A BASIC WEB-BASED DISTANCE EDUCATION MODEL

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ABSTRACT

During the recent years, the rapid growth of the Web and multimedia technologies urged a shift of Computer-Based Educational Technology towards the Web. In the leading universities of the developed countries, studies on Web-Based Education have started and in an increasing manner are going strong. In the last few years, the leading universities of Turkey are also greatly interested in Web-Based Education and have started their re-structuring accordingly.

The goal of this study is to design a basic model to be utilized by a university aiming to offer web-based distance education. In achieving this; by the use of system approach, a model comprising of three subsystems, namely system analysis, system design and evaluation&control, working in coordination with each other, has been tried to be proposed. There may be only one missing point of this study, that is; since preparing a lesson or program according to this model was not foreseen in this thesis, the effectiveness evaluations suggested in the evaluation&control subsystem could not be realized. It is recommended to realize such an evaluation in a further study to make it possible to reveal the effectiveness of web-based education by preparing a lesson or program according to this model.

On the other hand, a survey has been conducted in Turkey in some of the universities either offering web-based education or are interested in studies in this field. The aim of this survey is to analyze from system design point of view the studies carried out in our universities on this matter and to get a picture of the existing situation. The directed questions aiming this were prepared by taking into consideration of the three stages of system design subsystem, i.e. administrative design, educational design, and technological design. It is intended for the result of this survey to shed light to the new-coming institutions in this field. As a matter of fact, each stage of this subsystem is a survey item itself and should be researched one by one in other studies.

Furthermore, for individuals interested in distance education and web-based distance education and for people newly involved in this matter, this thesis is intended to be a reference material and to serve this purpose the sections are prepared containing the basic information accordingly. Nevertheless, since most of the information regarding system design are prepared without taking into consideration the disabled

people, the relevant information are not complete. In another study, the offering of the web-based education to the disabled people, especially for deaf, hard of hearing or speech impaired, and blind students, has to be investigated.

Finally, in this thesis the proposed model for the Web-Based Distance Education, as being a basic and conceptual model, has a flexible structure; i.e., suitable for all the institutions and establishments intending to offer the web-based education. What is important here, is to exploit the potential sources within the institution that will display the required systematic approach.

ÖZET

Geçtiğimiz yıllarda, Web ve çoklu-ortam teknolojilerindeki hızlı büyüme, Bilgisayar-tabanlı Eğitim Teknolojisi'nin Web'e doğru kaymasına neden olmuştur. Dünya'nın gelişmiş ülkelerinin önde gelen üniversitelerinde Web-tabanlı eğitim çalışmaları başlamış ve günümüzde daha da gelişerek ve yayılarak devam etmektedir. Son birkaç yıldır, Türkiye'nin önde gelen üniversiteleri de Web-tabanlı eğitime büyük önem vermiş ve bu yönde yapılanmaya başlamışlardır.

Bu çalışmada Web-tabanlı uzaktan eğitim vermeyi hedefleyen bir yüksek öğretim kurumu için temel bir model oluşturulması hedeflenmektedir. Burada, sistem yaklaşımı kullanılarak; sistem analizi, sistem tasarımı ve değerlendirme&control olmak üzere birbiriyle koordinasyon içinde çalışan üç altsistemden oluşan bir model ortaya konulmaya çalışılmıştır. Bu tez kapsamı içinde, önerilen model esas alınarak bir dersin veya programın hazırlanması öngörülmediği için değerlendirme&kontol altsisteminde önerilen etkinlik değerlendirmeleri gerçekleştirilememiştir. Bir başka çalışmada, bu modele göre hazırlanacak bir ders veya programla, web-tabanlı eğitimin etkinliğini ortaya çıkartacak böyle bir değerlendirmenin yapılması tavsiyelerimiz arasındadır.

Diğer taraftan, Türkiye'de Web-tabanlı eğitim veren ya da bu konuda çalışmalara başlayan üniversitelerin bir bölümünde bir araştırma yürütülmüştür. Bu araştırmanın amacı, üniversitelerimizde bu konuda yapılan çalışmaları sistem tasarımı açısından incelemek ve bir durum tespiti yapmaktır. Bu amaçla yöneltilen sorular sistem tasarımı altsisteminin yönetsel tasarım, eğitsel tasarım ve teknolojik tasarım safhaları dikkate alınarak hazırlanmıştır. Araştırma sonunda elde edilen verilerin, bu konuda yeni çalışmaya başlayan kurumlara bir ışık tutması hedeflenmiştir. Gerçekte, her bir safha kendi başına bir araştırma konusudur ve başka çalışmalarda tek tek araştırlmalıdır.

Ayrıca, bu tezin uzaktan eğitim ve Web-tabanlı uzaktan eğitim konusunda ilgi duyan kişiler ve bu konuda çalışmaya yeni başlayacak kişiler için de bir elkitabı olması hedeflenmiş ve bölümler temel bilgileri de içerecek şekilde hazırlanmıştır. Ancak, tasarıma yönelik bilgiler genel olarak "özürlü kişi"ler dikkate alınmadan hazırlandığından, bu alandaki bilgiler eksiktir. Bir başka çalışmada, "özürlü kişi"ler için web-tabanlı eğitimin nasıl verilebileceği konusu ayrıca araştırılmalıdır.

Sonuç olarak, Web-tabanlı uzaktan eğitime yönelik önerilen model, temel ve kavramsal bir model olduğundan esnek bir yapıya sahiptir. Yani, Web-tabanlı eğitim vermek isteyen bütün kurum ve kuruluşların yararlanabileceği bir modeldir. Burada önemli olan kurum içinde sistematik yaklaşımı sergilemeye imkan verecek potansiyel kaynakların bulunmasıdır.

To my late father and mother…

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CHAPTER 1

INTRODUCTION

The technologies utilized in the education, are generally developed for other purposes. As an example, in the development of computers the educational purposes were not aimed. Nevertheless, the people in the field of education who are apt to make use of all the developing technologies in education, achieved this goal in time. The same thing happened also, in the Web. The Web which is quite new and having only 15 years elapsed since it was suggested by Tim Berners-Lee, has already taken its place in the world of education.

In our country many studies are also carried out in this field. Especially, development of courses and or programs on web-based education have started in the public universities. Some of the private universities are also seriously conducting their studies on this topic. During all this studies many printed matters published and many theses are prepared in our universities.

However, the examination of the published theses reveal that from time to time there is a discontinuity and discrepancy present among the theses prepared in an institution. This kindled the idea of proposing a consistent and continuous model facilitating the development of a web-based education course/program in an institution. Later on, the content of this basic model has been enlarged and proposing a conceptual model to serve as a guide to the institutions planning to offer web-based education or to restructure in this aspect, is aimed.

For this reason, in the formation of the model, system approach is taken as basis and a basic model is proposed to shed light to the required steps in system analysis, system design and evaluation&contol subsystems as well as the required decisions.

Besides, the content of this thesis is enlarged in order to cover the basic information that will serve as a basis for the system-design-subsystem in the proposed model and furthermore to enlighten the new-comer institutions/individuals in this field, and to serve as a source-document is also aimed.

To serve this goal; distance education and web-based education has been tried to be considered generally in all aspects; and a large variety of basic information covering from the history to the technologies, techniques, software and program languages to be

used, has been given. Furthermore the framework on which the educational design component of the proposed model is going to be based on, has also been considered.

The third goal in preparing this thesis, is to determine the existing situation by revealing the studies conducted on web-based education in Turkey and thus to shed light to those in the intention of conducting studies or to those universities that are already been involved in this subject. Besides; the effect of the proposed model on the solutions of the problems existing or to be encountered in the application together with its contribution to the justification of the decisions taken are also going to be sought for. In order to reach this goal, it was decided that it was necessary to prepare a questionnaire and to conduct a survey. Most of the questions are about the inquiry of the system design subsystem, and system analysis, system evaluation&control subsystems are not much covered.

Finally it can be concluded that this thesis is prepared taking into consideration all the above-mentioned goals and, is expected to serve as a source document for all the institutions which are aiming to create equal chances by offering a web-based education.

CHAPTER 2

DISTANCE EDUCATION

2.1. What is Distance Education?

The terms "distance education" and "distance learning" have been interchanged for years by many different researchers, providers, audiences, and media and, in principal, have the same meaning and goals. There is a continuing discussion on which term should be used with the pedagogical arguments centering in on the words "learning" and "education". Education incorporates a systematic approach to learning, including the institution and the creation of a collaborative learning environment. Institutions/instructors control educational delivery while the student is responsible for learning. In other words, Distance Learning is the result of distance Education. Another term that has experienced some recent popularity is Distributed Education. This term may represent the trend to utilize a mix of delivery modes for optimal instruction and learning. Since it is going to be focused on to develop a distance education model, the term preferred, and used will be distance education. Throughout of this thesis, it is going to be stuck on the hallmarks of Distance Education such as “the separation of teacher and learner in space and/or time (Perraton 1988), the volitional control of learning by the student rather than the distant instructor (Jonassen 1992), and noncontiguous communication between student and teacher, mediated by print or some form of technology (Keegan 1986, Garrison and Shale 1987)” (Sherry 1996).

There are many definitions of Distance Education in literature. Although the basic concepts of each of them are essentially similar, every improvement in technology and instructional science forced the authors to give a broaden definition in the course of time. The following definitions are especially selected because each of them has the common point such as noncontiguous communication between student and teacher, and also includes the new delivery methods emerged by time.

As defined by Michael Moore, then director of The American Center for the Study of Distance Education, Penn State:

Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements. (from the text Distance Education: A Systems View, co-authored by Greg Kearsley [California: Wadsworth Publishing Company 1996])

The ITC (Instructional Telecommunications Council) definition is:

The process of extending learning, or delivering instructional resource-sharing opportunities, to locations away from a classroom, building or site, to another classroom, building or site by using video, audio, computer, multimedia communications, or some combination of these with other traditional delivery methods.

Distance Education is defined, for the purposes of accreditation review, as a formal educational process in which the majority of the instruction occurs when student and instructor are not in the same place. Instruction may be synchronous or asynchronous. Distance education may employ correspondence study, or audio, or video, or computer technologies. (Guidelines for Distance Education, ©2000 North Central Association Commission on Institutions of Higher Education).

A narrower definition is given by Citrus College in England as:

Distance Education is a method of instruction that involves learning information by using your computer. Instead of attending traditional classes on campus, the course material is accessed primarily through the Internet.

As a summary;

Distance education is a system and process that connects learners and instructors with educational resources from a variety of geographically separate sites using a variety of different media. Students and instructors are separated from each other by either distance or time. A wide array of technologies are currently used to link the instructor and student. Two way communication exists between the learner, instructor,

and other learners either through print or some form of electronic media. Though modern technologies have drawn more attention to the potential available through distance learning more, it is not a new idea. Correspondence courses date back to the 1800's with students receiving materials from their instructors, completing prescribed assignments, and returning then to the instructor for written feedback. Since that time, however, telephone lines, satellites, video and other electronic advances have made it possible to communicate with any number of individuals or groups instantaneously in remote areas at relatively little expense. Courses are offered via videotape, broadcast television, microwave, satellite, interactive video, audio tapes, audio conferencing, CD-ROM, and, increasingly, computer networking—including e-mail, the Internet, and its World Wide Web. Now with the aid of computers, students can complete formal education requirements in the comfort of their homes at any time drawing information from traditional sources as well as through the innumerable resources available through the World Wide Web.

Recent advances in telecommunication technologies have radically altered the world of education, greatly increasing the choices and opportunities for consumers. Today, there are millions of distance learners in the world.

The definition of e-learning which is in the ASTD E-learning Handbook (Forshay and Bergeron 2002, p.387) is as follow:

> E-learning is defined as the computerization of the educational process. E-learning may include virtual classrooms for call center representatives, corporate-wide learning management systems, synchronous learning events for managers, CD-ROM-based new employee training, and interactive, asynchronous learning interventions for salespersons.

Although the main aim of this thesis is to concentrate on the distance education based on the world wide web, the general information and the common concepts of the other delivery methods are also discussed in this chapter.

2.2. The History of Distance Education

Understanding how an activity has started and developed frequently gives a much greater insight into why things are as they are. Plato said that "**necessity is the mother of invention**". Understanding the history of distance education is valuable in that how necessities have changed and triggered other inventions in time and how these inventions have affected the instructional science and its delivery methods.

With any attempt in understanding history, it depends on the weighting that is placed on specific items. These tend to be subjective, so a person should not expect this brief outline to be definitive. Please see other references which can be easily found in the Internet for further study.

Distance education has been around over almost 160 years! The first distance education was provided through printed and written correspondence by mail. Subsequently, the print materials were supported by audio tapes, video tapes, or both. Later, the print materials used in correspondence study were supported by radio or television broadcast signals, but with no direct real-time communication between the teacher and learner. Now, a student can engage in 'live' interaction with the teacher and with other students through a variety of telecommunication systems, even if they are at a great distance from each other.

The evolution of distance education has not been easy. In order to examine this evolution period, some of its milestones are given below.

1840

Isaac Pitman, the English inventor of shorthand, began teaching shorthand by correspondence in Bath, England.

1873

The first correspondence course in the USA, The Society to Encourage Study at Home which has 6 departments - History, Science, Art, Literature, French and German - was established by Anna Eliot Ticknot.

1892

Pennsylvania State University developed a program for correspondence study.

1910, 1913

The first catalog of instruction films appeared. Thomas Edison proclaimed that, due to the invention of film, "Our school system will be completely changed in the next ten years".

Slides and motion pictures were in use in the classrooms by 1920.

1921

The first educational radio license issued.

1925

First radio courses were offered by the State University of Iowa.

1945

The first educational television license issued.

1952

The Joint Council on Educational Television, a group of professional educators and interested parties, pressured the U.S. Federal Communications Commission to reserve a segment of the open TV channel spectrum for educational purposes. Thus ITV (Introductory TeleVision) was born.

1957

USSR launched the first artificial satellite, Sputnik, on Oct 4. This is accepted as the starting point of global telecommunications. Satellites play an important role in transmitting all sorts of data today.

1961

Leonard Kleinrock of the Massachusetts Institute of Technology (MIT) publishes "*Information Flow in Large Communication Nets*". This is the first paper on "packet-switching" theory – a key technology of the Internet.

1962

In July 1962, the first American communications satellite (Telstar 1) was launched into space. Because it was in a low orbit, massive antennas were needed and continuous communications were impossible. Today, satellites orbit 22,300 miles over the equator.

1969

The United Kingdom's Open University opened its doors with a new approach to correspondence studies. It offered courses not only via the mail, but it included a mixed media segment. Along with the printed material , audio and video materials were sent, and radio and television segments were broadcasted. In addition, each student was

assigned to a tutor who tutored over the phone and in group sessions in the evenings or on the weekends.

ARPANET connects first 4 universities in the United States. Researchers at four US campuses create the first hosts of the ARPANET, connecting Stanford Research Institute, UCLA (Los Angeles), UCSB (Santa Barbara), and the U of University of Utah. Birth of the Internet. (!?)

1972

ARPANET grows into the Internet. The Internet is a network of networks that work along the same lines as the ARPANET. The original ARPANET is the "backbone" of this broader network.

1977

The birth of the Internet is usually given as July 1977 when there was a large scale demonstration of internetworking using the ARPANET, packet radio networks and satellite transmission. Please refer to Appendix A for further information about the history of the Internet and its technologies.

1990

Tim Berners-Lee proposed the WorldWideWeb based on distributed computing and the Internet.

1993

Marc Andreesen and a group of student programmers at NCSA (the National Center for Supercomputing Applications located on the campus of University of Illinois at Urbana Champaign) developed the first graphics-based Web browser called Mosaic(January 23).

1995

Sun launches JAVA – a programming language- on May 23. Java applications known as applets can be embedded in Web pages. Java radically alters the way applications and information can be retrieved, displayed, and used over the Internet.

Up to this point, it has been tried to make a list including the milestones of the history of distance education. A further study has been carried out in Chapter 3, please also refer to Appendix A in which major milestones of the history of the Internet and the WWW are given.

2.3. Benefits of Distance Education

Distance Education technologies offer countless benefits, including convenience, flexibility, effectiveness, and equity. The benefits briefly discussed below are based on '*A Teacher's Guide to Distance Learning'* (Barron 1999).

Convenience

Distance education technologies can provide convenient locations for both students and instructors. Many of the technologies, such as the Internet, videotape, DVD and telephone, are easily accessed at home. Others, such as desktop videoconferencing, can be distributed from a single point (such as a university) to multiple remote sites (such as schools). Satellite transmissions can be viewed at specified sites, or the transmissions can be videotaped for later viewing at home or school.

Flexibility

Many forms of distance education provide students the option to participate whenever they wish, on an individualized basis. For example, some students may want to review a videotape in the middle of the night or read their e-mail during early morning hours. In addition, one student may wish to spend 30 minutes reviewing a Website, while another spends an hour.

Effectiveness

Not only is distance education convenient, it is also effective. Several research studies have found that distance education is equally or more effective than traditional instruction when the method and technologies used are appropriate to the instructional tasks, when there is student-to-student interaction, and when there is timely teacher-to-student feedback (Moore and Thompson 1990; Verduin and Clark 1991). In a study conducted at California State University, students who participated in a Web-based course, achieved significantly higher test scores (Schutte 1996).

Affordability

Many forms of distance education involve little or no cost. For example, over 99% of the homes in the United States have televisions and 65% are connected to a cable-TV service (Casey et.al. 1998). For these homes, it is relatively easy for the students to watch a videotape or a public broadcast television show. In addition, almost all homes have access to a telephone, enabling the use of voicemail and audioconferencing.

It can be accepted that over 90% of the homes in Turkey have televisions and very limited number of them, approximately 915.000 subscriber, are connected to a cable-TV service (http://www.telekom.gov.tr).

Multi-sensory

One of the benefits of distance education is that there is a wide variety of materials that can meet everyone's learning preference -- at least part of the time. For example, some students learn from visual stimuli, such as video, and others learn best by listening or interacting with a computer program. If distance education courses are well designed, they will likely offer learners a wide range of choices, thereby providing the optimal combinations of interaction and media.

Interactivity

Contrary to popular opinion, distance education courses can offer increased interactions with students. In particular, introverted students who are too shy to ask questions in class will often "open up" when provided the opportunity to interact via e-mail or other individualized means (Franklin et.al. 1996). Through the increased interactions, teachers can better meet individual student's needs.

Stephen Ehrmann of the Educational Strategies Program of the Annenberg/CPB Project at the Corporation for Public Broadcasting states the following:

"At virtually every institution I visit, faculty members tell me excitedly that students are expressing themselves more and better when using e-mail. Students who say little in a classroom sometimes become rich contributors via e-mail, perhaps because they feel protected from the stares of others." (Ehrmann 1995)

The new electronic technologies such as CD-ROM interactive disks, computer bulletin boards, and multimedia hyper-text available over the global Internet using the World Wide Web, can provide students with far greater involvement in the process of learning. These interactive technologies also allow students the exercise of far greater control over that process than is possible in many traditional learning environments. Integrated sound, motion, image, and text create a rich new learning environment awash with possibility and a clear potential to increase student involvement in the learning process.

Equity

Educational inequity is a major issue in this and other countries. Rural schools often have less contact with educational trends, fewer qualified teachers, and more need for technology. Distance education offers great potential for alleviating these issues and

has been employed very effectively in Canada and Australia -- two countries with geographically diverse student populations.

2.4. Who are Distance Learners?

Life in the late nineties and a new decade imposes pressures and demands on adults to balance home and family life, highly stressful job demands, and diverse social responsibilities in a rapidly changing technological environment. Few individuals have the luxury of devoting several years of their lives to full time studenthood.

Distance learners are people who, because of time, geographic, or other constraints, choose not to attend a traditional classroom. Financial considerations, family obligations, or work requirements may point to distance education as an appropriate way to meet their educational goals. In addition, most higher education opportunities are readily available in large urban areas with only a limited number of complete programs available at distance campuses. Distance learning enables students to eliminate long commutes, take courses designed with adult learning styles in mind, and take courses at non-work times. Many distance learning modalities allow for a high degree of interaction with the instructor and other students allowing for a complete learning experience equal to and in some cases superior to on campus programs.

Distance learners come from a wide variety of backgrounds, and are of all ages. They turn to distance education mostly for convenience. They are highly motivated to succeed and are disciplined enough to incorporate study time into their busy daily lives. Motivated students with a rich background of experiences find distance education offers them the flexibility they need to manage their daily responsibilities while completing needed training and continuing education needs.

2.5. Advantages and Disadvantages of Distance Learning

Since it is aimed to give a general information on the concepts of distance education in this chapter, the advantages and the disadvantages of this instructional method is examined below from the point of view of the learner because “learner” is the common denominator in every method.

