla ulaşılabiliyor mu ?	☐	☐	☐	☐	☐	☐	☐
14. XYZ Şirketinin Web Sitesinde arama tuşu hemen bulunuabiliyor mu ?	☐	☐	☐	☐	☐	☐	☐
15. XYZ Şirketinin Web Sitesinde arama sonuçları tatminkar mı ?	☐	☐	☐	☐	☐	☐	☐
16. XYZ Şirketinin Web Sitesinde ürünlerin ozellikleri hakkında ki açıklamalar yeterli mi?	☐	☐	☐	☐	☐	☐	☐

17. XYZ Şirketinin Web Sitesinde alışveriş sepetinin kullanımı kolay mı ?	☐	☐	☐	☐	☐	☐	☐
18. XYZ Şirketinin Web Sitesinde alışverişten sonra odeme süreci kullanışlı ve açık mı?	☐	☐	☐	☐	☐	☐	☐
19. XYZ Şirketinin Web Sitesinde yeterince alternatif odeme şekli mevcut mu ?	☐	☐	☐	☐	☐	☐	☐
20. XYZ Şirketinin Web Sitesinde internet tarayıcınızın yonlendirme tuşlarını kullanmadan site içerisinde dolaşmak kolay mı ?	☐	☐	☐	☐	☐	☐	☐
21. XYZ Şirketinin Web Sitesinde kullanılan küçük grafikler(imgeler) anlaşılabilir mi ?	☐	☐	☐	☐	☐	☐	☐

Table 7.1. First Part of the Questionnaire

2. ÜRÜN KALITESI / ÇEŞİTLİLİĞİ / BULUNABİLİRLİĞİ

1:Kesinlikle Katılmıyorum 4:Fikrim Yok 7: Kesinlikle Katılıyorum

	1	2	3	4	5	6	7
1. XYZ Şirketi yüksek kalitede ürünlere sahiptir.	☐	☐	☐	☐	☐	☐	☐
2. XYZ Şirketi çok geniş bir ürün çeşitliliğine sahiptir. Istediğim ürünü bulabiliyorum.	☐	☐	☐	☐	☐	☐	☐
3.XYZ Şirketinin ürünleri süpermarkettekiler ile aynı kaliteye sahiptir.	☐	☐	☐	☐	☐	☐	☐
4. Stokta bitmiş ürünlerin yerine ikame ürünlerin gönderilmesi kabul edilebilir bir düzeydedir.	☐	☐	☐	☐	☐	☐	☐

Table 7.2. Second Part of the Questionnaire

3. XYZ Şirketinin Web SİTESİNDEN ALIŞVERİŞ
Yapma kararınızda aşağıdakilerden hangileri ne kadar etkili oldu?

1: Kesinlikle Etkili Olmadı 4: Fikrim Yok 7. Kesinlikle Etkili Oldu

	1	2	3	4	5	6	7
1. XYZ Şirketinin Ürün Fiyatlarının Uygunluğu	☐	☐	☐	☐	☐	☐	☐
2. XYZ Şirketinin Sağlamış olduğu Kolaylık ve Rahatlık (Siparişin eve teslimatı, taşıma külfetinden kurtulma v.b.)	☐	☐	☐	☐	☐	☐	☐
3. XYZ Şirketinden alışveriş yapmanın bana Zaman Tasarrufu Sağlaması (Bana zaman kazandırması) (Alışveriş için daha az zaman harcama)	☐	☐	☐	☐	☐	☐	☐

Table 7.3. Third Part of the Questionnaire

7.2 The Graphical Presentation of the Results

Before making any qualitative analysis, it is always instructive to do some quick qualitative analysis using graphical presentations. To this end we have hand counted the frequencies of the answers and obtained vertical bar charts of frequency distributions for each category.

7.3 Frequency Distribution for the First Category of Hepsiburada

The frequencies for the first category of Hepsiburada:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Totally Disagree	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Disagree	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	1	0	0	0	0	0
Slightly Disagree	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	1	0	0	0	2	1
Undecided	0	0	0	2	1	2	0	3	2	11	16	14	1	1	6	7	3	11	11	3	5
Slightly Agree	6	13	11	16	16	13	9	16	17	17	13	12	17	17	12	12	16	12	14	12	11
Agree	12	15	18	13	13	17	14	13	5	7	5	7	10	8	7	9	11	11	9	17	13
Totally Agree	17	7	6	4	4	3	12	3	8	0	1	1	4	9	9	5	5	1	1	1	5

Table 7.4. Frequency Distribution of the First Category of Hepsiburada

The corresponding bar chart is:

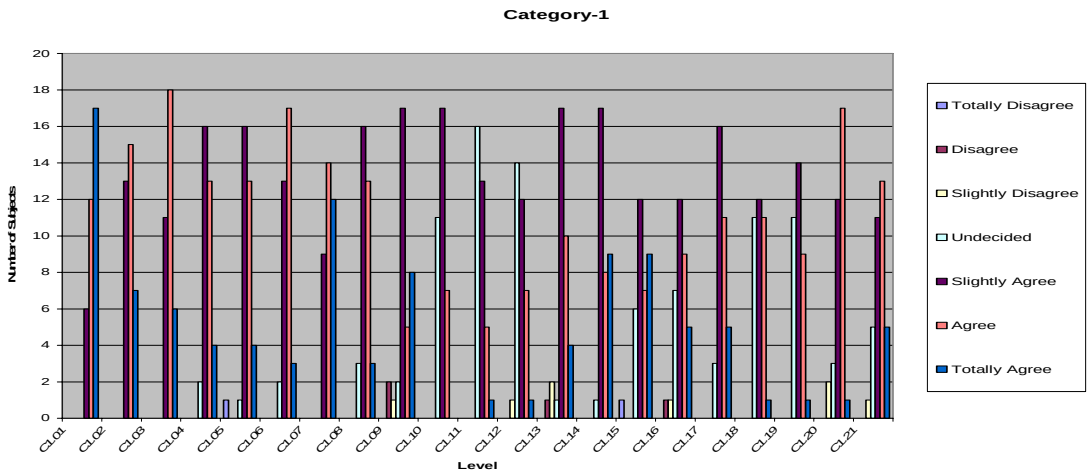

Figure 7.1. Bar Chart for Category-1 of Hepsiburada

The survey questions of the first category are specifically selected for the test of usability of the sites. The category consists of a total of twenty one questions. Some results follow:

- The lowest scores are 1 with frequency of 1 in the fifth and the fifteen questions and the highest score is 7 with frequency of 17 in the first question.
- The other two highest frequencies are observed from the third, sixth and twentieth questions. In the third question 18 subjects gave the score 6, 17 subjects gave the score 6 to the sixth question and 17 subjects gave the score 6 to the twentieth question.
- Question eleven has the lowest mean in the category.
- Questions ten and twelve have the other lower means in this category.
- Note that three sub categories emerge: $C_1.01$, $C_1.02$, $C_1.03$ and $C_1.07$ with the highest cumulative frequencies. $C_1.10$, $C_1.11$, $C_1.12$, $C_1.18$ and $C_1.19$ with the lowest cumulative frequencies. And the rest in between these two subcategories.