2.5.1. Advantages of Distance Learning

There are many delivery methods of distance education. Each method has many peculiar advantages, for example; printed material which is the only tool in correspondence courses can be used in any setting without need for sophisticated presentation equipment. Since listing of all advantages of each method is not the case here, only the general advantages of distance learning are listed below without considering of which method is used.

- not confined to specific times and spaces,
- encourages the use of community resources,
- encourages the student creativity,
- expose students to more information and content,
- significant interaction with faculty and peers,
- contact with other students from diverse backgrounds and locations,
- access to experts in the field regardless of location.

2.5.2. Disadvantages of Distance Learning

Although the title of this section includes the word “disadvantage”, it is more suitable to mention its limitations. As stated in the previous section, every method has some interesting limitations turning it to an advantage, for example; a correspondence course is impersonal because it eliminates all nonverbal cues and body language.

With new advances in electronic technology, distance learning students can expect to get quality education comparable to education received in face-to-face classes. However, adjusting to new formats for teaching and the use of electronic equipment can present challenges for students who have been out of the formal education setting for a number of years. Online courses require a basic but efficient knowledge of computers and the World Wide Web. Many individuals use computers on a limited basis at work but have not explored the use of the electronic media for education or recreation. Even with many supports in place , it is likely that students will experience some frustration from time to time depending on the functioning of the equipment.

Students living in rural areas often choose distance learning because of the lack of educational programs within a reasonable commute from home. Still distance

learning options cannot bring libraries and research facilities to remote areas. However, many resources are now available through the World Wide Web by selected readings, and access to journal articles through web links and University library services.

Few faculty are chosen specifically as distance educators and those faculty who do teach at a distance do so in addition to a regular class load. Classes take a great deal of time to develop and to conduct. For these and other reasons, the number of courses available to students through distance education is very limited. Furthermore, the degrees offered in distance education to the students in our country is also very few. Students considering taking coursework from a variety of universities should be aware that credits may not be transferable toward a degree at any one institution. It is likely that the availability of courses will increase within time if student demand for such offerings continues to grow.

2.6. Effectiveness of Distance Education

Many educators question if distant students learn as much as students receiving traditional face-to-face instruction. Research comparing distance education to traditional face-to-face instruction indicates that teaching and studying at a distance can be as effective as traditional instruction, when the method and technologies used are appropriate to the instructional tasks, there is student-to-student interaction, and when there is timely teacher-to- student feedback (Moore and Thompson 1990, Verduin and Clark 1991, Ngu 2002, Neuhauser 2002).

The key to effective distance education is focusing on the needs of the learners, the requirements of the content, and the constraints faced by the teacher, before selecting a delivery system. Because of these reasons, distance education programs must be carefully planned by understanding of course requirements and student needs. Appropriate technology can only be selected once these elements are understood in detail.

2.7. Models of Distance Education

Although many people have a monolithic view of distance education, there are numerous models of distance education which have their own particular strengths and weaknesses. They are built around the central components of the instructional process: presentation of content; interaction with faculty, peers, and resources; practical application; and assessment. Each distance education model uses technologies in various ways to address some or all of these components.

Besides instructional delivery technologies and interaction, class size is the another determining factor of a model. Therefore, the major models used in distance education can be classified according to class size to be considered, technologies to be used and interaction to be supported.

Therefore, this section will examine the major models used in distance education programs. Specifically, each of class size, instructional delivery technologies, and interaction is the determining factor of the models.

2.7.1. Class Size

If the Class Size is considered, it is possible to build a distance education program on the following three types of models; independent, tutorial, and group.
At one time the only type of distance education was independent study. The Moody Bible Institute, for example, has been offering independent study course for almost 100 years (Baker 1999). In independent studies, student works through a course independent of other students or the instructor. Typically student receives a packet of information at the beginning of a course, including lectures, books, and assignments, and then works through the material at his own pace. Once he has completed all of the assignments, and possibly an invigilated final exam, he submits his materials and receives a grade for the course. The advantage of this approach is that you can usually work at your own pace (within general limits such as six months to a year per course) and study whenever is convenient. The two primary disadvantages are that you lose the feedback of fellow classmates and you also lack regular interaction with the instructor.

The tutorial model attempts to address the second disadvantage of independent studies by facilitating interaction between the instructor and the student. Like an

independent study, you can often work through the tutorial at your own pace and in your own time, however you have regular interaction with the instructor. This may occur through weekly or monthly telephone conversations in which you discuss your learning activities. The advantage of tutorials is that you aren't completely alone, you have your instructor to guide and mentor you. The disadvantage, particularly if you have to sequentially submit each assignment, is that you may not be able to progress as quickly as with an independent study.

However, because of the educational advantages to personal interaction, many of the distance learning programs have adopted a tutorial or group approach.

The group approach simulates a traditional classroom experience, except all of the students are at a distance. Using various communication technologies, which will be discussed further in the interaction section of this chapter, students interact with each other as well as the instructor throughout the duration of the class. This can not only improve the learning experience but it greatly decreases the feeling of isolation so often associated with distance learners. Sometimes a team is formed – the same group of students works through a series of courses together in pursuit of a degree – which makes it possible for distance students to develop real relationships over time. The drawback to group courses is that they frustrate the student who wants to move through a program at a different rate, either faster or slower, than the academic calendar permits.

Table 2.1. Models of Distance Education and Class Size
(Source: http://www.gospelcom.net/bakersguide/models.php)

Class Size	**Description**	**Advantages**	**Disadvantages**
Independent Study	Work through the course alone	Can learn at your own pace	Can feel isolated
Tutorial	Work one-on-one with an instructor	Can learn at your own pace while still benefiting from interaction	Not as time-flexible as independent study
Group	Many students work through the course together	Can learn from other students throughout the course	Forced into a traditional academic calendar

2.7.2. Instructional Delivery Technologies

A wide range of technological options are available to the distance educator. They fall into four major categories:

Correspondence Model : The Correspondence Model regarded generally as the first generation of distance education.

Multi-media Model : The word media, plural of medium, is commonly used to describe ways to convey information and entertainment. The term *multi media* often describes highly sophisticated technology, and refers to any communication method that conveys information, or that allows interaction between teachers and students.

The Multi-media Model, regarded as the second generation of distance education, entails the use of highly-developed and refined teaching-learning resources, including printed study guides, selected readings, videotapes, audiotapes, and computer-based education (CBE), including computer-managed education (CME), computer-assisted education (CAE), and interactive video (disk and tape).

Computer-based-education (CBE) allows courseware to be delivered without a great deal of real-time instructor intervention, but with lots of practice and feedback. CBE also is private, delivers training and education on demand, and lets learners progress at their own pace. Namely the uniqueness of computer-based instruction is its capability to have a student communicate and exchange information with computer networks, creating a learning environment. However, there are limitations to CBE. For example, it is very difficult for a computer to provide meaningful feedback on written responses longer than a few words.

Computer-assisted education (CAE) utilizes interactive video disks (IVD). IVDs can be effectively used to provide distance education. IVD programs normally provide the student with three or four selections, with each choice initiating various video segments. Depending on the student's choice, the video tape continues, instruction is provided or feedback is given about the option selected. Although there is no real-time interaction with the faculty member, the student interacts with the instructional units presented through the computer.

The strengths of CBE and classroom instruction can offset each other. Some classroom instructors use CBE to provide a consistent set of foundation skills, freeing the instructor to do those things that human do better than machines. The same could be

true in a distance education model, by combining CBE with the technologies for asynchronous group discussion (Forshay and Bergeron 2002, p. 367).

In the long term, classroom training will remain, but John V. Moran, president of CP e-Learning Technologies, CP Corporation, says that "But in five years, there will be no distinction between e-learning and Web-based training. All e-learning will be delivered over the Web: CD-ROMs won't exist (Moran 2002, p. 382)".

While many institutions have evolved from using the Correspondence Model to the Multi-media Model, another significant trend is to move towards the Telelearning Model of distance education (Nipper 1989, Pelton 1991, Taylor 1992).

Telelearning Model : This third generation of distance education is based on the use of information technologies, including audio-teleconferencing, video conferencing and broadcast television/radio with attendant audio-teleconferencing.
Some authors classifies some of the instructional delivery technologies used in distance education as audio and video communications (AVC) systems. These technologies can be included in this telelearning model. Students at remote locations can engage in live interaction with the teacher and with other students in real-time. This interaction can be achieved in one of several ways, depending on the type of AVC equipment that is utilized (Raymond 2000).

The first type of system involves two-way audio communication, with no video. This learning situation is similar to an audio conference or conference call.

The second type of AVC delivery system utilizes two-way audio and two-way video communication. Students at distance location can see the professor and can speak with the professor and other students. The signals can be delivered by a number of means, including telephone lines, satellite systems, cable television, and closed-circuit television.

Flexible Learning Model : The emerging fourth generation of distance education, the Flexible Learning Model, promises to combine the benefits of high quality CD-ROM based interactive multimedia (IMM), with the enhanced interactivity and access to an increasingly extensive range of teaching-learning resources offered online by connection to the Internet.

Computer-mediated education systems do not provide actual instruction, as in the case with computer-assisted technologies. Computer-mediated education systems include facsimile machines, electronic mail systems, computer networks, and interactive compressed video (ICV) systems (Raymond 2000, p.51).

Computer networks can range in size from local area networks (LAN) which link computers within a small area (such as university or department), to wide area networks (WAN) which connect computers within a large geographic area such a city or state, to the Internet, which is the largest computer networks in the world and connects many of the world's LANs and WANs (Dyson 1994).

Computer networks not only make it possible for students to access information from data sources throughout the world, but they also enable educators in both distance education and traditional education classes to interact with individual students at remote sites. For example, teachers can use electronic mail to communicate with students about teaching assignments, feedback on graded exercises, or answer to specific questions. Students can submit course assignments to their teachers electronically, ask questions and obtain feedback from their instructors.

Online distance education is the most recent trend and one that is growing rapidly. Online classes really popular in the interactivity arena. They generally adopt one of the four previous models. Sometimes the course material is developed as an interactive multimedia presentation which is available online. The limitation to the online approach for every model other than text is the connection speed of the students – those with slow modems cannot handle large multimedia files or streaming audio and video. As connection speeds increase, and the second-generation Internet is developed, these limitations will be eliminated.

Web-based courses and Web-supported courses are the examples of computer-mediated education. Web-based courses should be differentiated from Web-supported courses. Web supported courses use the Internet to augment and enrich teaching/ learning through methods. In web-based courses, the entire content is offered online. This subject will be entirely discussed in the next chapter, Chapter 3.

A final example of computer-mediated education is interactive compressed video systems (ICV). These systems combine computers with telephone lines to transmit signals. Codecs are used at both ends of a digital phone line. There may be slight delay of sound and some impairment in video quality depending on the type of equipment that is used (Raymond 2000).

Some of the characteristics of the above models of distance education are summarized in the Table 2.2.

Table 2.2. Models of Distance Education and Instructional Delivery Technologies

Models of Distance Education and Associated Delivery Technologies	Characteristics of Delivery Technologies			
	Flexible Access	lexible tudent rogression	ighly efined laterials	Advanced Interactive Delivery
The Correspondence Model				
• Print	Yes	Yes	Yes	No
The Multimedia Model				
• Print	Yes	Yes	Yes	No
• Audiotape	Yes	Yes	Yes	No
• Videotape	Yes	Yes	Yes	No
• Computer-based education (eg CME/CAE)	Yes	Yes	Yes	Yes
• Interactive video (disk and tape)	Yes	Yes	Yes	Yes
• Interactive multimedia (IMM)	Yes	Yes	Yes	Yes
The Telelearning Model				
• Audioteleconferencing	No	No	No	Yes
• Videoconferencing	No	No	No	Yes
• Broadcast TV/Radio + Audioteleconferencing	No	No	Yes	Yes
The Flexible Learning Model				
• Interactive multimedia (IMM)	Yes	Yes	Yes	Yes
• Computer mediated communication (CMC) (eg Email)	Yes	Yes	No	Yes

2.7.3. Interaction

As Bates (1991) has highlighted, there are two very different types of interactivity in learning: social and individual. Individual student's interaction with teaching-learning resources, including textbooks, study guides, audiotapes, videotapes and computer assisted learning programs needs to be balanced with social interaction between learners and teachers. He argues that: "for both conventional and distance education students, by far the largest part of their studying is done alone, interacting with textbooks and other learning media" (Bates 1991, p.6).

Specially designed printed materials, audiotapes, videotapes and computer-based learning packages (which are aimed at teaching concepts and cognitive skills associated with clearly defined objectives in the context of a coherent curriculum) are some of the tools improving the quality of the student's individual interaction.

For social interaction to support effective learning, distance educators tried to simulate face to face communication through the development of instructional systems based on technologies such as audio-teleconferencing, videoconferencing and computer mediated communication that can support contiguous two-way communication between students and teachers.

Computer-mediated communication (CMC) is a generic term that represents the ability of people to communicate with one another through the use of computers and networks. The most popular forms of computer-mediated communications are e-mail, computer conferencing, bulletin boards, and discussion lists.

The necessary balance between social and individual interactivity will vary from course to course and will be a function of such variables as the type of subject matter, the specific objectives of the course and the structure and quality of the learning materials, and not least the student target audience (Taylor 1994).

Social interaction, with the instructor and with fellow students, is an important part of one's learning experience. There are four basic approaches to such interaction:

- none,
- audio or video conferencing,
- synchronous online chat, and
- asynchronous online discussion.

No interaction, either with the instructor or student, is the hallmark of most independent study programs. Obviously one must be a good independent learner to benefit from this approach.

Audio or video conferencing, which permits live interaction between the instructor and students, is the model used with classroom videoconferences. However, some programs use a telephone conference call to facilitate this interaction which offers the benefits of live discussion without the high costs associated with full-motion videoconferences.

Online interaction falls into two categories:

- synchronous, meaning at the same time, and
- asynchronous.

Synchronous interaction is the online equivalent of a conference call, except you use a chat room. Everyone in the class gets online at the same time and then logs on to a chat room for discussion. Instead of speaking to one another with voices, you type all of your interaction.

Table 2.3. Models of Distance Education and Interaction

Interaction	**Description**	**Advantages**	**Disadvantages**
None	No interaction	Benefits independent learners	Missing the insights of fellow students
Conference Call	Live audio or video discussion	Lively group discussions	Can be costly
Synchronous Online Chat	Computer chat room	Low cost, real-time interaction	Slower than verbal chats
Asynchronous Online Discussion	E-mail or message boards	Everyone does not have to be connected simultaneously, archive of discussions	Less spontaneous than live chats

Asynchronous discussions don't require that everyone is online at the same time. Rather, you post your message at a time convenient to you and then others read it when they are online and post their response. Electronic mail, and message board are the examples of the tools facilitate this type of discussions.

This subject will also be discussed in Chapter 4, Section 4.6. with the title of "A framework for Online Interaction".

2.7.4. Controlling Part

The various distance education models differ not only in the types of technologies that are used, but also in the locus of control over the pace and place of instruction. In some models, the faculty and institution have primary control, as is the case in a traditional classroom environment. In others, the control rests with the student.

The three distance education models presented in this section do not represent all the possible approaches to distance education. Rather, they represent the two ends and the middle of a continuum from faculty/institution-control to student-control.

Distributed Classroom: Interactive telecommunications technologies extend a classroom- based course from one location to a group of students at one or more other locations; the typical result is an extended "section" that mixes on-site and distant students. The faculty and institution control the pace and place of instruction.

Independent Learning: This model frees students from having to be in a particular place at a particular time. Students are provided a variety of materials, including a course guide and detailed syllabus, and access to a faculty member who provides guidance, answers questions, and evaluates their work. Contact between the individual student and the instructor is achieved by one or a combination of the following technologies: telephone, voice-mail, computer conferencing, electronic mail, and regular mail.

Open Learning + Class: This model involves the use of a printed course guide and other media (such as videotape or computer disk) to allow the individual student to study at his or her own pace, combined with occasional use of interactive telecommunications technologies for group meetings among all enrolled students.

The above model was developed by University of Maryland University College for the University System of Maryland Institute for Distance Education. More information is available at http://www.umuc.edu/ide/modlmenu.html .

2.8. Which Model is Best?

There is no one best model. The asynchronous online models of instructional delivery and interaction have the most momentum right now and will probably become the de facto standard in the coming years.

Although technology plays a key role in the delivery of distance education, educators must remain focused on instructional outcomes, not the technology of delivery. On the other hand, learners need to examine which models work best for their circumstances and learning styles and then select a program which offers the closest fit to their needs.

The key to effective distance education is focusing on the needs of the learners, the requirements of the content, and the constraints faced by the teacher, before selecting a model.

Typically, this systematic approach will result in a **mix of media**, each serving a specific purpose. For example:

* A print component or on-line documents can provide much of the basic instructional content in the form of a course text, as well as readings, the syllabus, and day-to-day schedule.

* Interactive audio or video conferencing can provide real time face-to-face (or voice-to-voice) interaction. This is also an excellent and cost-effective way to incorporate guest speakers and content experts.

* Computer conferencing or electronic mail can be used to send messages, assignment feedback and other targeted communication to one or more class members. It can also be used to increase interaction among students.

* Pre-recorded videotapes can be used to present class lectures and visually oriented content. Such videotapes can be available via a Web page.

* Fax can be used to distribute assignments, last minute announcements, to receive student assignments and to provide timely feedback.

Using this integrated approach, the educator's task is to carefully select among the technological options. The goal is to build a mix of instructional media, meeting the needs of the learner in a manner that is instructionally effective and economically prudent.

2.9. Distance Education in Turkey

Although distance education has been around over 160 years, Turkish people were aware of this educational system almost 50 years ago. However, Turkish Ministry of Education and the educational institutions are carefully following all new applications and trends on this system .

Turkey applied this system according to the social and economic conditions of the country. These are the main reasons why this concept was involved to our educational system so late.

Especially between 1927-1955, distance education was discussed as a concept (Odabaşı and Kaya 1998, p.63). In Turkish Education System, the beginning of distance education has started in 1950. In 1958, Correspondence Education Center was formed by the Ministry of Education. An education technology strategies and methodologies committee was formed in this center (Alkan 1987). Towards the end of 1975 correspondence education was cancelled by the ministry because it was considered unsuccessful by academicians (Odabaşı and Kaya 1998, p.64). In 1981, a code was accepted by the National Assembly, and the universities were charged to start distance education. In 1982, Open University was formed by Anadolu University and started distance education. From that time onwards, the open university (AÖF-Açık Öğretim Fakültesi) and the open high school (AÖL-Açık Öğretim Lisesi) educates thousands of students every year. This has opened a new era in the country.

Besides AÖF and AÖL, many other universites (METU, Sakarya, Bilgi, etc.) have started distance education. Fast changes and technological developments has also made changes and developments in distance education. For example; National Academic Network (ULAK-NET) was set up to provide communication links between the universities. Many universities have started video conferencing among themselves via this backbone (İşman 1998, pp. 58-60).

In December 1999, a new code was accepted and the Council of Higher Education (YÖK-Yüksek Öğretim Kurumu) formed a National Informatics Society, and a distance education regulation was prepared. One of the purpose of this regulation is to involve distance education in the existing traditional education system. For this, Informatics Institutions are formed in the universities. According to the research made in the web-pages of the 53 state universities 38 of them has the one. On the other hand, the effects of the technologies on our education system can be seen from the department of Computer Education and Instructional Technology (CEIT- (Bilgisayar ve Öğretim Teknolojileri Eğitimi - BÖTE)) which were established in many universites to train and educate the students, who will be a teacher after graduation, with the ability to use the newest technological tools. Nowadays, Turkish universities are developing their formation because they have realized the importance of distance education.

A detailed research was made about distance education in Turkish universities and results are presented in Chapter 6. Please refer to Chapter 6 for details.

2.10. Distance Education in the World

Through the historical development of distance education that came to be what it is now, it has dispersed to many places of the world. Although the historical development is considered briefly in "The History Of Distance Education" section, it will be examined here in specific phases.

The first application of distance education was by postal correspondence especially developed in countries with wide geographical areas such as Canada, Australia and USA (Girginer 2001, p.11).

One of the main reasons of the development of DE in these countries is due to the widely usage of educational technologies. Consequently the DE models, that use information and communication technologies which are particularly based on teleconference and the Internet, have started.

Let us examine the historical development of DE in the world, as we discussed on the Section 2.7.2.

The first phase is the education by Correspondence Model. This model has started when postcards containing educational matter were sent to the students in 1840'ies (Glatter and Wedell 1971, s.4). In this phase, printed materials were only used in DE.

Second phase is the Multimedia Model. In this phase the DE was realized by printed materials, sound and visual technologies. After 1920'ies communication technologies such as Radio and Television were used. The first continuous radio transmitter was broadcasted in U.S.A. in 1920, and this was followed by England, France, Russia and Germany (Aziz 1992, pp. 7-9).

The application of TV College in U.S.A. in 1956 was followed in Italy by RAI in 1958 under the name Tele-School and after that in England as Open University (İşman 1998, p.49).

Third phase is the Telelearning Model which depends on telecommunication technologies to obtain synchronized communication. Audio conferencing and Video conferencing are the technologies used in DE during this phase. With these technologies which were used excessively during 1980-1995, any interaction deficiencies, inherently existence in DE, were satisfied.

After 1990'ies computers started to play a very important role in the developed countries' education systems. Today, computer-aided education is being used extensively because the usage of computers in many areas has widely increased.

The fourth phase is the Flexible Learning Model. Today, the DE is realized by technologies such as interactive TV and the Internet.

There is a change in the educational needs in parallel to the technological improvements. Because of this, the education has to be improved in order to fit the technological changes. That is, usage of educational technologies has a growing importance as the days pass by.

CHAPTER 3

WEB-BASED EDUCATION

Human beings is differentiated from other living beings by coming together to share and learn knowledge, consciously. Until the mid of 19th century, coming together at the same time and place was a necessity. Later on, knowledge was firstly transmitted by letters and then by using many technological tools on different media. These mediums are briefly described in the second chapter.

Although correspondence is dated to the very early years of distance education era, it is still used as an useful method. Nowadays, a new method has emerged. In this method, the technologies of the Internet is used for the delivery of knowledge from one point to many other points of the world. Some of the restrictions such as 'time' and 'place' are no longer valid. This new development is named as Web-Based Education.

3.1. What is the Internet?

The Internet is the world's largest, most powerful, most widely used computer network connecting personal computers, advanced mainframes, and high-speed supercomputers around the world.

> "The Internet is at once a worldwide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location."
>
> (Leiner and Cerf)

E-mail, file transfer, remote login, packet-based voice communication (the precursor of Internet telephony), file and disc-sharing are some of the applications of the Internet technologies. Thus, it is clear that the Internet is not serving for just one application.

3.2. The Internet and Distance Education

The Internet is the largest, most powerful computer network in the world. It is estimated that about 80% of the planet will be on the Internet by 2010 (Zakon 2005). As more and more colleges, universities, schools, companies, and private citizens connect to the Internet either through affiliations with regional non-profit networks or by subscribing to information services provided by for-profit companies, more possibilities are available for distance educators to overcome time and distance problems in reaching the students.

Internet brings the development of virtual reality into a functional network tool. The potential for the Internet to revolutionize the field of distance education lies in the comparative simplicity of the tools available; the ease of document authoring; low cost compared to satellite technologies; the decreasing trend away from mainframe servers towards powerful desktop computers; and the theoretical possibility for anyone to utilize it anywhere. Previously impossible institutional mandates for distance education programs are now becoming practical within the "geographic, demographic, social and economic restraints placed upon them" (Arkan 1999, p.9).

3.3. Advantages of Internet in Distance Education

When compared with the other distance education tools, Internet has the following advantages:

- Increased freedom of time and location for learners,
- Standardized cross-platform tools for multi-media and hypertext access, notably World-Wide Web browsers,
- Rapid revision and dissemination of instructional programs,
- World-wide network expansion,
- Increased instructor-student interaction and feedback,
- Much lower transmission and delivery costs,
- Completely digital environment, with few limitations on transmission of data in any form.

Fundamentally, the Internet expands service provision to the desktop level. Tools developed for the Internet can be utilized from any location, so that, learners can

be freed from the requirement of traveling to a specific location for instruction. The idea is not new, but the tools being developed make its implementation much more viable. Successive waves of support tools will be increasingly simple to use, moving towards transparency of computing technology. This will be aided by the growing technological literacy of the user populations a literacy, which is not a foregone conclusion for all users (Arkan 1999, p.10).

While some users are attempting to run completely Internet-based distance education programs, most of those involved are using the Web to supplement classroom instruction. One user praised the dynamic nature of web information, as data can be rapidly modified as the circumstances change. However, this capability implies that learners will need to have full Internet access from hand-held units so that they do not rely on printouts for accuracy. The field is already looking beyond what had been anticipated, and calling for a more comprehensive version of anyone, anytime, anywhere education provision model (Arkan 1999, p.10).

3.4. Internet Tools in Distance Education

With access to the Internet, distance educators and learners can use these tools:

Electronic mail (e-mail) -like postal mail, e-mail is used to exchange messages or other information with people. It is the principle tool of the Internet. Instead of being delivered by the postal service to a postal address, e-mail is delivered by Internet software through a computer network to a computer address that makes it a simple, portable, inexpensive mechanism for rapid communication between individuals and groups. It serves as the foundation for almost all other network tools.

E-mail is supported on the web with either the mailto tag or with a web-based form which either sends e-mail directly or sends it through a CGI script. Another important use of e-mail is the list server, which allows a user to send messages to many other people at once. This is useful for class announcements or general discussion.

Bulletin boards - many bulletin boards can be accessed through the Internet. Two common public bulletin boards on the Internet are USENET and LISTSERV. USENET is a collection thousands of topically organized newsgroups, covering everything from supercomputer design to bungee cord jumping, and ranging in distribution from the whole world to single institutions. LISTSERV also provides

discussion forums on a variety of topics broken out by topic or area of special interest. They both provide a mechanism for concurrent information dissemination as well as facilitating discussion among learners.

World-Wide Web (www) - The WWW is an exciting and innovative front end to the Internet. The WWW provides Internet users with a uniform and convenient means of accessing the wide variety of resources (pictures, text, data, sound, video) available on the Internet.

3.5. What is the World Wide Web?

Because computers and programs are part of the Internet, incompatibility problems can result since information is created using different computers and software. In 1989, a group of scientists at the "European Laboratory for Particle Physics (CERN) in Geneva, Switzerland began developing an Internet tool that would link information produced by all of the CERN researchers. The tool provided a way to link textual information on different computers and created by different scientists. The object was to overcome issues of incompatibility and utilize a new way if linking made possible by computers, called "hypertext". Rather than presenting information in a linear or hierarchical fashion, hypertext permits information to be linked in a web-like structure. The CERN project resulted in an innovative front-end to the Internet now referred to as the World-Wide Web (WWW).

Huges described the World Wide Web as “wide area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents”.

In the span of a decade, the World Wide Web has grown from a small research project into a vast repository of information and a new medium of communication. It serves a platform that has vast resources of the Internet. The Web does not have an engineered architecture like the other networks such as the telephone, or the highway systems. On the contrary, it is a virtual network of content and hyperlinks, with over a billion interlinked “pages” created by the uncoordinated actions of tens of millions of individuals. Because of the decentralized nature of its growth, the Web has been widely believed to lack structure and organization as a whole. Recent research, however, shows that there is a structure of the Web (Kleinberg and Lawrence 2001, p.1849).

The WWW architecture is based on the client/server model of distributed systems. In the model, a client process makes a request to a server process, normally running on a different machine and using a network such as the Internet for communication. The server process receives the request, establishes a connection with the client, performs the desired function, returns the result to the client, and breaks the connection. Consecutively, the server becomes available to receive requests from other clients and perform similar services for them. In some implementations, the server may create a copy of itself (called forking) immediately upon receiving the request; the child process then establishes the connection with the client and performs the desired service while the parent process goes back to listening for other request. This design enables a single server to provide services for a number of clients at the same time.

In the architecture of the WWW, the client is normally a Web browser, such as Netscape Navigator or Microsoft Internet Explorer.

3.5.1. The HyperText Transfer Protocol

The common element among the client and the server is that they all support a high-level set of conventions - a protocol - called HTTP (HyperText Transfer Protocol). In this context, it was pointed out that:

The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems.

HTTP communication usually takes place over TCP/IP (Transmission Control Protocol/Internet Protocol) connections (Çetiner 2000, p.31). This does not preclude HTTP from being implemented on top of any other protocol on the Internet, or on other networks. HTTP only presumes a reliable transport; any protocol that provides such guarantees can be used.

3.5.2. Web Browsers and HyperText Markup Language

The WWW provides users with a uniform and convenient means of accessing the vast resources of the Internet. In 1993, The software tool called Mosaic was first announced by the National Center for Supercomputing Applications at the University of Illinois. Mosaic is an easy to use graphical user interface that permits text, graphics,

sound and video to be hyperlinked. Mosaic was the first of the Internet tools that are now referred to as "Web browser". There are many browsers with highly skilled capabilities. However, the most popular browsers are Netscape and Microsoft's Internet Explorer.

Web browsers permit users to connect to the Internet and facilitate accessing information located on another remote computer that has a server capability. The Web browser links to the remote computer so that the information you need can be sent to your computer to view. A special language called Hypertext Markup Language (HTML) is used to create documents to be viewed by all web browsers. HTML allows users to access almost any other resource from a web page.

HTML solves incompatibility problems using standardized tags that indicate such things as whether a piece of text should be plain, bold, italic, or linked to another piece of text. Pages of information on a computer formatted with HTML and accessible to someone with a Web browser, are referred to as "home page"s or "Web page"s. In educational resources of the WWW, a "web page" has many links for all elements in the course which are guiding students through the course and directing them to course-related media.

3.5.3. WWW and Java

Web surfing is an enormously popular practice among millions of computer users today. However, before Java, the content of the information on the Web has been only a series of HTML documents that are not attractive. Web users are hungry for applications that are interactive in which they can travel among heterogeneous networks and can execute no matter what hardware and software platform they are using without spreading viruses to their computers. Here come Java and can create such applications easily and efficiently by taking software from some random site and executing it on any kind of platform which means breaking_down the biggest barrier and makes the Web surfing very attractive.

On the WWW, Java programs are named applets. A Java applet is an application that includes several additional methods that the runtime system uses that techniques to handle the applet, such as what to do when a user clicks an applet icon and how looks

on a page. These Java applications are embedded inside HTML files. They can be downloaded into a Java-capable browser with the click of a mouse.

In the execution of an applet, firstly, the Java interpreter verifies the code's integrity, then the browser's runtime Java interpreter downloads and executes the applet' s code.

3.5.4. Distance Education and Java

As mentioned before, the most powerful tool used in distance education is WWW and the most powerful tool used for making the WWW more attractive is Java. It is obvious that, with the help of Java distance education with WWW will be more enjoyable and educational. On the WWW, using Java applications (applets) with HTML an interactive education environment is created. For example, for online courses given on Web, Java is an important educational and visual tool in which the written text can be explained or supported by Java applets.

Today, at the WWW, applets are the most crucial educational tools that are used in online courses and there are some very important reasons that make them crucial.
Java Applets are usually graphical user interface applications and can easily attract the Web users' attention that forms the basis of education generally. If the student's attention is caught, an instructor has the advantage of teaching the subject more easily. In normal education, the instructor has the chance of having the students' attention as there is a face to face situation. However, this is a major problem in distance education since there is a separation both in space and time. The only HTML documents may not attract the students' interest although images may help slightly. HTML documents supported with applets will be not only be more attractive but also more educational. With the help of a good applet, a student can learn the subject more easily with "play and learn" method while enjoying it also.

As a result, online courses supported with various visual and educational applets will be more educational and have great advantages when compared to standard online courses since applets give the opportunity to simulate a case or to run an interactive test about the case.

3.6. Web Site Development

When we look through the history of the Internet, we see that its worldwide usage was available after the web technologies were developed. When educators were just beginning to use the World Wide Web, it was much simpler than it is now; since the only technology available for developing Web sites was Hypertext Markup Language (HTML). Because of its limited capabilities, it was only possible to send and display static pages of simple text and graphics from a server to a browser. Multimedia, interactivity, two-way communications, and page customization were not yet available. Becoming an expert at Web development did not need as much effort as it needs now, because there was less to learn, and as a result of this there was less to teach on the Web development.

Today, the situation is far different. Many more technologies are available. HTML itself has expanded, and Dynamic HTML (DHTML) is in use. Forms have been added to allow information to move in both directions on the Web, and a variety of languages and technologies are available to process incoming information at the server end. Simple programming languages like JavaScript, VBScript have provided interactivity and responsiveness on the client side. Java is being used on the Web for more complex tasks. Pages are no longer static; instead they can present information and activities specific to those who are viewing them. They can change on the fly according to such variables as specific users, time of day, location of the user, particular requests and histories, and many others (Ingram 2002).

Active Server Pages (ASP) from Microsoft are making Web pages easier to present customized information. Extensible Markup Language (XML) may broaden the possibilities even further.

Also, the types of information that can be presented on the Web has changed drastically, while text and GIF and JPG images are still being the main formats used in most Web sites. Thus, we have now many other choices. For example, animated GIFs are mostly used in many web sites instead of stationary images. On the other hand, it is relatively easy to insert sound and video clips now. Streaming video and audio are possible so that we can receive broadcasts over the Internet. Special plug-in programs allow Web surfers to view Flash animations, Director movies, Authorware programs, Virtual Reality (VR) environments, and many others (Ingram 2002).

While web technologies are improving drastically, our understanding of how to design Web pages and sites, and use the Web has also grown. Visual design, site organization, usability design, file and database structure, and many other issues are becoming important for Web designers. For educators, questions of instructional design and integrating the Web into our instructional system are also important. Finally, a key concept for educators is interactivity, which most agree is vital to good instruction on the Web (e.g. Gilbert and Moore 1998). A framework for designing interactivity into Web-based instruction is proposed in Chapter 4, Section 4.6. Please refer to this section to have an idea about the proposed interaction attributes of an online course.

As it is mentioned above, there is a great deal to learn when one begins to produce Web sites. The purpose of this section is to introduce the four-level model of Web development expertise proposed by Ingram.

In addition, he describes six major dimensions of knowledge that may differ from level to level. These dimensions divide the whole knowledge that one must know in order to develop Web sites successfully, into sub-sections.

The six dimensions are as follows:

- Page design
- Media use
- Client-side processing
- Server-side processing
- Site structure
- Development process

Obviously, it is possible for an individual to have skills at different levels within different dimensions. He expresses that people who are significantly more advanced along one dimension than the others are unlikely to have a complete grasp of the Web or of its possibilities.

3.6.1. Six Dimensions of Expertise

3.6.1.1. Page Design

Page design is the most basic dimension of expertise in the Web development. At first, people developing Web pages had to know HTML in order to develop even simple Web pages. Later on, Web page editing softwares were developed. The first one

helped ease the process by inserting fully formed tags when the user made corresponding menu choices. All the users had to do was to insert text, graphics filenames, and hyperlink uniform Resource Locators (URLs). The first WYSIWYG (What You See Is What You Get) page editor was PageMill for the Macintosh, although, given the differences among computers, screens, and browsers, no editing software can be entirely WYSIWYG. Today, there are many other editors in use. Some of them can produce DHTML, Active Server Pages, and other advanced technologies.

3.6.1.2. Media Use

The workhorses of media on the Web are GIF (Graphics Interchange Format) and JPG (or JPEG- Joint Photographic Expert Group) graphics. Ingram suggests that one should be able to insert such images into a page as well as use them as backgrounds at the Basic and Intermediate Levels of Web development. There are more advanced media choices, which may require extra steps or coding in development, such as sounds, video clips, animations, and streaming media.

To use such media effectively on the Web, one must have both the skills to produce and edit them and the ability to put them on the Web and integrate them with other Web elements.

3.6.1.3. Client-Side Processing

The Web works on a client-server model. The core of most Internet-based services consists of server computers and software, which offer information, processing, and transmission abilities. People access the servers through clients, which again are specific software programs running on individual computers. For example, we may send and receive e-mail through specific e-mail client programs such as Eudora, Outlook, or Pegasus on our personal computers. To do so, however, we must connect to e-mail servers, which handle such chores as transmitting our messages to the destination servers and holding incoming messages until our client programs request them. The Web itself consists of a huge number of www servers scattered around the world. Here the key point is that, with computers and software on both sides of each Web transaction, we have the ability to process information in various ways on either end.

This allows a skilled Web developer the choice of deciding where the processing will be most effective and efficient. For example, frequently the servers are much busier than the clients. The clients spend a great deal of time waiting for a single user to enter commands. Thus, often it can be more efficient and responsive to have the server downloading processing tasks to the client. In other situations, where key information is to store on large database on the server side, the processing must take place there.

With the advent of Web scripting languages, especially JavaScript and VBScript, the Web developer has gained the ability to create pages that are more interactive and responsive to users without changing the essential nature of the Web and its browsers. Scripts are snippets of programming code that are embedded, much like HTML, in the Web pages that are sent to the client's browser. The last several browser versions from both Netscape and Microsoft have included the ability to interpret and execute these scripts from within the page. The advantage of this scheme is that it maximizes both server load (no extra processing takes place on the server side) and the bandwidth needed to transmit the code, since scripts are simply ASCII text that is interpreted on the client side, just like HTML itself. More complex scripts can be used to communicate with the originating server as well, allowing even more flexibility, interactivity, and responsiveness. The ability to use and write scripts is an increasing part of good Web page development, especially in instructions, where scripting can allow more meaningful interactivity.

Another client-side processing technology is the programming language Java, which increases the bandwidth requirements but does put complex processing tasks on the client side. He suggests that Java, or something like it, will provide a way to run large-scale applications over the Web.

3.6.1.4. Server-Side Processing

For more complex interactivity, the client side of the Web (the browser) and the server side must work together. Whenever one searches a database for information, submits personal or professional information to an organization, or participates in an on-line Web-based conference, there is likely to be processing taking place on both ends. The first innovation to allow the two-way exchange of information on the Web was the online form. Forms consist of the text boxes, radio buttons, check boxes, and,

especially, “submit” buttons. Forms are remarkably easy to develop on the client side, as part of a basic Web page. However, when the user clicks the Submit button, some of the basic things can happen;

1. the form results can be e-mailed to someone;
2. the form results can be posted to a Web page automatically (this occurs in online asynchronous discussions, for example);
3. the form results can be sent to a text file or database file on the server, where it can be stored and used to aid subsequent decisions, and
4. the server can have other special programs to deal with form results.

In order to take any of these actions, the server must have programs installed to handle them. Often these programs are CGI (Common Gateway Interface) programs. The programs may be written in a variety of languages, since CGI is not itself a programming language but instead a standard interface among programs on the Web servers. PERL has been the most popular CGI language, especially on Unix servers, but many others, such as Visual Basic and C, are used as well. Server side scripting with JavaScript is also an option now. No matter which language is used, a CGI program allows the server to process form results and do other tasks that can increase the interactivity and responsiveness of the Web to the users.

3.6.1.5. Site Structure

Small Web sites often have little or no structure, and they may not need any. With larger sites, the need for a planned structure becomes evident in at least two ways. First, in order to maintain and update the site, those working on it need to have a clear idea of where things are, where new material should be entered, and so on. Second, site users probably will find it easier to navigate and use the site if there is a clear structure to it. Any complex website might be organized in many different ways.

3.6.1.6. Development Process

Finally, it is not enough just to have good technical skills in order to do Web development. As sites expand to dozens, hundreds and thousands of papers, they are taking on the characteristics of large-scale instructional development or software

engineering projects rather than smaller, craft-style designs (Powell et.al. 1998). Nowadays, teams of people develop good sites. Therefore, one of the key skills in Web development is the ability to plan and follow a systematic development process.

Such a process is the best way to ensure a high quality site that is developed on time and on the budget.

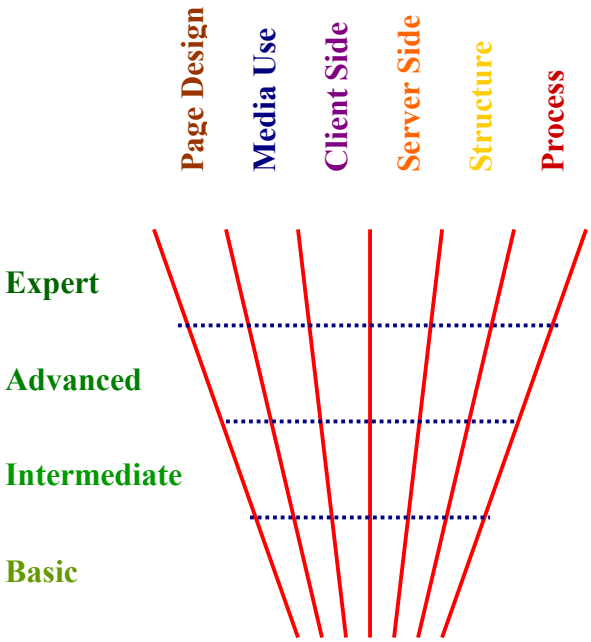

Figure 3.1. The Four Levels of Web Site Development Expertise
(Source: Ingram 2002, p.451)

3.6.2. Levels of Web Development Expertise

Albert L. Ingram (2002) describes the four levels of Web development expertise with reference to the six dimensions, as summarized in Table 1 through 4. In the following, the levels are discussed shortly.