7.4 Frequency Distribution for the Second Category of Hepsiburada

The frequencies for the second category of Hepsiburada:

	1	2	3	4
Totally Disagree	0	0	0	0
Disagree	0	0	0	0
Slightly Disagree	0	0	0	0
Undecided	0	0	0	1
Slightly Agree	15	13	17	19
Agree	16	14	13	11
Totally Agree	4	8	5	4

Table 7.5. Frequency Distribution of the Second Category of Hepsiburada

The corresponding bar chart is:

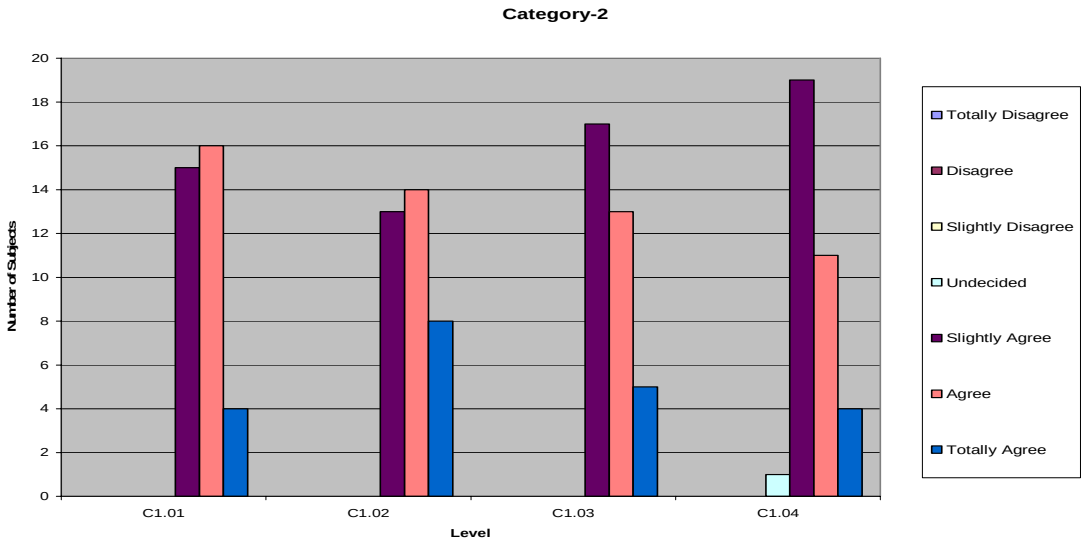

Figure 7.2. Bar Chart for Category-2 for Hepsiburada

- Most of the scores in this category are close to each other.
- The fourth question has the peak value where the frequency is 19 for the score 5, which yields to more than half of the subjects.
- In all four questions, at least %77.2 of the subjects gave the score 5 or 6 to these questions.
- Although, question four has the peak value for this category, it also has the lowest mean in this category with 5.5.

7.5 Frequency Distribution for the Third Category of Hepsiburada

The frequencies for the third category:

	1	2	3
Totally Disagree	0	0	0
Disagree	0	0	0
Slightly Disagree	0	0	0
Undecided	2	3	2
Slightly Agree	20	16	11
Agree	8	12	14
Totally Agree	5	4	8

Table 7.6. Frequency Distribution of the Third Category of Hepsiburada

The corresponding bar chart is:

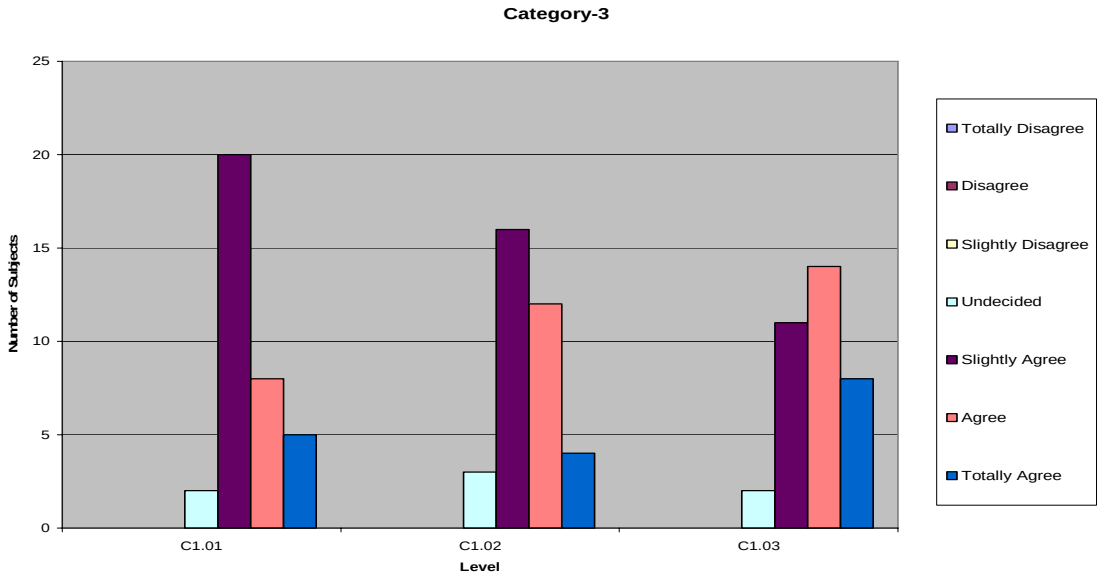

Figure 7.3. Bar Chart for Category-3 of Hepsiburada

- Most of the scores in this category are close to each other.
- More than half of the subjects, namely 20, gave the first question the score 5.
- In all four questions, at least %71.4 of the subjects gave the score 5 or 6 to these questions.
- Although, question one has the peak value for this category, it also shares the lowest mean value with the second question, which is 5.5.