3.6.2.1. Basic Level

The Basic Level is the first step for someone just starting out in Web development and is characterized by beginner-level skills in all dimensions. Someone at the Basic Level is able to enter text, perform basic formatting tasks, use graphics, and so forth. The media he or she uses are primarily GIF and JPG files. The pages and sites developed will consist of static pages served individually with no information returned to or acted upon by the server. Static pages are, as the name implies, pages that are for the most part unchanging. They include such timeless information as *"Paris is the capital of France"* and *"Triangles have three sides"*. In other words, they contain the content which is likely to remain the same. Static pages are not assigned to any particular module. Instead, static pages are arranged by *topic*. This is important, because it means that if two different modules address the same topic, then the scaffolding for each module links directly into the *same* set of static pages. There are several compelling reasons to do it this way:

- It ensures consistency in, for example, course materials. Similar triangles are described the same way in every mathematics course covering them.
- It allows efficiency of structure. The section on similar triangles is constructed only once. And once constructed for one course, it does not need to be moved, altered, or changed in any way to be used by another course.
- It allows designers to assign review reading without the risk of a student getting lost.
- It enables easy upgrading. If somehow the concept of similar triangles should happen to change, then changing the static data updates all courses linking to that static data.

The site structure is likely to be nonexistent. Most sites produces by those at the Basic Level are likely to be very small, however, so the structure is not critical. Finally, individuals at the Basic Level are unlikely to use any systematic development process.

Table 3.1. Basic Level
(Source: Ingram 2002, p.452)

Page Design	• Text entry and formatting (at least these options: fonts, sizes, styles, colors, alignment, headers • Background colors and graphics • Inline graphics • Internal and external text links
Media	• GIFs and JPEGs
Client-Side Processing	• None
Server-Side Processing	• Page serving only
Site Structure	• *Ad hoc* structure based on small number of pages
Development Process	• *Ad hoc*, organic, evolutionary, rapid prototyping

3.6.2.2. Intermediate Level

The Intermediate Level takes people a step beyond the basics in several areas. At the Intermediate Level, page design skills are more or less complete. Developers are skilled at using most or all of the standard HTML features. Nowadays, they probably access those features through one or more of the available WYSIWYG editors, not through learning and editing HTML directly. Among the media used, going beyond GIFs and JPGs, are PNG files (a relatively new graphic format for the Web), animated GIFs (popular, but difficult to use effectively), and background or embedded sounds.

An intermediate Web developer is at least starting to learn about client-side scripting, most likely using JavaScript. On the server side, someone at the Intermediate Level can use canned programs to engage in simple form handling. Many servers have CGI program libraries available with the ability to perform common server-side tasks. In addition, some Web editors, notably FrontPage, include server extensions that provide such functions (Ingram 2002).

The file structure also starts becoming important at this level, because the size of the sites developed is increasing, and the developer needs to be able to find pages and information quickly and easily.

Table 3.2. Intermediate Level
(Source: Ingram 2002, p.453)

Page Design	• Text formatting (options: lists, special html formats, indentations) • Tables for more complex page formatting • Graphics as links • Links to anchors (same page, other pages) • Image maps for links
Media	• Background sounds • PNG files • Animated GIFs
Client-Side Processing	• Copy and use scripts from other pages with changes • Write own scripts
Server-Side Processing	• Forms processing using canned programs (e.g., e-mail and storing in text files)
Site Structure	• Planned and deliberate: hierarchical, linear, Web, combination • File structure taken into account
Development Process	• Basic planning, analysis, and design processes. Structure/flow charts and storyboards

In summary, the Intermediate Level represents the current state of Web development for large numbers of people who are not professional developers but who develop small to medium-size sites for personal, educational, or professional use. Much useful information has been placed on the Web at this level.

3.6.2.3. Advanced Level

The latest technologies on the Web are used in this level. Especially for education, this level includes a significantly greater level of interactivity. In paper design, there are several important elements that are more advanced. Frames have been a part of HTML for several browser generations, but are difficult to use effectively. DHTML, mentioned earlier, is still a young technology and not standard across browsers. Even so, it now allows precise placement of graphics, text, and other elements

can be moved, changed, and made to appear and disappear under user or script control. All of these features make possible much more dynamic, interactive, and responsive Web pages. Dynamic pages may reflect ongoing and changing circumstances. The content of static pages is expected to remain the same, while the content of dynamic pages may change on a daily, weekly, or monthly basis. Generally dynamic pages are created by uploading current content inside a standard template. The template is the same as that surrounding the content of static pages.

In addition, Cascading Style Sheets allow the developer to have greater control over fonts, sizes, colors, and styles than that allowed by HTML alone. At the Advanced Level, developers are likely to be able to make good use of video and audio clips to convey information and tone, as well as a variety of specialized media that might require "plug-ins"-small programs that are added to the browser to increase its functionality.

Both client-side and server-side processing takes on increasing importance at the Advanced Level. On the Client-side, an advanced developer should be able to write significant scripts as well as begin to use Java programs in various ways. On the server-side, the developer might design and program CGI programs. In addition, he or she should begin to connect Web pages to databases to make the sites more individually responsive. These connections can be used for a variety of tasks, from delivering the results of simple information searches to creating all the papers on a site on the fly. While this strategy takes more planning, design, and programming, it can also make updating and maintaining a site much easier.

An advanced developer can differ from those at the earlier levels is in her/his use of more systematic analysis, design, and development procedures. Whether from software engineering, instructional design, or other disciplines, the procedures allow the designer to be sure that he or she is solving the right problems and to design a site to solve them well. Project Management, information architecture (Rosenfeld and Morville 1998), usability engineering (Nielson 1993), software engineering (Powell et.al. 1998), and many other disciplines start to become important at this level.

Table 3.3. Advanced Level
(Source: Ingram 2002, p.456)

Page Design	• Frames • Dynamic HTML • Cascading Style Sheets • More complex tables (e.g., tables within tables)
Media	• Audio and video clips • Files requiring plug-ins
Client-Side Processing	• Write complex scripts from scratch • Use and modify java programs
Server-Side Processing	• Supplying intermediate CGI to do customized tasks • Connecting to databases for publishing and possible updating
Site Structure	• Complex • Fully designed up front • Information architecture and usability considerations • File structure planned and specified
Development Process	• Good analysis and design process drawing on instructional design and incorporating some other elements from other disciplines

3.6.2.4. Expert Level

At the Expert Level of Web site development, practitioners are fully capable of using the latest and most effective Web technologies. Usually, development at this level demands a team of people, making it even more imperative that the site structure be well specified early and that good development process be used.

In page design, Expert Level Web development involves dynamically generated pages that are based on database-driven information, instantiated into page layout templates. This allows a high degree of customization, interactivity, and responsiveness in the Web site (Garrison and Fenton 1999). Active Server Pages, a Microsoft technology, allow one to produce such pages, and there are other possible technologies as well. As far as media go, at this level, sites may include any media that might be transmitted on the Web, including streaming video and audio.

An individual who is expert at client-side processing will have full scripting skills and/or full programming skill in a language like Java. These allow her or him to create highly interactive and capable pages that do far more than simply present static information. On the server side, Expert Level developers are able to produce sites with full database connectivity with complex server-side processing using scripts and programs.

Table 3.4. Expert Level
(Source: Ingram 2002, p.457)

Page Design	• Dynamically generated pages based on database-driven information, page layout, etc. • Very complex interactive elements • Active Server Pages
Media	• Streaming audio and video
Client-Side Processing	• Full scripting skills
Server-Side Processing	• Full database interconnectivity, complex server-side processing, programming
Site Structure	• Based on abstract model that is instantiated on the fly
Development Process	• Fully planning, analysis and design process combining instructional design and development with relevant concepts from software engineering, usability engineering and project management, etc.

At this level, the structure of a Web site has probably moved beyond one based on linking individual pages in various ways. Instead, there is most likely an abstract model of the site, which is instantiated on the fly from databases. This is an efficient, effective strategy for producing, upgrading, and maintaining a site but requires a great deal of front-end analysis, planning, and design before any programs are developed or information entered.

3.7. Why Use the WWW for Distance Education?

The Web (WWW) may be a great way to distribute information, but can we really teach with it? There is a big difference between information and instruction, and this basic principle is as valid on the Web as anywhere else. Instruction requires practice and feedback. Without those two key ingredients, there is no instruction –simply the delivery of information.

The WWW and Web browsers have made the Internet a more user-friendly environment. The ability to integrate graphics, text, and sound into a single tool means that novice users do not have to struggle with such a steep learning curve. In addition, organizations and individuals can create home pages independently and link to other home pages on their own computers or to pages created by others on different computer systems.

For educators, the WWW provides an exciting new opportunity for distance education. The distance educator, in creating a classroom home page, can use the WWW. The home page can cover information about the class including the syllabus, exercises, literature references, and instructor's biography. The instructor can also provide embedded links to information on the WWW that would be useful to students in the class. Embedded links mean that, when a posting refers to another point on the WWW containing additional teaching material or software to be downloaded, the student has to click on the link only, in order to go there directly. Other links have access to library catalogues or each student's individual home page. In addition, the home page can link students to a discussion list or listserver that has been set up for student communication. It is also a relatively simple matter to use the home page to create forms that students can fill up and send as an e-mail message.

Web with an inviting graphical screen layout, interactive multimedia learning materials, simplified access and searching of databases and open technical standards that allow any brand of modern computer to access the Web; makes learning more accessible (Arkan 1999).

These are the highlighted reasons for choosing the WWW as a platform on which distance education programs are developed. The importance and the necessity of the WWW in pedagogical science will be clarified more throughout this thesis.

3.8. A Brief History of the Internet and the World Wide Web

The internet is a network of networks. It developed from an earlier military network called the ARPANET. The ARPANET was designed to be a military control network in the event of a nuclear war (?!). The original motivation for the ARPANET was to allow researchers to share big computers. Amongst the first applications were Telnet, which allowed people to operate a computer remotely, and File Transfer Protocol (FTP), which allowed files to be transported from one computer to another.

File Transfer Protocol is used for bulk file transfer. An FTP site is used to distribute printed material such as course manuals, texts, large diagrams, work samples or templates, and any other material that may be printed. FTP servers may also be used as a means to allow students to submit text or other files. FTP is supported in HTML with the ftp tag.

Telnet programs, such as Ewan, allow users to interact directly with a remote program. Chat programs, such as MUDs, MOOs, or IRC are accessed using telnet. A user can access a telnet site directly from a web page using a telnet link. Telnet sites can be used to support on-line chat, simulations, bulletin boards, electronic library catalogues, and any other user-program interaction.

Telnet and FTP are still very important technologies. However, when e-mail was invented in 1972, it soon became the most widely used application. The Internet has always been more about communication than simply having access to computing resources.

The original model for the Internet allowed for a maximum of 256 networks to be attached. It was assumed that networks would be very large scale and 256 would be plenty. In the 1970s a network technology called Ethernet was invented. This allowed small groups of computers to be connected cheaply. In the 1980s the IBM PC was invented and businesses began to acquire many small computers rather than just big one. By the 1990s Local Area Networks (LANs) were proliferating in businesses and universities. The modern Internet is a network of hundreds of thousands of smaller networks.

The World Wide Web was invented in 1991 just as home computers were becoming popular. The most important feature of the Web is that it is graphical and easy to use. The network of links is called a web. A key feature of the Internet is that it

was not designed for any particular application (such as Telnet or e-mail) but as an infrastructure on which new applications (such as WWW) can be built.

In the **Appendix A**, certain technological developments are listed in order from 1836 to 2003. The time schedule is consciously extended to the date 1836 because it was the date of the innovation of telegraph which uses Morse Code to communicate between humans, like the communication between computers via binary codes today. Afterwards, all key innovations and developments related to communication and dissemination of information are included in to expose the relationship between succeeding developments. Please refer to Appendix X to get more information about the history of the Internet and the WWW.

3.9. What is Web-Based Education?

> "Any purposeful, considered application of Web technologies to the task of educating a fellow human being." (William Horton)

Web-based education (hereafter called WBE) organizes Web technologies to the task of education. WBE is the term that is used most often to describe the use of Web technologies for learning within educational institutions. Sometimes the term Web-based instruction is used instead of web-based education. There is another generally used term which is web-based training. This term is common within business organizations. I will stick with WBE, because the primary emphasis of this thesis is the kind of education especially provided in educational institutions and universities.

3.10. History of WBE

Web-based education is the result of three social and technical developments: distance learning, computer-conveyed education, and internet technologies.

It gets inspiration or ideas from the technologies, and techniques of all three areas.

Distance education

Distance learning has its roots in the correspondence education that developed in the United States, France, Germany, and the United Kingdom during the mid 1800s (Moore and Kearsley 1996).

After 1900s, many technologies have been developed and they have been put under educationalists' service in one or two decades (Horton 2000).

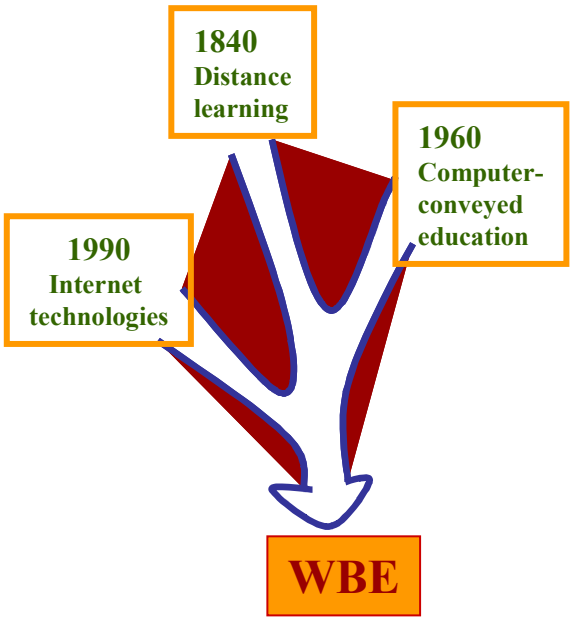

Figure 3.2. The Roots of Web-based Education
(Source: Horton 2000, p.2)

1925	First radio courses offered by the State University of Iowa
1940s	Educational television added capabilities to broadcast live presentations
1980s	Teleconferencing allowed teachers and learners to talk together
1980-90s	Satellite television networks let learners see and interact with instructions
1990s-now	Web technologies is just the latest technology to advance distance learning

Computer-conveyed education

There are several forms of computer-conveyed education. These forms take various names such as computer-aided instruction (CAI), computer-based education, computer-based instruction, and computer-based training (CBT). As in previous, the

terms instruction and education are usually used by educational institutions, and the term training is used by business organizations.

The first widespread use of computer in training is dated back to 1950s. Stanford University and IBM offered computer-aided instruction in elementary schools. The first real rise occurred in the 1960s when the PLATO system was planned by the University of Illinois and developed by Control Data Corporation. PLATO stands for Programmed Logic for Automatic Teaching Operations. It allowed the sophisticated branching necessary for teaching complex subjects. (Horton 2000).

CAI has some limitations. It requires a mainframe computer system and its distributed terminals. However, it was used widely. For example, over 100 PLATO systems were in service in the U.S., and learners had logged 40 million hours of instruction by 1985.

The advance in computer technology has also affected the developments of computer-based education systems. After the development of personal computers, computer-conveyed education took its next giant leap. Thus the previous limitations was exceeded, but the new ones emerged. The incompatibilities of hardware and software products of different companies limited the use of educational programs.

Each advance made training easier and less expensive to develop and deliver, but already this training was limited to users to a single computer systems or proprietary networks.

Web Technologies

Many of the technologies required for web-based education actually developed for irrelevant purposes. For example, the Internet evolved from technologies designed to fight World War III. The main aim was to construct such a network that survives under a nuclear attack and enables the communication between military based which are already surviving. Afterwards, it was widely used among universities and finally the system was opened to general public. However, it was not easy to use. People has to memorize cryptic commands, load several different programs and type long and hard-to-remember names of things.

The World Wide Web, developed at CERN, intended as a way that researchers could share their academic papers over the Internet. Thus, the term hypertext appeared and gained to literature. Finally, HyperText Markup Language (HTML) defined to

format and organize the pages. It was so easy that, soon universities and private companies created programs called browsers to display HTML documents on UNIX, Macintosh and Windows systems.

WBE is born

Simply, we can accept the starting point of WBE as the first time that someone read a web page and learned something (Horton 2000).

In order to enable Web browsers to display modules developed in the previous CBT tools, vendors of these tools, such as Allen Communication, Asymetrix, and Macromedia, quickly began offering plug-ins. However, the performance of the WBE was not as good as it was before. Thus, the slower network connections and packet-oriented communication protocols of the Internet forced to companies to develop separate products, such as Allen Communication's Net Synergy and Macromedia's Flash, specifically for authoring materials for the Web.

Capabilities like dynamic HTML, richer scripting languages and the ability to display XML documents supported more WBE developments.

The development of computers and electronic communications media opened a new era in education. The barriers of space and time has been removed, thus knowledge can be obtained and delivered anytime anywhere. As a result, training became easier and less expensive for people at a distance. Today, web based education is widely used by educational institutions. The fundamental responsibility of the instructor is still same as it was before. S/he transfers the knowledge to the materials that are used by students. However, there is a clear difference from the traditional system in which materials are produced by instructors. In WBE, the responsibility is divided among a team composing of instructors, programmers, web-page designers, etc. The reason of constructing such a team is instructor's lack of knowledge and education to produce effective WBE which requires several different skills.

3.11. Online Courses

A fundamental shift that is occurring in distance education is the shift to the WWW as the center of interaction between the faculty and the student. On campus, the center of a course is the physical classroom. In the new distance education model, the

center of a course is the Web site resulting in a "**Web-centric course**" or "**online course**". The online course transfers the primary framework for instruction from the classroom or guidebook to the Web. It uses the interactive capabilities of the Internet such as e-mail, digital libraries and chat rooms to facilitate student-to-student and instructor-to-student communication and interaction. An online course will use many other traditional elements in its design including books, CDs, and group projects. Many faculties are beginning the shift to online courses by creating course Web sites where course syllabus, containing goals and objectives, a bibliography, structured student activities, announcements, and a library of resources and contents reside for easy access by students.

Individual faculty members develop these online courses available on the Web with technical assistance from computing center personnel as needed. They make use of existing Internet hardware and software resources and are offered by the same instructor who developed it, possibly with the assistance of another faculty member or graduate teaching assistant.

3.11.1. The Future of Online Learning

This section does not attempt to describe what ought to be, instead, what will happen. Mainly, Stephence Downes's paper (1998) named "The Future of Online Learning" is used as a reference through this section. Thanks to him for his predictions. This section is intentionally included to this chapter to provide the subject-consistency.

Bandwidth

Today, instructional material must be delivered from a server site, such as an educational institution, to a receiver site, such as a student's computer through narrow pipes i.e. having limited bandwidth at around 58,000 bits per second. Bandwidth limitations preclude the use, in many settings, of innovative Java applets, multimedia, video and videoconferencing.

Videoconferencing is a realtime video session between two or more users or between two or more locations. Videoconferencing over IP has become very popular. Using the public Internet as the transport is the one of the reasons. During periods of congestion, systems can throttle down from 30 fps to a lower number of frames per

second to eliminate jerkiness. However, the Internet is a cost-free transport, and users accept occasional blips.

This will change. Better data compression technologies, such as ADSL, networks of LEO (Low Earth Orbit) satellites have been launched. Towers supporting digital wireless internet are rising. It is not unreasonable to state that, in the face of these innovations, that bandwidth will be omnipresent and cheap.

Computers

Computers will become more reliable and will look less like computers. This development will be driven on two fronts. First, processor and memory speeds and capacity will continue to increase. And second, computers will become more reliable because they will become more specialized. Today's desktop computer, which does everything from word processing to internet access to graphic design, will gradually fade out of existence, as more specialized machines designed for particular applications will come to the fore (Downes 1998).

To identify trends in education, perhaps the best methodology is to identify trends which work well today, whether technologically-based or not. In other words, identify the tools people actually use today, and examine how computers of the future will evolve these tools for use in the future.

Stephen Downes (1998) suggests that the PAD (Personal Access Device) will become the dominant tool for online education, combining the function of book, notebook, and pen. Various PADs will evolve, depending on need and application. For example, large-screen WADs (Wall PADs) will hang from walls for home entertainment, business presentations, or education. The use of PADs in education will have two major consequences. Education will become truly personal, and it will become truly portable.

Software

Presentation software will become full-featured and easy to use. Greater bandwidth and capacity will greatly enhance the designer's ability to present learning materials. For example, educational software of the future will include every feature present in video games today, and more. Virtual reality and simulations will move to the personal computer interface level with the development of more powerful PADs and intuitive manipulation devices, such as the data glove.