7.6 Frequency Distribution for the First Category of Kangurum

The frequencies for the first category:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Totally Disagree	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Disagree	0	0	0	1	0	0	0	0	0	0	0	0	0	4	7	1	0	1	0	4	1
Slightly Disagree	0	0	0	2	0	0	1	2	1	2	1	1	4	3	4	0	0	1	1	4	6
Undecided	0	0	0	3	5	7	3	4	0	16	16	16	5	6	1	8	6	9	11	4	2
Slightly Agree	8	15	14	13	12	15	13	14	9	12	13	12	15	16	9	12	11	11	11	11	11
Agree	13	7	10	9	12	10	10	8	12	5	4	3	7	2	7	8	11	12	9	8	9
Totally Agree	14	13	11	7	6	4	8	6	13	0	1	3	4	4	6	6	7	1	3	4	6

Table 7.7. Frequency Distribution of the First Category of Kangurum

The corresponding bar chart is:

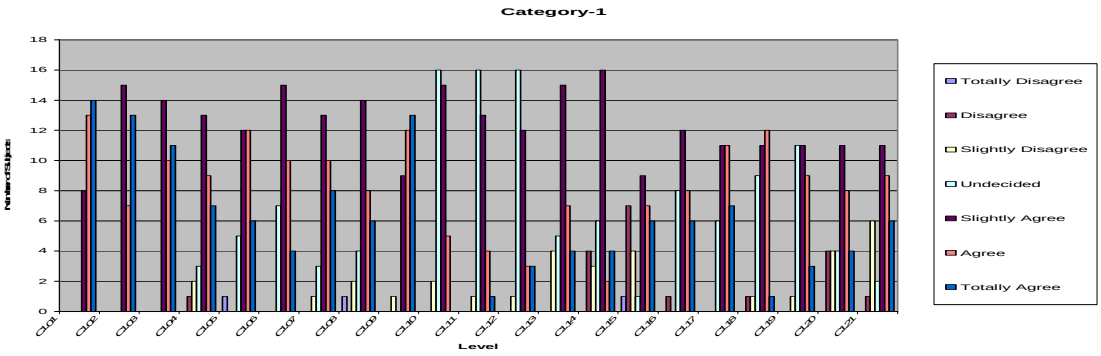

Figure 7.4. Bar Chart for Category-1 for Kangurum

The survey questions of the first category are specifically selected for the test of usability of the sites. The category consists of a total of twenty one questions. Some results follow:

- The lowest scores are 1 with frequency of 1 in the eight and fifteen questions and the highest score is 7 with frequency of 14 in the first question.
- The other two highest frequencies are observed from the thirteenth and fourteenth questions. In the thirteenth question 15 subjects gave the score 5, and 16 subjects gave the score 5 to the fourteenth question.

- Questions ten, fourteen and fifteen have the lowest means in the category and in the whole survey as well.
- Questions eleven, twelve and twenty have the other lower means respectively.
- Note that three sub categories emerge: $C_1.01$, $C_1.02$, $C_1.03$ and $C_1.09$ with the highest cumulative frequency. $C_1.10$, $C_1.11$, $C_1.12$, $C_1.14$, $C_1.15$ and $C_1.20$ with the lowest cumulative frequency. And the rest in between these two subcategories.

7.7 Frequency Distribution for the Second Category of Kangurum

The frequencies for the second category:

	1	2	3	4
Totally Disagree				
Disagree				
Slightly Disagree				
Undecided	1	3	2	10
Slightly Agree	14	12	12	12
Agree	13	14	15	8
Totally Agree	7	6	6	5

Table 7.8. Frequency Distribution of the Second Category of Kangurum

The corresponding bar chart is :

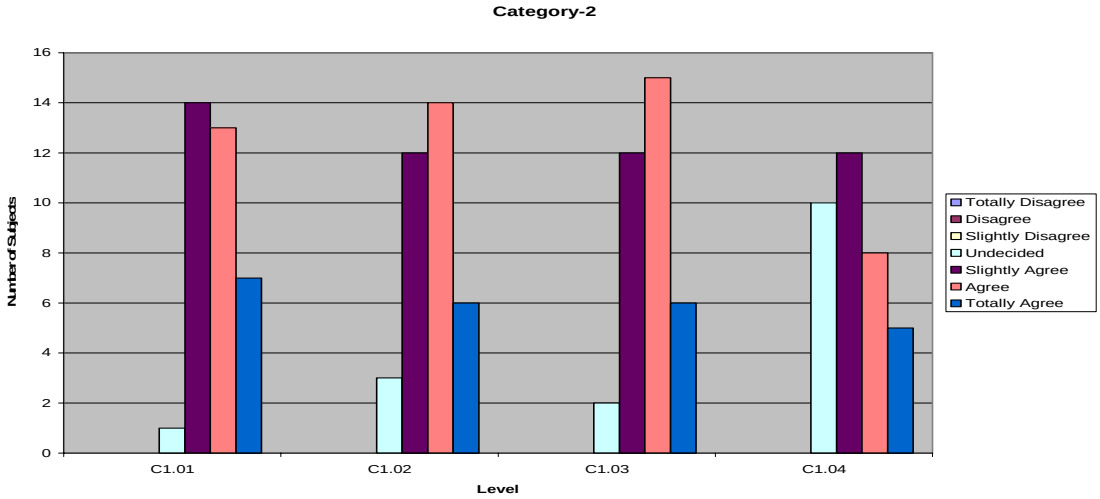

Figure 7.5. Bar Chart for Category-2 for Kangurum

- Most of the scores in this category are close to each other.
- The third question has the peak value where the frequency is 15 for the score 6, which yields to almost half of the subjects.
- In all four questions, at least %57.15 of the subjects gave the score 5 or 6 to these questions.
- Question four has the lowest mean in this category with 5.2.

7.8 Frequency Distribution for the Third Category of Kangurum

The frequencies for the third category:

	1	2	3
Totally Disagree			
Disagree			
Slightly Disagree			
Undecided	1		
Slightly Agree	17	14	14
Agree	13	16	13
Totally Agree	4	5	8

Table 7.9. Frequency Distribution of the Thirs Category of Kangurum

The corresponding bar chart is :

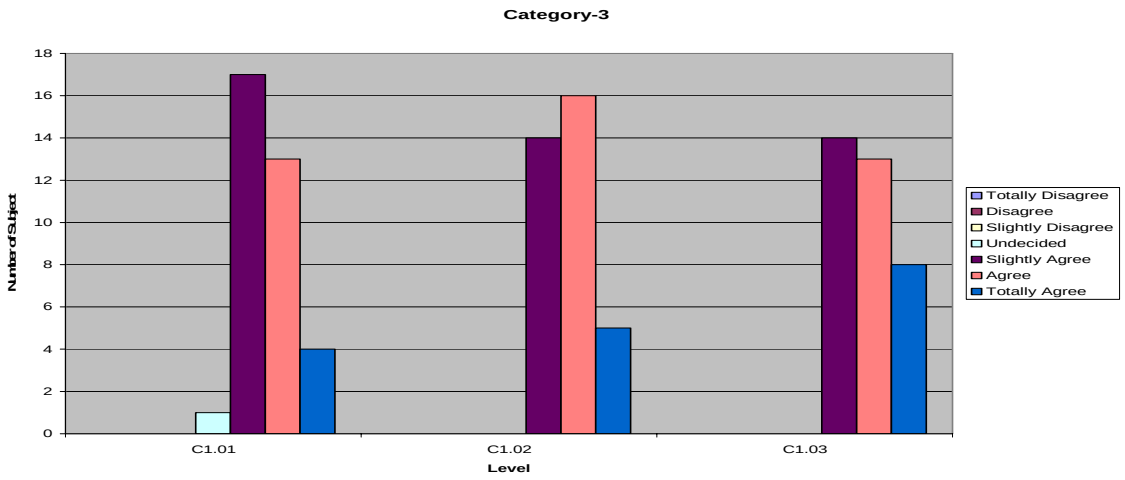

Figure 7.6. Bar Chart for Category-3 for Kangurum

- Most of the scores in this category are close to each other.
- Nearly half of the subjects, namely 16, gave the second question 5.