In the future, online conferencing will be easy and cheap.

Synchronous conferencing systems of the future will consist of a basic platform from which users can choose to conference using a variety of tools: video, audio, text based chat, and whiteboard. Additionally, such systems will support file transfer, remote launching and control of applications, and more. These systems already exist; what is lacking is only the bandwidth to use them effectively.

Today, most asynchronous conferencing is text based. In the future, asynchronous conferencing will evolve from being text media to full multimedia. Already, video email clients are available, and most online technology newsletters are published in full HTML format. Students, equipped with multimedia messaging clients, will be able to embed sound, images and videos into their messages.

Standards

Conferencing and multimedia standards are being developed today. Examples of this include SMIL (Standardized Multimedia Integration Language, pronounced 'smile') and the H.323 voice-over-IP standard for video conferencing. These standards will allow developers to introduce components of online conferencing systems, such as clients, which can work with any conferencing server.

Good examples of this already exist. Terminal emulation (or telnet) was developed in order to enable remote access to mainframe computers. Telnet standards, such as VT100, were developed. This enabled the development of a wide range of telnet clients which now allow any user on any system to access any remote mainframe.

Another good example is the world wide web. The web is based on a set of communications standards, called HTTP (Hyper Text Transfer Protocol). This allowed the development of independent clients, called browsers, to access any web server from any other system. Indeed, it is the very existence of HTTP standards that allows us to turn televisions, airport kiosks, or any other device we can name, into a web browser.

Education

Education in the future will be much less class-based, and much more topic-based. The topic selection for an individual's education will be based on that student's need, not the preselected curriculum for a particular class. Any given student may at any time be taking any given topic, and progressing at a pace through that material appropriate to his or her learning ability.

Learning Styles employed by online learning systems will be tailored to individual students as well. Different students learn in different ways. Online learning

systems will identify individual students' preferred learning styles, and present educational materials accordingly.

In traditional education, the host and the provider are the same institution. That is to say, the same institution which produces the instruction is also the institution attended by the student. For example, if I say I am taking a course from the Sakarya University, what I mean is that the course instruction is being delivered by the Sakarya University, and also that the University of Sakarya provides the facilities where I receive that course instruction.

In the future, host and provider institutions will increasingly be different institutions. One example of this is course brokering, wherein the course s/he is taking may have been developed by, and even instructed by, a Sakarya University's instructor, but is being delivered at X. Thus, when s/he takes the course, s/he uses X's classrooms, computers, and facilities even though the course is a Sakarya University's course.

The future of instruction design offers the exciting possibility of OpenCourseWare and reusable learning objects (Wiley 2000). According to Schatz (2000), the web, feedback mechanisms and, most significantly, meta tagged knowledge bits form the basis of this new approach. Instead of starting from scratch every time, this approach will enable customized learning at a specific time, taking into consideration an individual's learning style, experience, knowledge, and learning goals.

There are two major components which a learning object will have:

First, all educational resources will be accompanied by metadata. Metadata is data about the data. For example, an article about Saturn would contain data about Saturn - it has rings, it is a gas giant, and so on. Metadata would be data about the article - it was written by Ahmet Sarı, it is located at saturn.com, and so on.

Second, educational resources will be written in XML (eXtensible Markup Language). XML is similar to HTML, but while HTML concerns itself mostly with how a document is formatted and displayed, XML is used to indicate the role of document components. Thus, authors, for example, will use XML to identify questions, asides, definitions, or any of a variety of other structural definitions.

Metadata and XML will be enormously useful for intelligent search agents, and these agents will be used increasingly for a variety of purposes: assembling specialized data, compensating authors, monitoring student progress - in short, anything which requires a structured retrieval of data from a variety of online sources.

"Learning Object" is also discussed in Section 7.1.1. which introduces new emerging technologies. Please refer to Chapter 7 for further details.

Instructional Management Systems

The task of coordinating student progress through various learning materials, tracking their grades, and facilitating interaction falls to a class of software applications known generically as instructional management systems. Such systems are already in development and have gained wide acceptance in the online educational community. Examples include Virtual U, Top Class, Web CT, and many others.

With the development of XML and online objects, websites of the future will become much more sophisticated, and so will the way in which the internet is used in schools. Clients used by students will not offer full internet access, the way Netscape does today. Instead, these will interact directly with (thousands of) educational servers. The servers will not deliver web pages so much as they will deliver educational objects.

3.12. Advantages and Disadvantages of Web-Based Education

In this section, advantages and disadvantages of WBE will be examined. However, we must always keep in our mind that an advantage can easily turn into a disadvantage if it is not designed properly. On the other hand, with good design and hard work, we can even neutralize many disadvantages. In the following, advantages and disadvantages are listed generally.

3.12.1. Advantages of WBE

The closest distance learning method to WBE is CAI. WBE has all the advantages of disk-based CAI, such as constant availability, non-judgmental testing, and instant feedback. WBE has also some advantages of its own:

- access to Web-based resources
- centralized storage and maintenance
- collaboration mechanism

The other advantages of WBE are examined with the main headings below.

WBE saves money

- Facilities and supplies

As in every distance learning methods, people use their homes or offices as their classes. Thus, the need for classrooms, chairs, desks, tables, and other classroom supplies are reduced or eliminated. On the other hand, learners can virtually access many of the instructional resources on the Web. This also reduces the investment requirements for libraries, bookstores, copying machines etc.

- Reduce administrative costs

Generally, most of the administrative works are time-consuming works and there are many chores such as distributing course materials, catalogs or handouts, registering students, recording grades and attendance etc. WBE systems do not eliminate suchlike works, but they simplify them.

- Lost opportunity costs

Some of the workers quit from their jobs for education. This may cause man-power problem for those companies. On the other hand, some of them get education while employed, if they can get permission to attend the courses. This causes some revenue lost for the company. WBE is the best solution for people who would like to continue their jobs and education at the same time period.

WBE enables better teaching technique

WBE that implements effective instructional design may actually provide a better learning experience than classrooms or disk-based CBE.

- WBE activates learners

With WBE, learners feel more in control of their learning. Because learners feel in control, they take more responsibility and learn more effectively (McGrath 1998).

In order to cause learners to perceive this feeling, the WBE should have a well-design. Learners must actively navigate the course, think and respond.

- WBE exposes learners to real-world data

Conventional classroom education restricts learners to the data given by the instructors in a limited time and tools. However, the Internet supplies tremendously large amount of data to the learners.

- WBE can develop better thinking skills and let learners reflect before responding

When events are conducted by e-mail or discussion groups, learners can take their time answering questions. Learners take longer to respond and think through their answers more deeply (Karayan and Crowe 1997, pp. 69-71).

WBE promotes collaborative learning

Web technology promotes collaborative learning (McGrath 1998). In conventional system learners can discuss, debate, and brainstorm with colloquies in their classrooms only. However, the Web broadens the class-boundary.

WBE helps learners identify knowledge resources

Libraries will be continuing to be used in future as in past and now. Library research helps learners identify valuable sources of knowledge. The internet contains a huge amount of information-sources. Many searching algorithms are used to identify sources' addresses, but sometimes thousands of addresses appear on the screen. At that moment, the problem is to find out the best one which replies our query. There are many researches on this developing subject. If we forget this problem for an instant, and presume that we found the required link, we can easily store this address to a personal jump page or the 'favorites'. Thus, resources identified on the Internet are easily obtained by a couple of mouse click.

Other advantages for learners

On the other hand, many surveys show that learners benefit from other aspects of WBE besides a more effective learning environment.

The other advantages of WBE for learners can be listed as follows;

- There are many courses available on the Web and they are increasing by time. In order to get their share from the market, the producers have to improve their courses.
- Discussions can continue outside of the class for days or weeks.
- With WBE, learners can get training right when they need it. They can proceed at their own pace.
- Learners have more flexibility in learning. They can easily choose their course-time, arrange learning-pace, and repeat lessons.
- Learners get better access to the instructor (Kroder et al. 1998).
- Sharing a paper or a project with other people are more easier on the Web than the traditional system (McGrath 1998).
- Learners feel more free by themselves than in a classroom. This facilitates the concentration on a subject.

- WBE accommodates many different learning styles such as visual or verbal, analytical or experiential.
- While preparing a course on the Web, the personalities of the learners can also be considered.
- One advantage cited by WBE learners is immediate feedback. Students love the immediate feedback of automatically scored tests.
- Learners are treated more equally. Personal characteristics like race, nationality, and gender do not play a role on grading them.
- With WBE, the hidden costs of training are minimal. Because, WBE cuts travel expenses, even clothing expenses. Since most materials are free on the Web, learners do not need to purchase them.
- With traditional classroom training, much of the learner's time is spent on non-training activities. WBT cuts out this wasted time.
- Taking a WBE course is not always easy for students who are not skilled in using a computer. This may be a problem at the beginning, but by time, people gain general technical knowledge about computer and internet technologies.
- In traditional classroom training, students seldom use their writing skills. But in WBE, they improve their writing skills. On the other hand, they develop self-discipline needed to stay on schedule, acquire specific online learning and reading skills (McGrath 1998, Horton 2000).

Other advantages for instructors

The development phase of a lesson on the Web takes more time than a traditional one. It may seem a disadvantage, but after overcoming this phase, conducting a lesson gets more easier than before. Some of the advantages of WBE for instructors are listed below;

- Instructors can teach from anywhere (Microsoft).
- Instructors can spend more time on productive activities for example, planning, producing, and polishing their course.
- The course content can be updated and changed to respond to learner's needs, to correct mistakes and to incorporate better content in any time and place. This new updated version can easily be put and obtained on the Web.
- The WBE is easy to do many of the routine, but time-consuming tasks of administrating a course such as returning graded assignments, making announcements.

- Conforming quotations, and checking citations to a Web source is very easy.

Other advantages for educational institutions

- WBE delivers consistently high-quality education. First of all, we accept that we have the ideal students. The ideal student is a person who learn independently, is self-disciplined, manage time well, enjoy working alone, is good in writing, have good basic computer skills, have a definite goal, such as a certification or a degree. In traditional classroom-training, sometimes the instructors sometimes the students may not be in good mood. This affects the effectiveness and efficiency of a lesson. However, in WBE, the quality of education is free from 'mood'.
- WBE provides training to the whole world. Lucent's Wireless University makes WBE courses available in 90 countries (Docent).
- Web-based technologies are flexible. Material can be added, revised, or deleted as the course is going on. Courses can be adapted to the needs of a specific class or individual learner.
- WBE keeps instructors on research. With WBE, instructors can spend more time in research instead of repeating the same lessons in classrooms every year.

3.12.2. Disadvantages of WBE

Up to this point, many advantages of WBE has been listed. It must always be considered that most of these advantages are only valid with a good design. However, there are some disadvantages of WBE which are inherently existing.

WBE requires more work

Designing, teaching and taking a WBE course requires more time and effort . The additional time required by the online format is found to result largely from increased student contact and individualized instruction and not from the use of technology per se (Cavanaugh 2005).

More instructor effort required

Generally, many instructors agree on that preparing a course on the Web requires more time and effort (Brown 1998, McGrath 1998).

Many studies have found that online courses require significantly larger workloads and report that instructors think teaching online was more difficult than

teaching in-class courses (Cavanaugh 2005). This was a result of workloads increasing due to increased interaction with students.

Students feel more free themselves for directing their questions to instructors, as if they are their private tutors. This may provoke instructors (Iadevaia 1999). After a certain experience, the workload may be no more than a conventional course (Harasim, 1999).

Conversion efforts take longer than expected

Converting existing classroom courses to WBE is not so easy as expected. 'Save as HTML' command in word processor or presentation graphics program does not convert the whole job to WBE. It needs more. Sometimes, redesigning the course rather than converting it is more practical. Converting a classroom course to the Web is examined in detail in Chapter 4, Section 4.7 named as "Converting Classroom Courses To The Web-Based Courses".

More effort required by learners

Learners taking a WBE course have to spent more time and effort than traditional courses (Kroder et al. 1998). Online discussions, brainstorming sessions and other activities take longer time. An instant response is not possible. On the other hand, people usually use their body as a basic tool in their communication. Lacking the feedback of body language makes the communication harder than the face-to-face one. As a result, learners refrain from the discussion. Actually, this is a typical behavior developed against to a new technology. To benefit from technology, learners must use it. So, benefits of learning technologies must be explained (Grudin 1994, Favorin).

Good instructional design and production required

WBE requires good instructional design and materials.

> "For IT subjects every detail needs to be correct because computers are so pedantic that if even one command is not precisely written, an entire exercise can fail. It is very time consuming to produce materials that attain this level of perfection."
>
> (Philip Rutherford)

Learners fear losing human contact

Many instructors and learners fear that they lose the human touch of classroom instruction (Horton 2000).

There is a widespread belief that the lack of face-to-face contact means that distance learning is impersonal (Kubala 1998). If the Web is used only to broadcast

learning materials, “human contact is lost, students are isolated, and the educational experience is passive, limited, and alienating” (Gibson and Herrera 1998). We must ask how much interpersonal interaction there is in the average lecture class?

Technical requirements are difficult to meet

Technical problems in WBE are unavoidable events. Many Web-based courses are “dead on arrival”. That is, learners never get started because they cannot meet the technical requirements for the course. They cannot figure out how to download and install the required browser, plug-in, and other software (Horton 2000).

“The strongest chain is as strong as its weakest link”

(proverb)

In a communication link, a Net connection is only as fast as its slowest component. For this reason, Web applications today and in the near future must work at 56 Kbps. We can buy faster modems, but only one component slower than ours will determine the transmission speed between two end-points. On the other hand, modem connect time must compete with other telephone needs over the same phone line used for voice and fax. Most homes do not have ISDN, ADSL, E1 lines, satellite links or cable modems. Widespread, low-cost adoption of these technologies is still years away. Developers of Net-based applications must keep this in mind, or limit their audience to those for whom throughput and persistent connections- and their costs- are not an issue (Forshay and Bergeron 2002, p. 365).

Recently, Türk Telekom has put ADSL (Asymmetric Digital Subscriber Line) into service, which provides up to 2 Mbps transmission speed over copper lines which are already used for telephone services. It is possible to transmit data, voice and image at the same time with this technology. It is widely used in the world since it provides broadband communication via digital coding techniques. Because of it’s asymmetric structure, it is possible to download data with high transmission speeds over existing telephone networks. Although the subscriber fee is fixed, it is already expensive for the individuals and not available everywhere also. For this reasons, it’s widely usage will take time.

Promises of 7X24 availability are seldom met in practice. There are many reasons of this, for example, the server sometimes has to be shut down for maintenance or to transfer the course to another server.

WBT disrupts established ways that work

Thousands of years people are educated by lectures in a place specifically allocated to them for a period of time. It is called as ‘classroom’. Classroom training has low technology but very refined technique. However, WBE is new, different, technology dependent and needs new techniques. It means that people have to change their many customs. Usually, people resist the changes.

Often first-time WBE learners express frustration with the lack of a traditional format (Kroder et al. 1998). An independent evaluation of an experimental statistics course found that 92.9% would have preferred a standard lecture-and-test course (Lessser 1998).

All these surveys express that people avoid from a total change. Ilya Zaslavsky at Western Michigan University states that “It is very important to preserve some of the traditional elements of classroom teaching so this change isn’t traumatic for the students” (Microsoft Corporation).

Actually, learners are not the only people resisting to the new techniques of WBE, some instructors resist also. When Aetna developed an intranet-based training program to train 3,000 employees, 2 of 33 trainers choose to transfer to other jobs (Barron and Rickelman 1999).

In traditional system instructor uses, formerly a piece of chalk and a blackboard, a marker and a whiteboard, however in WBE, they have to use software tools which will be obsolete.

CHAPTER 4

WEB-BASED EDUCATION DESIGN AND DEVELOPMENT

Designing WBE is an unlimited process. It is mostly thought that design is what occurs only at the beginning of a project. However, this is not true. Design process is a cyclic process proceeding with analyze, design, build and test.

"The design process involves top-down design gated by testing at every level and tempered by a willingness to back up and start over where called for."

(William Horton)

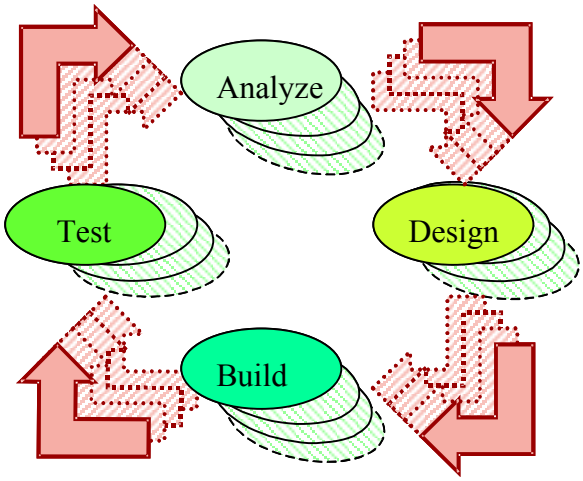

Figure 4.1. Design Process

Before starting to design a WBE course, we should answer to suchlike questions; Why do we want to use WBE? , What are our objectives?, Who are the learners?, What will we do for learners?, What will training accomplish for them?, What will we do for our institution?, How will they apply what they learn?, What are our objectives?… We can continue to generate this kind of questions. All of them help us to define our educational model and development methodology. If we have an

educational theory and a development methodology, we can produce an effective WBE course.

The main purpose of this thesis is to offer a Web-based distance education model. It is proposed in Chapter 5. It offers a conceptual framework to an institution by integrating three most important aspects of WBE, namely technology, cost and efficiency. In this model, system approach is used to progress in web-based course development. According to this approach, there are three subsystems which are "analysis", "design and development", and "evaluation and control". As you will see, there are very similar approaches of creating a system and designing and developing of a product. For this reason , this section is the base of Chapter 5.

4.1. Matching the Objectives

In the analysis phase of the model, the goals of the institution and the teaching objectives of the course must be clarified. The success of the course mostly depends on the works at this phase.

"Teaching objectives are what you want to teach someone, and learning objectives are what learners want to learn" (Horton 2000).

If your teaching objectives match learners' learning objectives perfectly, the course you have designed will stick the learners to their screen.

First, the goals of the institution or university must be listed out. Then, they must be kept in mind in preparing the teaching objectives, and even in the duration of design process.

4.2. Covering the Learning Styles

Before proposing a framework for a WEB course, we should firstly think about the ways people learn and how WBE and its components can be used to enable anybody anywhere to learn that way. A successful course includes at least a few of learning styles given in the following list which also gives an idea how we can do that (Horton 2000).

The square bullets indicates the way we learn by and the hyphens indicate the tools and methods to be used in WBE.

- Listening
  - Webcast using audio and video
  - Online conferences. Audioconferencing and videoconferencing….
- Seeking advice
  - Discussion groups and other collaboration mechanisms
  - Guest speakers in Webcasts…..
- Reading
  - Related Resource pages and Course resource pages
  - Virtual libraries….
- Watching
  - Webcasts
  - Presentation sequences
  - Whiteboard and screen-sharing sessions….
- Examining exemplars.
  - Virtual museums. Virtual field trips and guided tours
  - Featured Example and Code Sample pages
  - Group-critique activities…..
- Critiques
  - Discussion groups and other collaboration mechanisms
  - Mentoring
  - Group-critique activities…..
- Modeling the behavior of teachers, experts,..
  - Mentoring
  - Webcasts with guest experts.
  - Case-study activities….
- Exploring
  - Simulators
  - Virtual laboratories….
- Discussing
  - Discussion groups, chat sessions,and other collaboration mechanisms
  - Online conferences….
- Practicing
  - Simulators
  - Drill and practice activities

  - Virtual laboratories….
- Memorizing
  - Drill-and-practice activities
  - Presentation sequences
- Conducting research
  - Guided research and guided analysis activities
  - Case studies
  - Exploratory tutorials….

4.3. Design Decisions

There are many design decisions that will determine the structure of a course. For example, some courses are led by an instructor; in other courses, learners find their own way, set their own pace, and interact only with the computer. This is the case that must be decided at the beginning of a design process. In the following, the design decisions will be discussed in detail.

4.3.1. Decision 1 : The role of the instructor

The instructor's role is one of the first and the most important decision in WBE. We can imagine a spectrum that changes in between pure instructor-led and pure learner-led. Pure instructor-led education is limited to short events such as broadcast presentations. Pure learner-led WBE courses do exist and resemble stand-alone disk-based Computer Based Training (CBT) (Horton 2000).

Many WBE courses deliberately shift from instructor-led to learner-led during the progress of the course. Both instructor-led and learner-led training offer advantages. The best solution is to mix both methods in design.