- In all four questions, at least %77.2 of the subjects gave the score 5 or 6 to these questions.
- The first question has the lowest mean of this category, while third question has the highest mean with the values of 5.6 and 5.8 respectively.

7.9 The ANOVA Test

Although the "distance" between the numbers in the Likert scale of the survey cannot be defined geometrically, we argue that we have meaningful separations between the answers and thus we argue that the data we have collected can be considered as "virtually" interval level data. In this section the ANOVA test is applied to each category of the two sites.

7.10 ANOVA Test for Hepsiburada Category 1

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3 = ... = \mu_{21}$

$H_1 :$ The mean scores are not equal

The level of significance is selected to be $\alpha = 0.05$. The test statistic is naturally F. And the null hypothesis H_0 is rejected if the computed value of F is greater than the value critical value of F, which is 1,58528, for *d.f.* = 734 degrees of freedom. The results are neatly summarized in the following ANOVA table that we have obtained using the Analysis Toolpak of MS Excel:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	221	6,314286	0,57479
Column 2	35	204	5,828571	0,557983
Column 3	35	205	5,857143	0,478992
Column 4	35	194	5,542857	0,608403
Column 5	35	191	5,457143	1,137815
Column 6	35	196	5,6	0,541176
Column 7	35	213	6,085714	0,610084

Column 8	35	191	5,457143	0,608403
Column 9	35	186	5,314286	1,692437
Column 10	35	171	4,885714	0,515966
Column 11	35	166	4,742857	0,667227
Column 12	35	168	4,8	0,811765
Column 13	35	185	5,285714	1,210084
Column 14	35	200	5,714286	0,798319
Column 15	35	190	5,428571	1,722689
Column 16	35	182	5,2	1,4
Column 17	35	193	5,514286	0,727731
Column 18	35	177	5,057143	0,761345
Column 19	35	175	5	0,705882
Column 20	35	187	5,342857	0,820168
Column 21	35	191	5,457143	1,020168

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	114,3782	20	5,718912	6,682671	5,08E-17	1,904133
Within Groups	611,0286	714	0,855782			
Total	725,4068	734				

Table 7.10. ANOVA Results for Category 1 for Hepsiburada

The careful reader will immediately recognize that the computed value of F is far greater than the critical value of F. Thus the null hypothesis is rejected with an astonishingly small p-Value of 5,08E-17, which suggests that we can definitely state that the answers in this category have different means. The one-way ANOVA test supports our general conclusion: Subjects find the Web sites only partially useful. This conclusion suggests us to further analyze this category for those subcategories that would have same means. By “human eye scanning” we have determined that there is actually three subcategories in this category, namely questions 1, 2, 3 and 7 to be “totally useful”, questions 10, 11, 12, 18 and 19, to be “neither useless nor useful”, and the rest of the questions said to be “useful”. The results of these subcategories are as follows:

Category 1.1:

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_7$
$H_1 :$ The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 3,928924, for *d.f.* = 139 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	221	6,314286	0,57479
Column 2	35	204	5,828571	0,557983
Column 3	35	205	5,857143	0,478992
Column 4	35	213	6,085714	0,610084

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	5,392857	3	1,797619	3,236258	0,024286	3,928924
Within Groups	75,54286	136	0,555462			
Total	80,93571	139				

Table 7.11. ANOVA Results for Category 1.1 for Hepsiburada

This is the subcategory with the questions 1, 2, 3 and 7, which is considered to be "totally useful" by the subjects. Since the computed value of F is smaller than the critical value of F the null hypothesis cannot be rejected. This result is in accordance with our expectations. The population mean for this subcategory is $\mu^1 = 6.00$ with a sampling error of $\sigma = 0.5$.

Category 1.2

The hypothesis and the alternate hypothesis:

$H_0 : \mu_{10} = \mu_{11} = \mu_{12} = \mu_{18} = \mu_{19}$

H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. We can reject the null hypothesis if the computed value of F is larger than the critical value of F, which is 3,431442, for *d.f.* = 174. The results are:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	171	4,885714	0,515966
Column 2	35	166	4,742857	0,667227
Column 3	35	168	4,8	0,811765
Column 4	35	177	5,057143	0,761345
Column 5	35	175	5	0,705882

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2,434286	4	0,608571	0,878883	0,477871	3,431442
Within Groups	117,7143	170	0,692437			
Total	120,1486	174				

Table 7.12. ANOVA Results for Category 1.2 for Hepsiburada

This is the subcategory with the questions 10, 11, 12, 18 and 19. This subcategory considered to be ”undecided” by scores given by the subjects. As seen clearly, the computed value of F is smaller than the critical value of F, the null hypothesis is accepted. These results match our expectations. The population mean for this subcategory is $\mu^2 = 4.9$ with a sampling error of $\sigma = 0.4$.

Category 1.3

The hypothesis and the alternate hypothesis:

$H_0 : \mu_4 = \mu_5 = \mu_6 ... = \mu_{21}$
H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 2,29138, for *d.f.* = 419 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	194	5,542857	0,608403
Column 2	35	191	5,457143	1,137815
Column 3	35	196	5,6	0,541176
Column 4	35	191	5,457143	0,608403
Column 5	35	186	5,314286	1,692437
Column 6	35	185	5,285714	1,210084
Column 7	35	200	5,714286	0,798319
Column 8	35	190	5,428571	1,722689
Column 9	35	182	5,2	1,4
Column 10	35	193	5,514286	0,727731
Column 11	35	187	5,342857	0,820168
Column 12	35	191	5,457143	1,020168

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	7,857143	11	0,714286	0,697579	0,74116	2,29138
Within Groups	417,7714	408	1,02395			
Total	425,6286	419				

Table 7.13. ANOVA Results for Category 1.3 for Hepsiburada

This is the subcategory consisting of the questions 4, 5, 6, 8, 9, 13, 14, 15, 16, 17, 20, 21 and considered to be "useable" by the subjects. Note that the computed value of F for this set is 0,697579, which less than the critical value of F, which is 2,29138. Thus H_0

cannot be rejected at the 0.01 level of significance. We conclude that there is no difference in the variation of the answers for this set of questions as we expect. Assuming that we have an unbiased sample, sampled from a population by simple random sampling, the expected value of the mean for the population is calculated to be $\mu^3 = 5.4$. The sampling error on this result is $\sigma = 0.3$.