Besides the instructor's role in course design, the distance instructor could play an important role in the success of learning. In the following both instructor's and facilitator's roles are briefly discussed.

In distance education, the role of the distance instructor may be as important as the roles of developers and designers. Trentin and Scimeca (1999) argue that experts assume a leading role in program design, but have to be supported by instructors.

Sherry (1996) argues that in recent distance education environments (e.g., Web-based learning environments), additional roles are needed besides the traditional instructor roles. He explained that a team of instructor, technician and service provider must work together to produce and spread a quality distance educational program. Usually, there is one person who is responsible for running the class at a distance, managing students and providing guidelines for both instructor and students. This person is usually known as the site facilitator.

On-line instructor could help students by explaining difficult concepts using examples or suggesting external links, encourage students to communicate, participate, meet each other on-line and submit course-related work. The site facilitator could help in the evaluation, purchase, installation and support of software and hardware as well as implementing and maintaining successful uses of technology. Shortly, instructional support is carried out by the on-line instructor, while organisational and technical support is provided by the facilitator. Both the instructor's and facilitator' s responsibilities should be clearly defined before learning sessions.

As technology developing new concepts are taking part in the literature. 'Site facilitator' is the one of them. The question asking the teacher's role in their distance education programs was addressed to the Turkish universites and it is realized that these concepts are not clear in people's mind. This is most probably because the distinction between the roles of instructors and facilitators is not properly determined at first. Please refer to Chapter 6 for details.

4.3.2. Decision 2 : Synchronous or asynchronous?

Before starting a design process, the institute has to make a decision whether to make WBE synchronous or asynchronous. William Horton (2000) gives the definitions of these words as follows:

"Synchronous : The term synchronous means that everyone involved in an activity must perform their part at the same time. Such events are sometimes called real-time or live events. Such events include chat sessions, screen-sharing and whiteboard sessions, and videoconferences.

Asynchronous : These activities are ones that participant can experience whenever they want. Permanently posted Web pages and automatically scored tests are clearly asynchronous – learners can read them at any time."

Generally web-based courses are not purely synchronous or asynchronous. Although their some parts include synchronous activities, they can be designed as an asynchronous course. For example, "respond immediately" tests and "timed" tests can be included in an asynchronous course. Thus, the course can only be synchronous within a few hours.

If learners need to discuss issues with other learners at length, most learners share the same needs and have the same questions, and learners need the motivation of scheduled events reinforced by peer pressure, then synchronous activities are chosen.

If learners are from a wide span of time zones and countries, learners have inflexible or unpredictable work schedules, and learners have unique individual needs, then asynchronous activities are chosen.

On the other hand, synchronous communication is problematic in world-wide teaching, because of time-zone differences, poor connections (especially transatlantic), and Internet latency and congestion, as well as differences equipment. Asynchronous models were more effective (Thomas 2004).

4.3.3. Decision 3 : Class Size

As in traditional classroom training, there are "schedule" and "class" concepts in WBE. Learners take the courses according to the previously defined time schedule. Because the course is offered in the limited time period, the number of people to be registered to that course, i.e. the size of the class, must be predetermined by the course designer.

The size of the class is an important issue as it affects both the economics and instructional effectiveness of the course (Horton 2000).

The class size affects the design of activities and other course materials. The business and teaching objectives of the institute are considered to decide on a class size.

4.3.4. Decision 4 : Learners Profile

All courses are designed for people. In traditional system, there is a classroom in which people are taught in predefined periods of time. However, there are many place- and time-choices in distance education. Learners take their lesson in the places where they want. Only the technology which is used as mediator limits the places.

The WBE designers must predict and design for where learners will actually take the courses. The choice can be the learner's office, a learning center, home, and even the road. According to place where the lesson will be taken, the technical specifications of computer, the speed of network connection, the technical assistance facility, the effects of the environment, motivation of the learner, the technical requirements, interruptions and distractions will change. They all affect the design of a course. For example, the network connection limits the use of media, participation in live events, and use of confidential or secret information in a course. The environment of the learner affects the learner's attention, their participation in an activity. The choice of computer affects the use of multimedia tools in course design.

There are many design criteria recommended for a successful course in many books. The following tips are the essence of them.

If learners will be taking courses in his/her office;

- Create the course with short modules
- Use large graphics and multimedia if the speed of the network allows them to load quickly

If learners will be taking courses mainly in learning centers;

- Use multimedia, advanced browser capabilities, and large graphics freely

If learners will take courses from home;

- Limit the size of pages so they download quickly even at modem speeds
- Design the course to accommodate frequent interruptions
- Increase efforts to motivate learners
- Minimize the technical requirements, especially the plug-ins the learner must download and set up

Taking a course while traveling is a very seldom case. Unless it is specially requested , designing a course for traveling people goes for nothing.

4.4. Technology Standards

Technology is the most important factor affecting our goals and limitations. In this section I will only touch on the importance of choosing a browser, file formats, and file sizes. The right choices bring the success.

4.4.1. Browsers

It is impossible to display web pages without browsers. For this reason, choose one or two specific browsers. Each version of a particular brand of browser adds new capabilities to that browser. For example, the Dynamic HTML supported in Version 4 browser may be adequate for simple animations that would require a plug-in with Version 3 browsers (Horton 2000).

4.4.2. File Formats

The choice of file formats may limit the choice of tools for creating course materials. Learners prefer the courses requiring less downloads and plug-ins. In order to design a successful course, pick file formats that play in the browsers most people already have.

Browser-native formats

The formats displayed directly by the browser itself without assistance from other software, such as plug-ins are called browser-native formats. They depend on the brand and the version of browser. The browser-native formats for Internet Explorer 5.0 are:

- HTML, including Dynamic HTML, and Cascading Style Sheets (CSS)
- Text (ASCII and Unicode)
- JavaScript 1.2
- GIF, JPEG, and PNG graphics
- XML, including XSL style sheets
- Java

Consider platform-independent formats

Platform-independent formats are usually industry standards rather than proprietary formats. Though plug-ins are required, they exist for most browsers and are either inexpensive or free. Some industry-standard formats include:

- Music : MIDI
- Video : MPEG
- Virtual Reality: VRML

Web formats

Here are some formats in this category:

- Sound : WAV, Real Audio, MP3
- Multimedia : Shockware Director, Shockware Flash, QuickTime, AVI
- Documents : Adobe Acrobat PDF, Rich Text Format (RTF)

Virus-proof formats

For example, a Java applet is more virus-proof than a Java application. A word-processing document without embedded macros is more virus-proof than one with macros.

4.4.3. File Sizes

Learner's connection speed determines duration of the downloading process of a web page. The total file size for each page is limited in order to provide a reasonable downloading period. Here are some guidelines that should get most pages down the cable is less than ten seconds (Horton 2000):

If learner's connection speed is:	Limit each page to a total size of:
14.4 Kbps	10K
28.8 Kbps	20K
56 Kbps	40K
128 Kbps	80K
1 Mbps	640K
Faster	1 Megabyte per Mbps

4.5. A Framework of a Web-Based Course

> "There is more to a successful course than instructional content. Successful courses require a framework to entice learners, to register and orient them, to keep them informed about the course and the people associated with it, to help them navigate the course reliably, and to congratulate when they are done. Such a framework or "shell" provides a study home for the lessons and other learning materials of the course."
>
> (William Horton)

Neither two professors will teach exactly the same way, nor two web sites will be the same. However, most web sites should contain similar information to benefit the students. The consistency of web site design is important for two reasons. First, a consistent design for a university's web offerings is important to help students navigate numerous courses. Second, all online courses should contain certain key components because these components are necessary to ensure the students' successful course completion.

To accomplish these goals, many authors and professionals issued their opinions about what sort of web pages should be consisted in a course framework. The following framework is proposed by considering these advises.

A course framework is a very important part of a Web-based course. We can say that the success of a course mostly depends on the successfully built framework. It consists of the Web pages which are specifically designed for a specific role or purpose. The titles in the boxes below are the objectives of these pages.

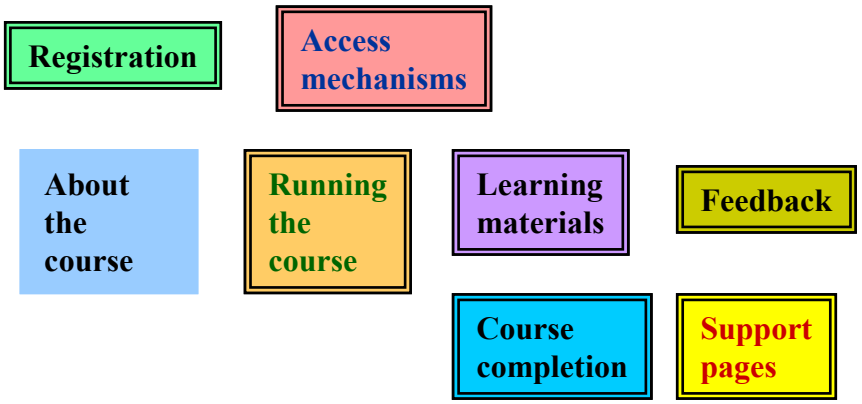

Figure 4.2. The Components of a Complete Course Framework

4.5.1. About the Course

Learners want to know about a course before they make a registration to that course. This is required even if it is mandatory. The box named "About the course" contains some useful web-pages that inform learners in many respects.

Course Announcement Page

The main purpose of this page is to call learners' attention to that course. This is achieved by giving the objectives of that course and some information such as fee, instructor's name, format and duration of the course. It also consists of links to other web-pages to offering more details about the course. The web-pages generally branched out from the announcement page are briefly defined below.

Course Description Page

This page provides complete details about the course. The more successfully designed 'description page', the more successfully marketed course. Generally, the following items are included in a description page.

- Identification of the course: number, title, version, etc.
- Invitation to the course
- Specification of the course: length, language, fee, etc.
- Objectives of the course
- Prerequisites
- Technical requirements
- Fees and costs
- Author or instructor of the course
- Grading policy and procedures
- Links to alternative sources
- Link to continue

Objectives Page

In the analysis phase of a course, the teaching objectives of that course are determined. If these objectives perfectly match with learners' learning objectives, that course attracts learners. In order to achieve this, it is required to tell people what they will do, be able to do, understand, and believe by taking the course.

Organization Page

An Organization Page identifies the training department, or university offering the course and any advantages it provides to learners who take its course.

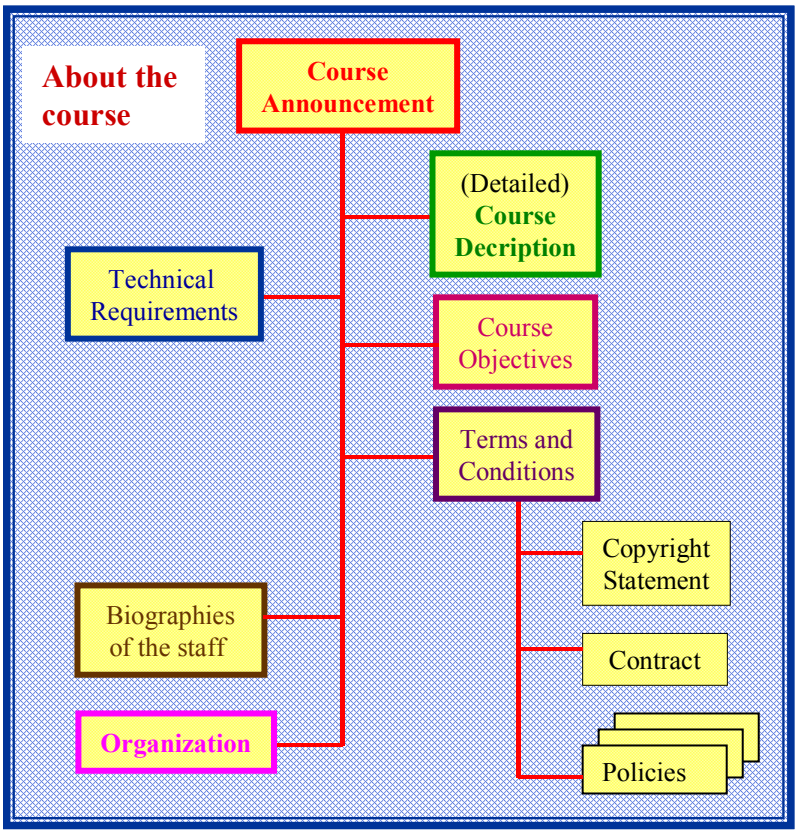

Figure 4.3. About the Course

Biographies of Staff Members

In traditional system, learners and instructors contact with each other face to face. This is a great advantage to know the instructor. However, this contact is lost in web-based training. In order to win learners' confidence to the instructor and other staffs, a complete but brief biographies of them should be included. Instructor's e-mail address and phone numbers should also be included.

Terms and Conditions Page

The Terms and Conditions page typically contains a short form of the contact, including the agreement to be bound by the full contract and the policies of the course (Horton 2000).

It is branched out as policies, contract, and copyright statements.

Course Policies

The Course Policy is typically a long document that provides details only summarized or mentioned in the course description (Horton 2000). Most of the questions in mind of the learners such as billing policy, withdrawal policy, grading method, privacy are explained.

Copyright Page

Copyright ownership must be clearly stated, to preserve university's or department's ownership of that course and all its many pieces of text, graphics, and multimedia.

The Web is full of millions of documents. Some of them are registered to the copyright registration office, but some of them are not. With the growth of the Web and the proliferation of Web-based education, this subject is becoming a very important issue. Because of the nature of all digital resources, they can be easily copied and used in other projects. Thus, people generating income without making an effort. In order to prevent this kind of use of resources on the Web, all developers of Web-based education should know about copyright law.

Legal Contract Page

This is a typical contract that states exactly what the learner can and cannot do with the course and what rights the learner has and which the learner waives.

4.5.2. Registration

As carried out in many sites, registration is completed in two phases:

- filling a registration form; from learner to WBE site
- sending an e-mail acceptance; from WBE site to learner

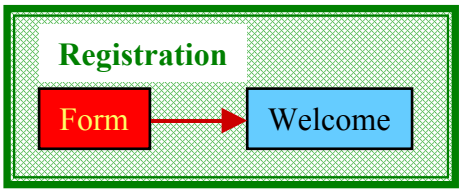

Figure 4.4. Registration

A learner is accepted to the course after s/he completely filled the mandatory items in registration form, and submitted the form to the WBE site. Registration is finalized with an e-mail message sent by course administrator, which informs learner's login ID and password.

4.5.3. Running the Course

Welcome Page

The Welcome Page provides a "front door" for students. This page is a "virtual" greeting as they enter the online class. It makes them feel at home and eager to get on with the course. Inclusion of a graphical link to this Welcome Page can be suggested.

Biographies of Learners

This may be an optional item. If learners wish to forward their biographies, they can. Providing a template or a checklist may help learners.

Roster Page

This is a kind of directory including instructor, other staff members, and learners names and their e-mail addresses with hypertext links. The purpose of the roster is to enable learners, instructor and other staff members to communicate with one another.

Course Home Page

The course home page is the default location when restarting a course. The announcements related to the course, such as upcoming events, activities, schedule changes, new events, etc., take place on this web-page.

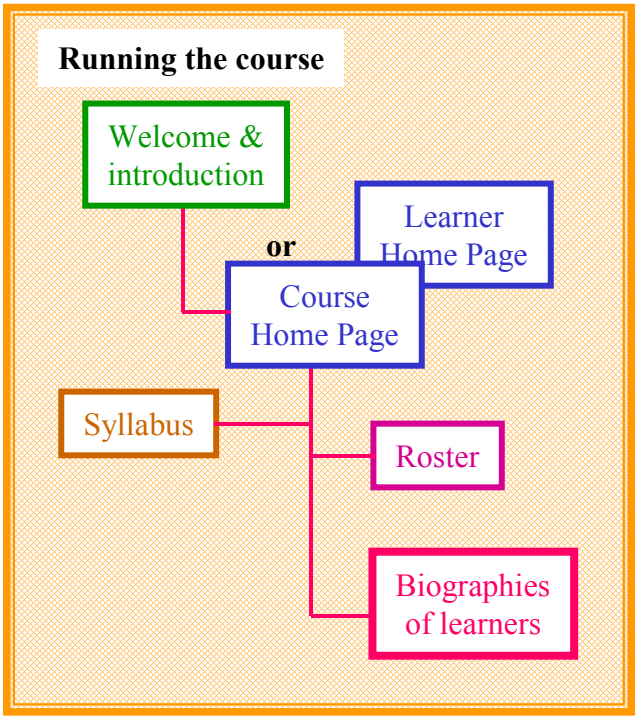

Figure 4.5. Running the Course

Learner Home Page

Some WBE tools display a home page customized to the individual student. It provides pertinent details, announcements, and reminders for all courses the learner is taking. With such a page, the learner does not have to visit the individual home pages for each course in which the learner is enrolled (Horton 2000).

Syllabus page

The syllabus is the core of instructor-led WBE courses. It lays out the schedule of the course and links to all the activities, presentations, readings, staff members, and external resources of the course (Horton 2000).

4.5.4. Learning Materials

Some pages of the course framework help learners find the learning materials they need through out the course. Some of these resources are internal to the course and others reside on the wider Internet (Horton, 2000).

Course Resources Page

The Course Resources page presents the learner with a list of resources of value through out the course. These could include plug-ins, downloads, campus help lines, links to the community or university libraries, and/or links to web sites related to the class or subject matter.

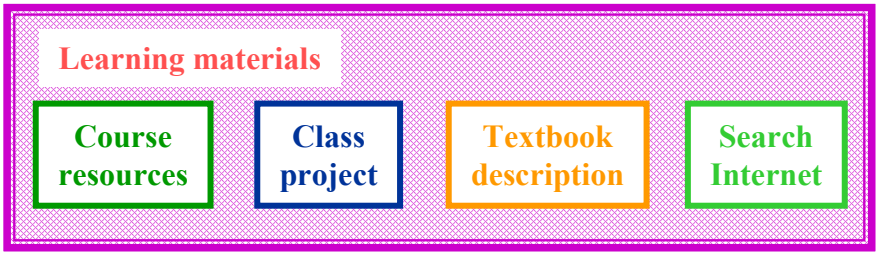

Figure 4.6. Learning materials

Search-the-net-page

Include a page for triggering searches with the most popular search engines.

Textbook Description

If the course uses a paper textbook, include a description of the book. Provide enough detail for learners to obtain the book.

Class Project

If students must complete a substantial project, provide complete instructions.

4.5.5. Course Completion

At the end of the course, an announcement is made to inform learners that the course is over.

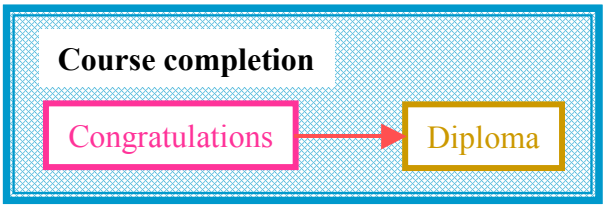

Figure 4.7. Course Completion

Congratulation Page

This page clearly signal the end of the course.

Diploma

A diploma or certificate of completion is forwarded to the learners via internet.

4.5.6. Feedback

Collecting learners' opinions and suggestions are very useful to improve quality of the course. As we mentioned before, design is a cyclic process. The feedbacks obtained from learners are continuously evaluated and then the required changes are done. The feedbacks are collected with in three ways: pre-course survey, comment forms, and post-course survey.

Figure 4.8. Feedback

Pre-course Survey page

This is useful if you want to learn more about learners and to more precisely target their learning needs.

Comment forms

Through out the course, learners offer feedback, point out errors and make suggestions by clicking links or buttons sprinkled on the course pages.

Post-course Survey page

This is a questionnaire forwarded by WBE center, investigating the success of the course. This feedback helps improve the course.

4.5.7. Access Mechanisms

These mechanisms let learners find their own way.

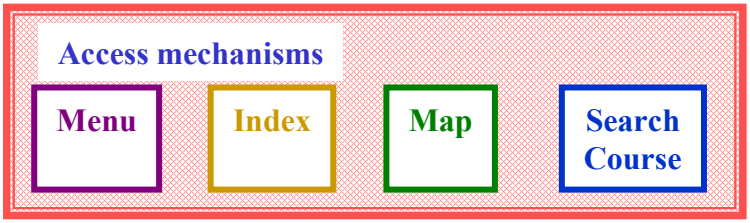

Figure 4.9. Access Mechanisms

Menu and Table of Contents

The menu is a hierarchical organization of the Web pages that make up a course. It shows what the course or lesson covers, reveals how it is organized. Good menus organize the entire course into a few levels with a few choices at each level. They thus simplify the task of finding individual pages.