7.11 ANOVA Test for Hepsiburada Category 2

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$

H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 3,928924, for *d.f.* = 139 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	199	5,685714	0,457143
Column 2	35	205	5,857143	0,596639
Column 3	35	198	5,657143	0,52605
Column 4	35	193	5,514286	0,551261

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2,078571	3	0,692857	1,300473	0,276919	3,928924
Within Groups	72,45714	136	0,532773			
Total	74,53571	139				

Table 7.14. ANOVA Results for Category 2 for Hepsiburada

This is the second category consisting of four questions. Note that the computed value of F for this set is 1.300473, which less than the critical value of F, which is

3,928924. As a result of that, H_0 cannot be rejected at the 0.01 level of significance. We conclude that there is no difference in the variation of the answers for this set of questions. In other words no subcategories exist. The expected value of the mean for the population is calculated to be $\mu_2 = 5.7$. The sampling error on this result is $\sigma = 0.5$. Generally speaking subjects find the two sites with respect to the questions in this category to be useable**.**

7.12 ANOVA Test for Category 3

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3$
H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 4,81949, for *d.f.* = 104 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	191	5,457143	0,667227
Column 2	35	192	5,485714	0,668908
Column 3	35	203	5,8	0,752941

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2,533333	2	1,266667	1,818986	0,167412	4,81949
Within Groups	71,02857	102	0,696359			
Total	73,5619	104				

Table 7.15. ANOVA Results for Category 3 for Hepsiburada

This is the category-3 consisting of three questions. Note that the computed value of F for this set is 1.818986, which less than the critical value of F, which is 4,81949.

Thus, H_0 cannot be rejected at the 0.01 level of significance. We conclude that there is no difference in the variation of the answers for this set of questions. Since there are only three questions, the search for a subcategory would no be reasonable for this category. The expected value of the mean for the population is calculated to be $\mu_3 = 5.6$. The sampling error on this result is $\sigma = 0.5$.

7.13 ANOVA Test for Kangurum Category 1

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3 = ... = \mu_{21}$

H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is naturally F. And the null hypothesis H_0 is rejected if the computed value of F is greater than the value critical value of F, which is 1,904133, for *d.f.* = 734 degrees of freedom. The results are neatly summarized in the following ANOVA table that we have obtained using the Analysis Toolpak of MS Excel:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	216	6,171429	0,616807
Column 2	35	208	5,942857	0,820168
Column 3	35	207	5,914286	0,727731
Column 4	35	188	5,371429	1,534454
Column 5	35	194	5,542857	0,902521
Column 6	35	186	5,314286	0,868908
Column 7	35	196	5,6	1,070588
Column 8	35	183	5,228571	1,710924
Column 9	35	211	6,028571	0,910924
Column 10	35	160	4,571429	0,663866
Column 11	35	163	4,657143	0,702521
Column 12	35	166	4,742857	0,961345
Column 13	35	177	5,057143	1,290756
Column 14	35	161	4,6	1,952941
Column 15	35	160	4,571429	3,546218
Column 16	35	184	5,257143	1,373109
Column 17	35	194	5,542857	1,020168

Column 18	35	175	5	1,117647
Column 19	35	177	5,057143	1,055462
Column 20	35	167	4,771429	2,29916
Column 21	35	179	5,114286	1,986555

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	175,8612	20	8,793061	6,805581	2,07E-17	1,904133
Within Groups	922,5143	714	1,292037			
Total	1098,376	734				

Table 7.16. ANOVA Results for Category 1 for Kangurum

The careful reader will immediately recognize that the computed value of F is far greater than the critical value of F. Thus the null hypothesis is rejected with an astonishingly small p-Value of 2.07E-17, which suggests that we can definitely state that the answers in this category have different means. The one-way ANOVA test supports our general conclusion: Subjects find the Web sites only partially useful. This conclusion suggests us to further analyze this category for those subcategories that would have same means. By "human eye scanning" we have determined that there is actually three subcategories in this category, namely questions 1, 2, 3 and 9 to be "totally useful", questions 10, 11, 12, 14, 15 and 20, to be "neither useless nor useful", and the rest of the questions said to be "useful". The results of these subcategories are as follows:

Category 1.1:

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_9$

H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 3,928924, for *d.f.* = 139 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	216	6,171429	0,616807
Column 2	35	208	5,942857	0,820168
Column 3	35	207	5,914286	0,727731
Column 4	35	211	6,028571	0,910924

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1,4	3	0,466667	0,606922	0,61161	3,928924
Within Groups	104,5714	136	0,768908			
Total	105,9714	139				

Table 7.17. ANOVA Results for Category 1.1 for Kangurum

This is the subcategory with the questions 1, 2, 3 and 9, which is considered to be "totally useful" by the subjects. Since the computed value of F is smaller than the critical value of F the null hypothesis cannot be rejected. This result is in accordance with our expectations. The population mean for this subcategory is $\mu^1 = 6.00$ with a sampling error of $\sigma = 0.5$.

Category 1.2

The hypothesis and the alternate hypothesis:

$H_0 : \mu_{10} = \mu_{11} = \mu_{12} = \mu_{14} = \mu_{15} = \mu_{20}$

H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. We can reject the null hypothesis if the computed value of F is larger than the critical value of F, which is 3,108126, for *d.f.* = 209. The results are:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	160	4,571429	0,663866
Column 2	35	163	4,657143	0,702521
Column 3	35	166	4,742857	0,961345
Column 4	35	161	4,6	1,952941
Column 5	35	160	4,571429	3,546218
Column 6	35	167	4,771429	2,29916

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1,338095	5	0,267619	0,158573	0,977216	3,108126
Within Groups	344,2857	204	1,687675			
Total	345,6238	209				

Table 7.18. ANOVA Results for Category 1.2 for Kangurum

This is the subcategory with the questions 10, 11, 12, 14, 15 and 20. This subcategory considered to be"undecided" by scores given by the subjects. As seen clearly, the computed value of F is smaller than the critical value of F, the null hypothesis is accepted. These results match our expectations. The population mean for this subcategory is $\mu^2 = 4.7$ with a sampling error of $\sigma = 0.3$.

Category 1.3

The hypothesis and the alternate hypothesis:

$H_0 : \mu_4 = \mu_5 = \mu_6 ... = \mu_{21}$

H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 2,36853, for *d.f.* = 384 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	188	5,371429	1,534454
Column 2	35	194	5,542857	0,902521
Column 3	35	186	5,314286	0,868908
Column 4	35	196	5,6	1,070588
Column 5	35	183	5,228571	1,710924
Column 6	35	177	5,057143	1,290756
Column 7	35	184	5,257143	1,373109
Column 8	35	194	5,542857	1,020168
Column 9	35	175	5	1,117647
Column 10	35	177	5,057143	1,055462
Column 11	35	179	5,114286	1,986555

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	16,04675	10	1,604675	1,267053	0,247315	2,36853
Within Groups	473,6571	374	1,266463			
Total	489,7039	384				

Table 7.19. ANOVA Results for Category 1.3 for Kangurum

This is the subcategory consisting of the questions 4, 5, 6, 7, 8, 13, 16, 17, 18, 19, 21 and considered to be "useable" by the subjects. Note that the computed value of F for this set is 1.267053, which less than the critical value of F, which is 2,36853. Thus H_0 cannot be rejected at the 0.01 level of significance. We conclude that there is no difference in the variation of the answers for this set of questions as we expect. Assuming that we have an unbiased sample, sampled from a population by simple random sampling, the expected value of the mean for the population is calculated to be $\mu^3 = 5.3$. The sampling error on this result is $\sigma = 0.3$.

7.14 ANOVA Test for Kangurum Category 2

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$
$H_1 :$ The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 3,928924, for *d.f.* = 139 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	201	5,742857	0,667227
Column 2	35	198	5,657143	0,761345
Column 3	35	200	5,714286	0,680672
Column 4	35	183	5,228571	1,063866

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	6,085714	3	2,028571	2,557203	0,057809	3,928924
Within Groups	107,8857	136	0,793277			
Total	113,9714	139				

Table 7.20. ANOVA Results for Category 2 for Kangurum

This is the second category consisting of four questions. Note that the computed value of F for this set is 2.557203, which less than the critical value of F, which is 3,928924. As a result of that, H_0 cannot be rejected at the 0.01 level of significance. We conclude that there is no difference in the variation of the answers for this set of questions. In other words no subcategories exist. The expected value of the mean for the population is calculated to be $\mu_2 = 5.6$. The sampling error on this result is $\sigma = 0.5$. Generally speaking subjects find the two sites with respect to the questions in this category to be useable**.**

7.15 ANOVA Test for Kangurum Category 3

The hypothesis and the alternate hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_3$
H_1 : The mean scores are not equal

The level of significance is selected to be $\alpha = 0.01$. The test statistic is F. And the null hypothesis H_0 is rejected if the computed value of F is larger than the critical value of F, which is 4,81949, for *d.f.* = 104 degrees of freedom. The results are summarized in the following ANOVA table:

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	35	195	5,571429	0,546218
Column 2	35	201	5,742857	0,490756
Column 3	35	204	5,828571	0,616807

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1,2	2	0,6	1,088415	0,340628	4,81949
Within Groups	56,22857	102	0,551261			
Total	57,42857	104				

Table 7.21. ANOVA Results for Category 3 for Kangurum

This is the category-3 consisting of three questions. Note that the computed value of F for this set is 1,088415, which less than the critical value of F, which is 4,81949. Thus, H_0 cannot be rejected at the 0.01 level of significance. We conclude that there is no difference in the variation of the answers for this set of questions. Since there are only three questions, the search for a subcategory would no be reasonable for this category. The expected value of the mean for the population is calculated to be $\mu_3 = 5.7$. The sampling error on this result is $\sigma = 0.5$.

8 CONCLUSION

Recently, usability and web accessibility have been one of the main areas of research in the field of information technologies. Although, most people found it difficult to define usability, most people have the ability to recognize usability when they deal problems in their daily life, especially in the Internet.

The key to Web site usability is ensuring that the site is both useful and usable for the intended users. A useable interface can be explained as accessible, appealing, consistent, clear, simple, navigable and forgiving for the inexperienced users.

In this thesis, we conducted 35 experienced computer and Internet users, mostly within the age range of 18-25 and gave them a survey on the usability for two very well-known e-Commerce sites.

The questions in the first category are especially designed for testing how usable are the two sites. In this category several conclusions follow:

- On the whole these sites are moderately useful, with an average score of 5.48 for Hepsiburada.com and 5.20 for Kangurum.com.
- The second subcategory of the survey indicates that the introduction of broadband connections made it possible for the Internet users to access and browse e-Commerce sites easily. But this makes the infrastructure of Turkey useable, not the sites!
- The third subcategory indicates that the sites are only slightly useable related to the attributes in these questions. In other words the sites need major improvements which will make them much easier to navigate.
- The biggest problem of the e-Commerce sites is that they are not user friendly. That is, in general, even the most experienced computer and Internet users find it difficult to do what they actually want to do without entering into “dead ends”.
- In both sites, subjects find it difficult to reach and search the new products, the products that are on the sale and the products that are sold mostly. This yields us

that, the products in these sites are not placed in such a way that subjects find it easy to find and navigate.

- In the site Hepsiburada.com, subjects were"undecided" about the usage of shopping chart. They also have the "undecided" opinion for after the process of the shopping.
- In the site Kangurum.com, subjects were "undecided" about the usage of the search button and also about the results of the searches that they have done. This yields us that; the accuracy of the results is not at the top. In addition top that, subjects find it hard to navigate using the navigation buttons.
- In the site, Kangurum.com, as in the Hepsiburada.com subjects were "undecided" about the usage of the shopping chart and the process shopping.
- The steps through the shopping are not easily understandable; statements are vague, which makes it quite inconvenient for the subjects.

The other two categories are only indirectly related to the usability of the Web sites. Nevertheless we took them for the sake of having some nice to know IT knowledge. According to our survey we can safely say that people agree with the questions in these categories if not strongly agree.

After this study an e-mail was sent to Kangurum.com. In this e-mail the results of this study was briefly explained. In sum, Kangurum.com has been informed that according to the usability test we conducted their e-commerce site was found to be barely useable. This short e-mail was replied promptly, saying that they have been working on the development of a totally new design lately. Their new site is now on-line. This information verifies that the usability test suggested in this thesis can be applied to e-commerce sites.

A more detailed study would include collecting data according to the different age groups and with different levels of experience with computer and Internet skills. Nevertheless even a simple usability analysis such as this compels us to conclude that even the biggest e-Commerce sites of our country need major improvements in order for them to become usable.