Index

The index is an alphabetical list of terms assigned by human indexers. Format of an index in WBE is similar to an index in a book, but hypertext links are used rather than a page numbers.

Map

A map places a mental model in the mind of the learner. A good course map;
shows the main categories and subcategories, links to categories and subcategories,
reveals and reinforces the organizing metaphor (chapters, rooms, buildings, etc.)
is usually attractive.

In general, an organizational map is best for aiding immediate navigation within the course, and a conceptual map is better for helping people learn relationships implicit in the material (McDonald and Stevenson 1998).

Search

Some large courses contain a text-search mechanism similar to the 'find' command in word processors or Internet search services. Including search mechanism is a difficult task, but often worth the effort for large complex courses.

4.5.8. Support Pages

The Course Tutorial, Help, and a FAQ (Frequently Asked Questions) page are the support pages.

4.6. A Framework for Online Interaction

As a first step toward proposing a framework for online interaction, I reviewed definitions of the terms used in the research literature. I found some consensus and some areas of disagreement in definitions and use of terms.

Generally, the terms "interaction" and interactivity" are used interchangeably. However, Wagner (1994) draws a sharp distinction between them. She says that "interaction" is an interplay and exchange in which individuals and groups influence each other. Thus, interaction is when there are "reciprocal events requiring two objects and two actions (p. 20). On the other hand, she says "interactivity" seems to have emerged from "descriptions of technological capability for establishing connections from point-to-point … in realtime" (p. 20). Thus, interaction focuses on people's behaviors, while interactivity focuses on characteristics of the technology systems. Even if one accepts this distinction, it is clear that there is a relationship between these two qualities in distance courses.

Interactivity is crucial for success in Web-based learning. The purpose of interaction is to promote explanation and challenging perspectives among two or more learners (Garrison 1993).

Northrup and Ramussen (2000) classify interaction as;

- Student to instructional material
- Student to instructor

- Student to student
- Student to management (feedback).

Engaging and reflecting, annotating, questioning, answering, pacing, elaborating, discussing, inquiring, problem-solving, linking, constructing, analyzing, evaluating, and synthesizing are the activities of an interactive course (Liaw and Huang 2000).

Interaction must be designed intentionally into the Web-based course. Although there are some technological restrictions, if it is well-designed, it is possible to develop a successful Web-based course having interactivity. The dose of interactivity is very important. "The more interaction" is not "the better". Gilbert and Moore (1998) suggest that the more interactive the Web-based course becomes, the more complex it is to use.

Northrup (2002) suggest a framework for online interaction, that provides five interaction attributes of an online course:

1. Interaction with content,
2. Collaboration,
3. Conversation,
4. Intrapersonal interaction, and
5. Performance support.

4.6.1. Instructional Content and Interactivity

Northrup (2002) defines the instructional content as the central component of a Web-based course, as this is where knowledge, skills, and abilities are presented.

Categorically, there are two approaches to present instruction;

- Instructor-centered approach
- Student-centered approach

The expectancy of outcomes of instruction determines the approach we will choose.

Instructor-centered approach. If instruction were procedural, declarative, or well-defined role and definition, this approach would work well. Generally, information is presented, examples are provided, practice exists, and, in many cases, feedback is available through instructors. Lectures are presented via text and graphic online, e.g. PowerPoint lectures.

Student-centered approach. Student-centered learning is appropriate for outcomes of instruction that are focused on analysis, synthesis, and evaluation (Berge 1999). In this approach, the responsibilities of a learner is much more than the previous one. S/he must be an "ideal learner".

Examples of student-centered learning in a Web-based environment include demonstrations, debates, simulations, role-plays, case-studies, and discussion groups (Berge 1999, Paulsen 1995).

4.6.2. Collaboration and Interactivity

The topics used for designing collaborative environments are similar in the traditional classroom training and on the Web-based courses. For example, group size, group role definition, group assignment all are issues common both of them.

An effective collaborative group requires positive interdependence, group and individual accountability, promotive interaction, and interpersonal skills (Johnson and Johnson 1994).

4.6.3. Conversation

To facilitate successful online conversation, Chism (1998, pp. 7-8) suggests six strategies:

- Building group coherence by getting to know one another online.
- Sharing information by assigning collaborative groups.
- Processing ideas by elaborating on discussions, sharing cases, and asking questions of one another through listservs.
- Online tutoring as a tool for asking peers questions is preparation for an upcoming test.
- Refining a communication skill by framing arguments and leading e-discussions.
- Providing feedback to students through peer critique and instructor critique online.

Engaging in both synchronous and asynchronous forms of conversation can extend learning online while motivating the online learner and extending the social interaction of the course (Sherry 2000).

Most online course delivery systems include a synchronous communication tool, such as the chat room, as well as interactive asynchronous tools such as e-mail, listserv, threaded discussion, and bulletin board. When used effectively, each of these can be used to maintain high levels of communication between and among class members and the professor and to promote desired levels of interactivity. The following is an overview of some of the strategies used by the authors to maintain quality interactivity in the online environment.

Chat

Chat is a real-time, electronic form of communication. It affords both the instructor and students the opportunity to engage in real time discourse and dialogue. Research shows that tudents participating in online courses where chat is used effectively on a consistent basis often identify frequency and quality of feedback as a major benefit. Constructive, interactive feedback helps shape student progress through the course in the synchronized learning environment (Roberson and Klotz 2002).

E-mail and Electronic Mailing Lists

Course delivery packages such as Black Board and WebCt include the capability for private e-mail within the course for communication among students and between students and instructor. An online instructor may also wish to set up an *electronic mailing list* either through a university server or other means, to which all class members subscribe. Commonly referred to as a *Listserv* (registered trademark of L-Soft International, Inc.), the electronic mailing list is similar to e-mail except when a message is sent, all subscribed members simultaneously receive the same message. This application is another valuable resource in the toolbox of online course delivery. Its major advantage is that it affords students the opportunity to communicate with the entire group via a single message. This *group messaging* and ease of communication enhances the sense of community that can be created in online courses. This ability to communicate with all students via one message can also be used by the instructor as an instructional tool.

Bulletin Board

An electronic bulletin board serves the same function as the cork or felt wall-mount versions common in many offices. It is the place within the online course where students and the instructor can post announcements and messages. The bulletin board can be a place for students to find updates, changes, important messages, assignments, and group correspondences. Because files such as lecture notes, power point

presentations, etc., can be attached to messages posted on the bulletin board, groups can post projects for others to view and provide feedback.

Threaded Discussion

One powerful application of the bulletin board is the use of a threaded discussion. This application allows the instructor to organize a thematic threaded discussion by posting a topical statement, question, problem, case study, etc., and then directing students to respond based on their knowledge, experience, readings, and interactions with other students. Using threaded discussions equalizes student participation (Procter 2000), something difficult to achieve in a traditional classroom setting. Unlike conditions present in a chat room situation, which is constricted by time, the threaded discussion affords students a longer period of time to frame ideas and respond to the original posting and to subsequent student postings (Roberson and Klotz 2002).

4.6.4. Intrapersonal Interaction

This attribute of an online course is included to the proposal framework, so that monitoring one's own learning would be possible in a Web-based environment. Self-questioning, summaries, explanation of to-be-learned content, standard times for completion of each of the weekly assignments, tips and ideas for time management and independent learning are some of the cognitive strategies which can be embedded within a Web-based course.

4.6.5. Performance Support

Performance Support is recognized as "…an electronic system that provides integrated access to information, advice, learning experience, and tools to help someone perform a task with a minimum of support by other people" (Raybould 1995).

In a Web-based course, students should be supported throughout the course. Student support may include tools, information, advice and learning experiences required to be successful online. For example, educational materials for students, tutorials on how to use chat rooms, reformat their computers, and access to library can be included to a Web-based structure.

Whether the course suggests a student-centered or instructor-centered approach, the quality of online interactions can promote successful learning outcomes. It is the

responsibility of the instructor and even the institution to provide a learning environment in which the learner has the opportunity for appropriate interactions with content, the instructor, and other students (Berge 1999).

4.7. Converting Classroom Training to the Web

"Organizations are taking greater advantages of the Web to provide training that is more immediate, convenient, and consistent. But there are challenges in converting classroom courses to Web-based training" (Colbrunn and Tiem 2002, p. 85).

The main activity of any education or training is the knowledge-transfer from the instructor to the learner. Many tools are used for this purpose. In traditional classroom training, as we know, instructors use some learning materials such as diagrams, charts and written notes. These materials were generally used by converting them to Web delivery form in Web-based courses. In the course of time, it is realized that converting a classroom course needs more effort. Last few years, people examined many course-conversion projects and have learned that there are a number of unique issues and challenges that arise when converting a classroom course.

4.7.1. Which Courses are Ideal for Web-Based Delivery?

Some courses are ideal for Web-based delivery, while others are not optimal for the Internet medium (Colbrunn and Tiem 2002). Good candidate-courses for Web-based learning, in most cases, focus on content and information.

"The Web is a good delivery medium for knowledge and comprehension of facts and principles, and for the application of knowledge. Application can be through simulations, games, case studies, or structured problem solving. Ideally, simulations or application exercises cover situations that can be thought through and resolved independently by an individual learner. It is possible to build opportunities to communicate with an instructor on an asynchronous (not in real time) or as-needed basis" (Colbrunn and Tiem 2002).

Web courses should not require a close approximation to job environments (Webb 1996, p.24). For example, the Web is not the right delivery mode for technical situations where patient medical conditions need to be assessed and inferred through sight, sound, and touch.

The software development of computer technology is always one step ahead from the hardware one. There are many softwares that enable synchronous communication over the network. However, there are many restrictions of requirements existing between two end points. For example, bandwidth is inadequate to enable realistic personal desktop videoconference camera shots over the copper wires. In addition, bandwidth and equipment determines the number of people who will be simultaneously accessed to the course. Because of these restrictions, most WBE is designed to be asynchronous and not delivered simultaneously; in contrast, real time human interactivity promotes optimal growth in people skills (Moore and Kearsley 1996, pp. 128-131).

People attending a Web-based course want to complete each session in a limited-time, and to cover at least one topic in that time. The duration of a session differs from course to course. It must be decided at the beginning of the development phase and then the subject matter should be separated to its segments by taking into consideration of that duration.

WBE courses need to be organized by modules based on major topic areas. In addition, courses should be taught with sufficient frequency and have large enough audiences to warrant the time, effort, and expense of the WBE conversion.

4.7.2. Specific Design Strategies for Conversion

The following design strategies are specific to the conversion of a classroom course. These strategies should be considered when converting text, converting graphics, and creating exercises.

4.7.2.1. Converting Text

The format of the text used in an instructor-led course is quite different from the one used in Web-based course. There is an expert who presents the written text in the classroom, whereas the web-based course is a self-study learning environment in which all learning materials must be clearly understandable for a novice learner.

“Essentially, the conversion to WBT is very similar to converting a course to a self-study workbook. Content has to be rechunked and organized for proper pacing and flow. Exercises and checkpoints need to be interspersed appropriately to allow for

reflection and interaction. In addition, the wording should be carefully reviewed and enhanced so that it clearly presents the message to a reader, as opposed to a listener" (Colbrunn and Tiem 2002, p.91).

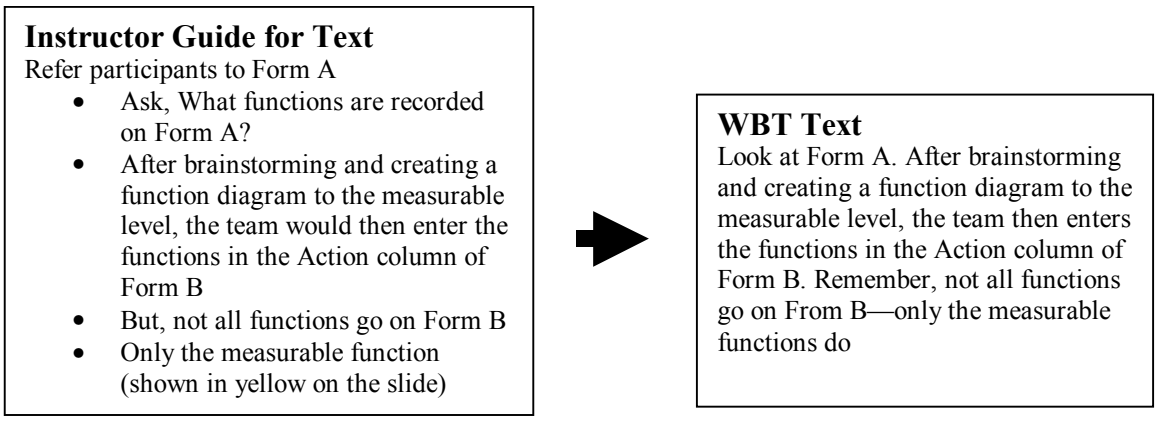

Figure 4.10. Example of text conversion
(Source: Web-based Training Cookbook (1997), Brandon Hall)

4.7.2.2. Converting Graphics

Another learning material widely used in classroom training is a presentation chart. The purpose of those slides is to support the instructor's presentation. Many slides are actually textual statements or lists. Putting those existing slides on the Web will probably decrease learner's interest in a very short time. However, the strongest feature of the Web-based courses is the possibility of delivering of any visual presentations. For this reason, in WBE, graphics are used to present or enhance the content visually. Therefore, eliminating or reinventing many of the slides to serve as graphics is needed.

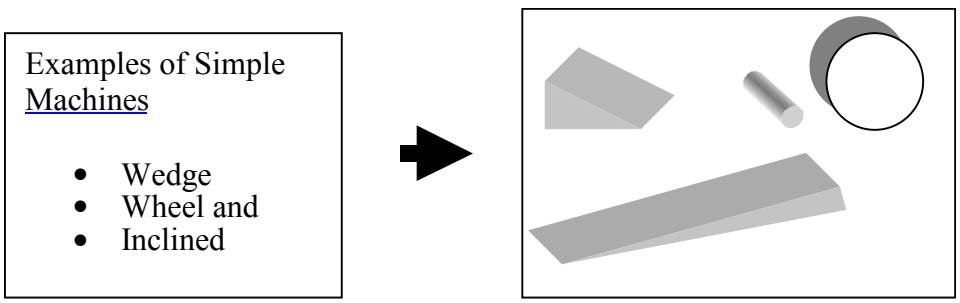

Figure 4.11. Example of graphic conversion

Graphics and visuals should be appropriately sized to be clearly read, relevant for course content, and used wisely to support, explain, and/or clarify content (Zhu and McKnight 2001).

MacGregor (2002) suggested limiting total graphic images to less than 35K per page because that size takes about 15 seconds to download using a 28.8KBPS modem. Save photographs in JPG format and line drawings or images in GIF file formats. Interlaced graphics, used wherever possible, will provide users almost immediate feedback about the nature of the graphic. Pages that require more than a minute to download are unacceptable to the average user, whose attention span for new sites has been measured at about eight seconds. To support universal access to course materials, Florida Gulf Coast University has recommended that web site developers design for download times using 28.8KBPS modems (Zhu and McKnight 2001).

4.7.2.3. Creating Exercises

Traditional Classroom exercises often take advantage of group interactions and team synergy to help students learn. Most of the time, straight conversion of existing exercises from the classroom course is not effective. Generally, the activity requiring interaction and team synergy is converted to a series of multiple-choice and fill-in-the-blank questions.

One current frustration in developing WBE is the limitations of technology. Interactivity is generally provided with using a basic programming approach in which HTML and JavaScript are used to create flashy actions. Creative use of those interactions limits its restrictions. For example, simple interactions like selecting the options or fill in the blank can be easily used instead of flashy actions that require large bandwidth and memory. Even if the interactions are simply multiple-choice questions, their creative packaging is the key to making effective exercises.

On the other hand, placing exams on the web poses a set of problems. Javascript cannot be used, since a student may easily view the source and obtain the answers, and it is important that the exams are different for each student. Otherwise, course exams will no doubt be distributed among students. In order to prevent this, questions of exams are generated dynamically. For example, in Assiniboine Community College in the USA, all possible questions are placed into a single directory (Downes 1997). From this set of questions, a subset is assigned to an individual module. From this subset, a CGI

script creates an exam by selecting random questions according to a set of rules defined by the instructor. Password entry is required to write the exam, and each attempt to reload the exam page, since it reactivates the PERL script, counts a an attempt.

Probably the most troublesome issue with administering assessment instruments is insuring that those being assessed are who they say they are. It is difficult if not impossible to reliably ascertain a participant's identity when communicating over the Internet. If reliable identification is necessary to maintain course integrity, arrangements must be made to administer assessment instruments through a proctored arrangement. This may require that participants meet periodically at a central location, or that arrangements be made at a reliable institution near the participant's vicinity.

According to the 'Regulation of Distance Education' of Higher Education Asssociation (YÖK), assignments are forwarded to the students through the Internet and the answers are obtained through the same medium. As a principle, some sort of exams such as homeworks, quizes may be assigned through the Internet but the weight of this sort of exams on final the mark is only 20% for bachelor's degree. However, 80% of the final grade should be of the exam grades which are taken at a reliable institution under proctored arrangements (Regulation of Distance Education, www.yok.gov.tr).

As the popularity of the Web continues to increase as a tool for education, academic institutions will continue to convert classroom instructions to WBE. By choosing the correct approach and taking into consideration the above-mentioned issues, producing high-quality web-based courses is possible.

CHAPTER 5

PROPOSED MODEL FOR WEB-BASED EDUCATION

Many universities are just starting out with distance education, commonly with web-based education, and it is necessary to identify different levels of involvement an institution may have. Stenerson (1998) states that four levels of distance education can exist. They include Distance Learning Programs, Distance Learning Units, Distance Learning Institution and Distance Learning Consortia. At the program level, distance education is usually carried out by a select few who are working on their own and have no system resources. The unit level is a self-contained unit within a conventional institution where there are dedicated resources and the potential exists for the design of a system. The institution and consortia levels represent a complete and dedicated institutional "system" for the delivery of distance education (Moore and Kearsley 1996). In this study, a model emphasizes the need for system analysis, design and evaluation for the Distance Education Units is proposed. The scope had to be limited due to the challenges of incorporating a distance unit into a "traditional" higher educational system.

5.1. Model Requirement

Advances in information and communication technologies in recent years are exerting significant effects on education systems and their applications in schools, colleges and universities. Particularly higher education institutions are constantly under pressure not only to adapt the web-based distance education system (WBE) but also to restructure its administrative frameworks in order to utilize the superior features of these system (Bothel 2001).

Successful applications of WBE require efficient redistribution of human and financial resources. These reformations need to be supported by policies, which should be transferred into actions by intelligent strategies. It is imperative to employ consistent decisions throughout this stage to ensure long-term success of these systems.

One important aspect of WBE system at application stage demands the adequate supply and maintenance of technological tools, which enable the instructors and students communicate efficiently regardless of their respective locations. However, the cost of a WBE system should not be equated to the mere supply and maintenance of these tools. The long-term success and cost effective application of a system can only be achieved by appropriate integration of technology with education. It also requires the interaction of decision-making processes with control processes during systems improvement stages. The establishment of a successful model satisfies above-mentioned points and ensures the efficiency of the system in the long run.

This study focuses on the framework creation and structural reformation stage of WBE system adaptation in a higher education institution. The conceptual model created in this study strategically highlights three most important aspects of WBE system, namely technology, cost and efficiency, in planning and application stage. Gellman-Danley and Fetzner (1998) state that planning for online distance learning must include financial, personal, academic, legal, technological, and support issues as a framework for future decision making. This model provides a conceptual framework to an institution at and beyond the stage of adaptation of a WBE system.

5.2. Purpose of the Model

The primary objective of this study is to propose a conceptual framework for the implementation process of web based education in a higher education institution by determining the important steps of the restructuring stage through system analysis, system design and evaluation phases. Therefore, this study is expected to be a starting point for the institutions, which are considering to implement web-based education.

In the light of the current high demand for higher education in Turkey and the regulatory and legal backing achieved in December 1999 (with “Distance Education Regulation”), this model would provide a solution to most institutions which are trying to balance the technological backing and educational efficiency while restructuring their administration.

5.3. Model Development

Before an institution offers WBE, it should fully understand the distance education system and its subsystems and their interaction with each other. Considering that it is very difficult to investigate the changes of system parameters, their effects on each other in an operating system, a mistake made and a wrong direction taken at this stage has the potential of leading the institution to difficult situations. Therefore it is imperative to start the process on a conceptual model in order to see and analyze the restructuring as a whole.

A conceptual model helps to identify and explain a system, its components and their relation (Kara 1979, p.82). Therefore, a conceptual model developed for implementing WBE would explain the characteristics of the distance education system and provide a foundation for fine tuning the WBE system for individual applications.

5.3.1. Hypothesis

It is important to pay attention to the below hypothesis as the validity and adaptability of the conceptual model depends on them.