APPENDIX A

	CATEGORY-1																					CATEGORY-2				CATEGORY-3		
Ad-Soyad	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**1**	**2**	**3**	**4**	**1**	**2**	**3**
Arzu Bayir	6	6	7	6	6	6	6	6	6	6	6	4	5	6	7	6	7	6	5	6	5	6	6	5	4	4	5	7
Levent Oskan	5	5	6	5	5	5	6	5	7	5	6	6	6	7	6	6	6	5	4	5	4	5	6	5	6	6	5	6
Selin Yurdakul	6	5	7	6	7	6	5	7	7	5	4	4	6	7	7	4	4	5	6	4	6	5	7	6	6	5	6	7
Secil Kucukgok	5	5	5	5	5	6	5	5	5	4	4	4	5	5	6	4	5	4	4	6	5	5	6	5	5	6	6	6
Damla Benibol	7	6	6	6	6	5	7	6	7	4	4	4	6	6	5	4	5	4	4	3	6	6	7	6	5	6	6	7
Can Serbetci	7	6	6	6	5	6	6	5	7	6	4	4	4	7	5	7	7	4	4	6	6	6	5	5	6	5	6	5
Merve Ertekin	5	5	6	7	5	4	5	4	7	5	4	4	5	5	7	4	4	4	4	6	3	5	5	6	5	5	4	6
Omer Bilgin	5	5	7	7	1	4	5	6	2	4	4	4	2	7	1	2	5	5	6	7	7	6	5	5	5	5	5	5
Emir Mumcuoglu	7	6	7	7	7	7	7	5	7	4	4	4	5	7	7	7	6	5	4	6	5	6	7	6	5	5	4	4
Gulsen Calkin	7	7	6	5	6	6	7	6	7	6	4	4	7	7	7	6	5	4	4	6	7	5	6	7	6	7	4	5
Ayfer Aydin	5	7	5	5	5	6	7	7	7	6	4	4	7	7	7	7	7	4	4	6	7	6	6	5	5	6	5	5
Adem Keskin	7	6	6	6	5	5	5	6	5	4	4	4	6	7	7	4	6	6	6	6	6	6	7	7	7	5	6	4
Sevim Bayir	7	7	5	6	6	6	7	6	6	4	7	7	7	7	4	6	7	7	7	5	6	6	5	5	5	5	7	7
Zeynep Buyukgokcesu	7	5	6	5	6	6	7	6	5	4	5	5	5	5	4	4	5	5	6	6	5	6	6	5	5	5	5	6
Doruk Giritli	7	5	6	4	6	5	7	5	5	5	6	5	6	5	5	3	5	5	5	6	4	6	6	5	7	5	5	6
Asli Berkcan	6	5	6	5	6	7	5	6	5	5	4	5	5	5	5	5	5	5	5	6	5	7	6	7	6	7	5	6
Tuna Dalkilic	7	6	6	5	5	5	6	5	5	4	5	5	5	6	4	5	6	4	5	5	4	5	7	6	6	5	5	6
Mert Icgoren	5	6	6	5	5	6	5	7	5	5	5	6	5	5	5	5	5	6	5	6	4	5	5	6	6	6	5	7
Aras Sarman	7	6	5	6	4	5	7	6	6	5	6	4	3	5	5	6	5	6	5	5	6	6	5	6	5	5	6	5
Canay Tuskan	7	6	6	5	5	5	6	5	4	5	4	3	5	5	6	7	5	5	5	6	6	5	6	5	6	5	5	7
Yasemin Solakoglu	7	7	7	4	7	5	5	5	3	6	6	5	3	6	6	5	5	6	5	5	5	7	5	7	5	6	6	6
Cem Unal	6	7	5	5	5	6	6	5	5	5	5	6	5	5	6	5	6	5	5	6	5	6	7	5	5	7	7	7
Umut Kazankaya	6	5	6	5	6	5	6	4	5	5	5	5	5	5	5	5	6	4	6	5	5	6	5	6	7	5	5	5
Baris Yilmaz	6	5	7	6	5	6	6	5	5	4	5	6	6	5	4	5	4	5	6	4	5	6	5	6	7	5	5	5
Can Bodur	6	6	5	7	5	6	7	4	2	5	5	5	5	5	4	5	7	5	6	5	7	5	6	7	5	5	5	6
Murat Gunaydin	7	5	6	6	5	7	5	5	5	5	4	5	6	6	4	7	5	6	6	5	7	5	7	6	6	5	6	6
Alihan Sahinkaya	6	5	6	5	7	5	6	5	6	6	5	5	6	5	5	5	5	6	6	5	6	6	5	5	5	5	6	6
Canan Erkan	6	6	5	6	6	6	7	5	5	5	4	4	5	5	7	5	5	4	4	3	6	6	6	5	5	4	5	5
Sibel Eranil	6	6	5	6	5	6	6	6	5	6	5	6	7	5	7	5	6	4	4	5	6	5	6	5	5	5	6	6
Guven Orman	7	6	5	5	6	5	7	6	5	5	5	5	5	6	5	5	6	5	4	4	6	5	5	6	5	7	7	7
Altay Genc	7	6	5	6	6	5	6	6	5	5	5	4	5	6	5	6	6	4	5	6	5	7	5	5	6	6	7	6
Ebru Esen	7	7	6	5	5	5	6	5	5	5	4	5	5	5	6	6	6	6	5	6	6	7	6	6	5	7	5	5
Eda Darcan	6	5	5	5	6	6	6	5	6	5	5	5	6	5	5	4	5	6	5	6	5	5	5	5	5	5	6	5
Mert Dincoglu	6	6	6	6	5	6	6	5	5	4	5	6	5	6	6	6	5	6	5	5	4	5	7	6	5	6	6	6
Cem Ozgur	7	7	6	5	6	6	7	6	4	4	4	6	6	4	5	6	6	6	5	5	6	5	6	5	6	5	5	5
OVERALL	221	204	205	194	191	196	213	191	186	171	166	168	185	200	190	182	193	177	175	187	191	199	205	198	193	191	192	203
AVERAGE	6,31	5,83	5,86	5,54	5,46	5,6	6,09	5,46	5,31	4,89	4,74	4,8	5,29	5,71	5,43	5,2	5,51	5,06	5	5,34	5,46	5,69	5,86	5,66	5,51	5	5,49	6
STANDARD DEVIATION	0,76	0,75	0,69	0,78	1,07	0,74	0,78	0,78	1,3	0,72	0,82	0,9	1,1	0,89	1,31	1,18	0,85	0,87	0,84	0,91	1,01	0,68	0,77	0,73	0,74	1	0,82	1

	AVR	ERR	AVR	ERR	AVR	ERR
AVR_CAT_1	6,02	0,45	4,9	0,37	5,44	0,27
AVR_CAT_2	5,68	0,48				
AVR_CAT_3	5,58	0,54				

Analysis Worksheet for Hepsiburada.com

	CATEGORY-1																					CATEGORY-2				CATEGORY-3		
Ad-Soyad	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**1**	**2**	**3**	**4**	**1**	**2**	**3**
Arzu Bayir	5	5	6	5	6	5	6	6	6	4	4	4	5	4	2	5	4	4	5	6	6	5	6	6	5	5	7	6
Levent Oskan	5	5	6	4	5	4	5	5	7	4	5	5	6	7	6	4	6	5	4	5	4	5	4	5	6	6	5	5
Selin Yurdakul	6	7	7	6	7	6	6	6	3	3	4	4	3	7	2	4	4	6	6	6	6	6	6	6	5	6	6	7
Secil Kucukgok	5	6	5	2	4	5	5	1	5	4	4	4	5	5	6	4	5	4	4	5	3	5	5	5	4	5	7	6
Damla Benibol	7	5	6	6	6	7	7	5	7	4	4	4	6	6	5	6	5	4	4	5	3	6	5	6	4	6	6	7
Can Serbetci	7	7	5	3	5	5	6	5	7	6	4	4	4	7	6	6	7	4	4	2	6	5	5	4	7	5	6	5
Merve Ertekin	6	5	7	7	6	4	5	4	7	5	4	4	5	5	7	4	4	4	4	6	3	5	5	6	4	5	5	6
Omer Bilgin	6	6	7	7	4	4	5	3	6	4	4	4	5	5	6	2	4	6	6	7	3	6	6	4	7	5	6	5
Emir Mumcuoglu	7	6	7	7	7	7	7	5	7	4	4	4	5	5	7	7	6	5	4	6	5	6	4	6	6	7	6	5
Gulsen Calkin	7	7	5	6	7	7	7	7	7	5	3	4	6	4	7	7	7	5	4	7	7	7	6	5	7	6	7	7
Ayfer Aydin	6	7	6	6	6	6	7	7	7	6	4	4	7	3	7	7	7	4	4	6	7	7	6	7	4	7	6	7
Adem Keskin	7	7	5	3	4	4	3	6	5	4	4	4	3	5	5	4	6	6	6	5	6	7	7	7	7	7	6	5
Sevim Bayir	7	7	7	7	6	6	7	7	7	4	7	7	7	7	2	5	7	7	7	3	6	6	4	7	4	6	5	7
Zeynep Buyukgokcesu	7	5	5	4	6	4	6	6	7	5	4	5	5	5	2	5	4	6	5	3	5	6	6	6	6	5	5	5
Doruk Giritli	6	5	5	5	5	5	6	7	7	4	4	7	5	5	2	6	5	6	5	5	3	5	6	7	4	5	7	5
Asli Berkcan	6	5	5	5	6	5	6	5	6	4	5	5	5	2	1	6	5	5	4	2	3	6	6	6	6	5	5	6
Tuna Dalkilic	6	7	5	6	5	6	6	7	5	6	5	3	6	5	5	5	6	4	5	5	5	5	6	5	5	5	6	5
Mert Icgoren	5	5	6	5	6	6	4	7	6	5	5	5	5	3	6	5	5	6	7	4	6	6	5	6	4	6	6	6
Aras Sarman	6	7	5	5	5	5	5	6	6	4	5	5	4	4	2	6	6	6	6	4	7	5	7	5	4	6	6	5
Canay Tuskan	5	5	6	6	4	5	4	5	6	5	6	6	3	2	3	5	6	5	5	4	5	5	6	7	5	6	5	6
Yasemin Solakoglu	6	5	6	5	4	6	5	5	6	6	5	5	5	5	3	5	6	6	6	5	6	5	5	5	6	4	5	6
Cem Unal	7	6	7	5	5	7	5	6	6	5	5	4	7	5	5	4	6	5	6	6	7	6	7	6	6	5	6	6
Umut Kazankaya	5	7	7	6	6	6	7	6	5	5	4	5	6	2	5	6	4	2	6	6	5	6	5	6	5	5	5	5
Baris Yilmaz	5	5	5	7	7	5	5	5	7	4	5	5	5	4	4	7	5	5	3	7	5	5	6	6	5	5	5	5
Can Bodur	6	7	5	7	7	5	6	5	5	5	5	5	6	4	5	5	5	3	5	7	6	7	5	5	5	5	6	5
Murat Gunaydin	7	5	7	5	5	5	5	4	5	4	6	6	4	3	6	5	6	4	5	6	5	5	6	6	6	5	5	6
Alihan Sahinkaya	7	7	7	5	6	6	5	5	6	6	5	4	5	5	6	6	5	4	6	5	7	7	6	6	7	6	5	5
Canan Erkan	7	7	6	6	5	5	4	5	6	4	5	5	5	2	7	7	7	6	5	5	5	7	5	5	5	5	5	7
Sibel Eranil	6	5	6	5	7	5	5	6	7	5	5	4	4	5	7	7	7	5	6	4	4	4	7	5	5	6	6	6
Guven Orman	6	6	5	5	5	6	6	5	6	5	4	5	3	5	5	5	5	5	7	3	5	6	6	5	4	6	6	7
Altay Genc	7	6	7	6	6	4	5	4	6	5	4	7	5	6	3	6	7	6	5	3	2	6	5	6	5	6	7	7
Ebru Esen	5	5	5	7	6	4	7	5	5	4	4	6	4	4	3	5	5	5	4	2	5	7	5	7	5	7	6	6
Eda Darcan	6	7	7	5	5	5	7	5	7	4	6	5	5	5	2	5	6	6	5	5	6	5	7	5	4	5	6	5
Mert Dincoglu	7	5	6	4	5	5	5	4	5	5	5	4	7	5	5	4	6	5	5	5	7	5	7	5	5	5	5	6
Cem Ozgur	7	6	5	5	5	6	6	3	5	3	6	4	6	5	5	4	5	6	4	2	5	6	5	6	6	6	5	6
OVERALL	216	208	207	188	194	186	196	183	211	160	163	166	177	161	160	184	194	175	177	167	179	201	198	200	183	195	201	204
AVERAGE	6,2	5,9	5,9	5,4	5,5	5,3	5,6	5,2	6	4,6	4,7	4,7	5,1	4,6	4,6	5,3	5,5	5	5,1	4,8	5,1	5,7	5,7	5,7	5,2	5,6	5,7	5,8
STANDARD DEVIATION	0,8	0,9	0,9	1,2	1	0,9	1	1,3	1	0,8	0,8	1	1,1	1,4	1,9	1,2	1	1,1	1	1,5	1,4	0,8	0,9	0,8	1	0,7	0,7	0,8

	AVR	ERR	AVR	ERR	AVR	ERR
AVR_CAT_1	6	0,5	4,7	0,3	5,3	0,3
AVR_CAT_2	5,6	0,5				
AVR_CAT_3	5,7	0,6				

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