- The institution may channel its resources to both the traditional education and Web-based distance education.
- The institution is able to utilize administrative components and resources like equipment and work force for restructuring for WBE system.
- The institution is capable of offering WBE as a host university.
- The students have access to the necessary media to follow the WBE.

5.3.2. Methodology

Implementation of WBE and restructuring process regarding that should be treated as a system with its concept, principals and strategies. In order to achieve this the conceptual model should be investigated at the level of its subsystems as every subsystem creates process of its own. The final conceptual model is based on this approach.

5.3.3. Structure

The components of distance education system should appear within the overall institutional system. A higher education institution with its internal and external relations, educational activities and all related involvements is a dynamic system. It has to adapt itself to the advances in educational technologies. A higher education institution, while restructuring itself to utilize WBE and its superior features to meet the increasing and various demands of education, has to follow the scientific path.

Making use of the system-approach during the implementation stage will have a very positive effect on the future success of the system. This approach enables the events, situations and problems to be handled as parts of a system (Erkut 1995, p.61) which in turn makes the process easier to be evaluated as a whole, and provides various solutions to problems.

The conceptual model suggested for a higher education institution to implement WBE has been created based on these arguments on these three subsystems (Figure 5.1.):

1. System Analysis
2. System Design
3. Evaluation and Control

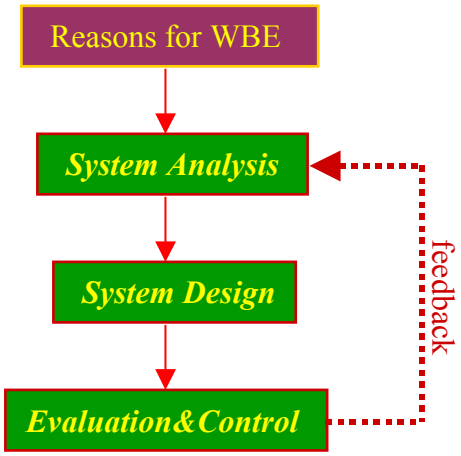

Figure 5.1. Schematic Illustration of Proposed Model

Every subsystem in this conceptual model has been created to reflect their interactions with each other in distance education system. Because of the continuous interaction and integration of the subsystems they should not be considered as if they are independent of each other.

5.3.3.1. System Analysis

The primary question universities should ask themselves is, why do they want a WBE program? Determining the purpose of a WBE program will enable the university to proceed with the process of system analysis and planning. “Planning should allow for adequate budgeting for staff, technology, student services, and training for all of the areas of WBE in meeting the needs of the institution” (Levy 2003, p.2). By deciding why it wants a WBE program, the institution needs to decide what it needs. In order to make this decision, the institution must firstly determine its vision.

All organizations have a vision statement that describes where they want to be and a mission statement that tells what they do currently. Many authors have written about the necessity of having a vision and plan for the implementation of online distance education (Aoki and Pogroszewski 1998; Hache 2000; Miller 1998; Moore 1994). Hache (2000) made it clear that when university faculty, staff, and administration start with a vision, it is necessary for them to understand that this vision will result in a change in the organizational culture. “For a distance-learning program to be successful, it must be clearly integrated into the vision of school administrators and the organizational structure of a school” (Bothel 2001, p.1).

There are four distance-learning models prevalent today that can be used to help establish localized visions for institutions. They are listed in the article titled as “Bring It All Together” (Bothel 2001) as: Support Center, Administrative Center, Academic Center, and Training and Education Center. “The *Support Center* is the most prevalent model” (p.3). These types of support groups that form a technology or learning "center" are often found under the umbrella of an individual department in a college. For example, a major university may have the college of education with a support staff, the school of medicine with a support staff, and other academic entities with individual staffs supporting course design and the use of educational technologies supporting distance learning. “The *Administrative Center* is one of the newest models and might

also be referred to as a "broker" model" (p.4). This model has an entity outside the typical university or college structure to administer or broker courses and degree programs. This entity administers courses/degree programs, but does not have large numbers of faculty of its own. A limited staff maintains the "University", but extensive dollars are spent in advertising and promotion. Some type of infrastructure will be established to exhibit courses, but it does not necessarily include extensive hardware and networking infrastructure. Western Governors University (WGU) and California Virtual University might fall in this category. "The *Academic Center* is an independently accredited entity that delivers its own degree programs" (p.4). There is a core academic group of very few full-time faculty administrators that recruit, hire, develop curriculum and schedule faculty. This model differs from the Administrative or Broker model in that the Academic Center "owns" its own programs and faculty. Distance learning methodologies provide the predominant delivery of programs with a large number of part-time faculty delivering centrally "controlled" courses. The Sakarya University-Distance Education Vocational School of Adapazarı may be an example of this model. "The *Training and Education Center* model stems from the traditional Continuing Education or Professional Development Center model" (p.5). These are profit centers that have their own faculty and staffs that have the main mission of producing revenue from continuing education and professional development. Degree programs are developed and offered through the main University on a proposal/contract basis or they may do contract course development for outside entities. The universities that have a distance education center may be an example of this model, for example Ankara university-ANKUZEM and Istanbul Technical University-UZEM. Please refer to above mentioned article for the details of these models. It is extremely important that the proposed model in this thesis does not target to those institutions which accept distance education merely a supplementary tool in their traditional education system like support centers. For this reason, in the system analysis phase, the institution must decide which model is most congruent with their vision except 'Support Center'.

In creating the university's vision and plan for distance education, the respect, value, and experience of all the participants should be considered. By including administration, faculty, staff, and students in this process, it will be easier to obtain a campus-wide consensus on the vision (Hughes 2001).

"The challenge to colleges in the 21st century is not to decide why they should have an online distance learning program, but to decide how to design and implement

such a program. Therefore, understanding how to plan a successful program will be essential to their success" (Levy 2003, p.3).

Care and Scanlan (2001) and Willis (2000) stated that the planning phase is of major importance in online distance education, and Gellman-Danley and Fetzner (1998) agreed that advanced planning and policy development are the key to a well-run distance education program. This planning will allow money to be spent more efficiently, and will also facilitate better use of existing resources and time.

An institution, which decides to implement WBE system, should start restructuring its framework by determining the factors important to implement distance education and reasons of their decisions. This decision might be taken simply in response to the changing external demand and legal, political, economical and technological changes in its country or in relation to the institution desire to expand to realize the potential global education opportunities.

Where the institution pictures itself by implementing distance education and what sort of demand it is going to respond to while it is trying to create a difference is important. In other words the institution should be able identify its future goals and spell them in such a manner that they would be acceptable within itself.

The institution should clearly identify the equation of what it wants to do to realize its goals and what it can actually do by analyzing its existing system. In today's dynamic conditions, external and internal inputs towards principal administrative functions (planning, finance, evaluation and control) are clearly the most important resource for an institution, which is trying to reach its predetermined goals. The first step of developing a system is realistic analysis of the existing system. As it is easier to achieve success in implementation through analyzing the system as a whole, it is more important focusing on system analysis instead of system design.

Prospective students and their characteristics including their backgrounds and economic situations and the ethical, social, economical, political and technological features of the market, where the WBE system is going to be presented, should also be analyzed. If this analysis is done with due care the opportunities in front of the institution would get clearer.

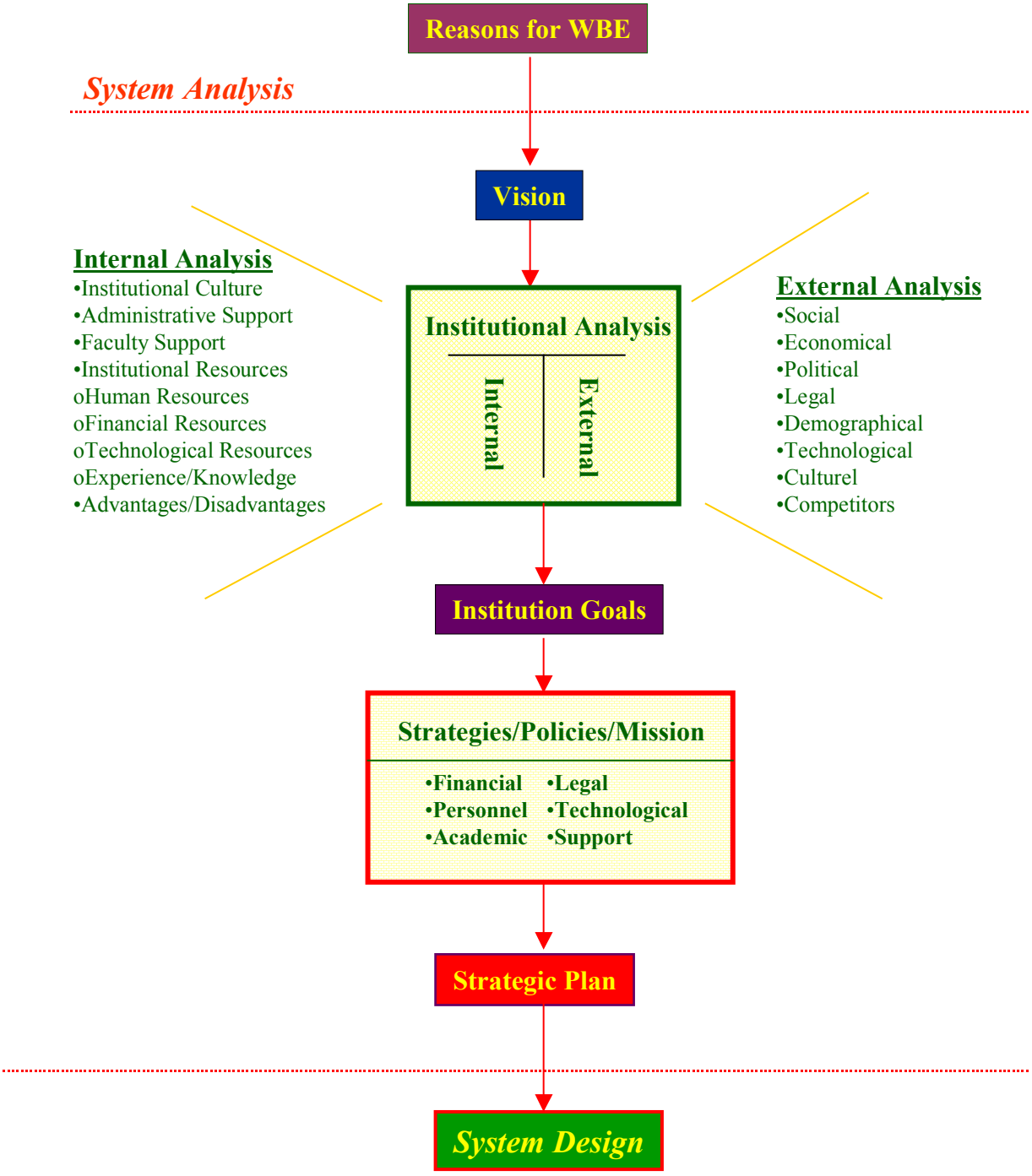

Figure 5.2. System Analysis Phase

To be able to survive in distance education field an institution should be able to keep in touch with the advances and determine its advantages and disadvantages in channeling the advances according to its needs through accurate self assessment (Stenerson 1998). Every institution should carefully investigate its own culture, target market and resources while getting prepared for the system design phase. In order to establish a distance education culture the institution should be supported by both the administrative and academic personnel. This support is vital to securing adequate resources and to successfully nurture the project through its early stages. With regard to web-based education, a commitment must be made to fund the technical and human resources to develop and deliver the course content.

Administrative support is very important because influencing participants such as instructors, and other potential participants into committing their time and efforts developing and implementing a web based curriculum. Curriculum refers to all coursework offered by a college. Without administrative support, a web-based curriculum may not get the opportunity to mature into a successful venture (McAlister et.al. 2005).

Other questions that are needed to be answered in the system analysis phase are;

- Are the existing human and financial resources enough or is there a need for a search for additional resources?
- Whom are going to be the instructors in the distance education system? Do they have enough background in distance education system or do they need training?
- How should the resources of the institution be redistributed between the traditional and distance education?
- What facilities or capabilities are available to assist in the preparation and delivery of course materials?
- Is the Web curriculum offered be congruous with the institution's mission and strategy?
- Are there institutional obstacles to adopting a Web curriculum?
- Is the technological capabilities of the institution compatible with market technologies? Etc.

The evaluation of internal and external environment analysis would determine the institution's goal. This goal should define the differences of the institution in the market and what sort of an approach it is going to adopt in presenting its own WBE system.

The institution should evaluate this goal with the existing situation. To achieve its goal the changes that are needed to be made should be clearly understood. This understanding should be supported with the right decisions and adequate controls.

In the conceptual model, the goal of the institution is considered as embracing the local, national and international markets. Even though in WBE system the geographical distances are not a concern, at least, there should still be enough consideration given to the presentation of the system to different cultures.

In order to implement WBE successfully an institution has to analyze its current system from different angles and develop a strategic plan according to the results of these analysis, and then design the new distance education system. A strategic plan avoids the institution from unnecessary costs, wasted time, confusion, frustration, and stress for those who are involved with web-based distance education. Levy (2003) states that there are six distinct and specific areas that must be considered in a strategic plan. They are; vision and plans, curriculum, staff training and support, student services, student training and support, and copyright and intellectual properties.

5.3.3.2. System Design

Second subsystem in the conceptual model is the system design. This subsystem has three different stages. In the direction of the institution's vision and the light of the target market analysis; administrative design requires administrative activities like resource planning, reallocation and distribution, development of supporting strategies and the policies regarding curriculum, while technological design requires the fusion of the curriculum with the available technology. On the other hand educational design determines the curriculum implementation itself. To be able to create a successful design, it is important not to separate these three stages but create them coordinately.

As with all new system designs, distance education system design should be closely monitored to solve problems as they appear and before they cause major impacts on the rest of the system.

In the following subsections of this section, the “three stages” of the subsystem is going to be defined. However, it needs to be emphasized that all the information conveyed in the previous chapters is aimed to form a basis for the subsystems of this proposed model.

5.3.3.2.1. Administrative Design

Administrative design encompasses all the administrative issues of the WBE. These issues can be grouped under four major functions of management; planning, organization, motivation and evaluation (Freeman 1997, p.5 and Cole 1993, p.6).

An institution needs to perform its administrative functions like policymaking, strategy and plan establishment aimed at student services and support, pedagogical support, technological support and financial support efficiently while implementing WBE. The policies have significant effects in determining the principles of educational design. The strategies and plans also define the means to reach the goals. For example, if a program intended for the international market requires interaction in three aspects and institutions policy is trying to find low cost options, the strategies should direct the distance education towards asynchronous models. These strategies should include and encourage the aspects like acquiring interacting technology, human resource management, broader resource planning and technology training.

After a diligent target market study and the characteristics of the prospective students are established the institution should determine its application and enrolment requirements and develop its administration and student support systems according to these requirements.

Administrative design should incorporate pedagogic support through defining the function of the instructor and specifying their selection criteria, rights and responsibilities. Financial services like investments for curriculum presentation, resource allocation for the duration of designated periods, budget preparation, financial responsibility identification by the institution should also be taking part in the administrative design.

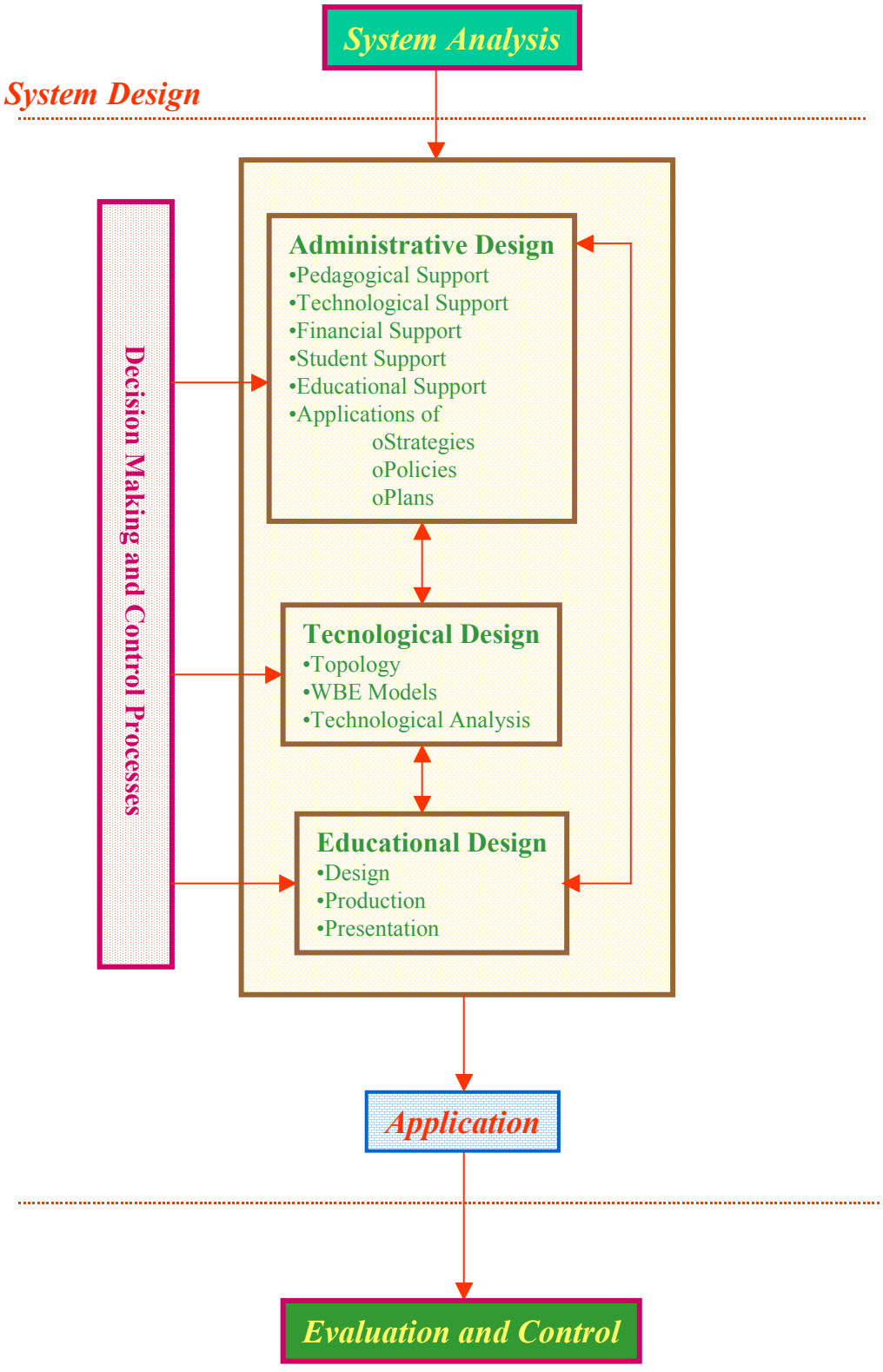

Figure 5.3. System Design Phase

Web-based education is not just about teaching and learning, it is about giving students an experience equivalent to the on-campus students (Berge 1998) by providing online the same types of student services that are available for on-campus student. Student services are the non-instructional activities provided by a college to support a student's education, such as catalogues, schedules, admissions, assessment and placement, registration, financial aid, scholarships, billing, bookstore, degree requirements, grades, transcripts, student clubs, counseling, faculty office hours, tutoring, labs, and library resources. In the design phase, the strategies and plans covering these requirements, that are congruent with the institution's vision and plans, must also be considered and implementation of these services are realized.

It is important to determine the strategies relating to student evaluation and grading methods, acquiring of instructional materials, course administration, and preparing a course-table incorporation with the educational design.

Course delivery through the web opens up a new range of options in how class materials are authored and used. For example, someone other than the person that developed the course materials may administer the course. In addition, course materials may be used for many sections of the same course with multiple instructors. There are many unresolved questions about the ownership of this intellectual property, and its continued use.

Copyright law is a major area of law that effects higher educational institutions. Institutions need to protect their interests while maintaining academic freedom for their instructors. Therefore, establishing a copyright/intellectual rights policy is necessary to deal with issues before a problem occurs (Gasaway 2002). This policy must be prepared at once by taking into consideration of both Turkish and international laws and regulations.

Additionally an institution should involve its future aspirations in administrative design. These aspirations like expansion of the target market and creation of their own footprint within WBE system should be supported by appropriate strategies and policies, which will make most of the future opportunities as they arise.

5.3.3.2.2. Technological Design

As mentioned earlier technological design is the identification of the means of the available technology, which is going to deliver the curriculum according to the institutions goals. Institutionally, adopting a Web based curriculum may represent radical change to the traditional academic model. This change may require instructors to spend a significant amount of time familiarizing themselves with the Web and its technologies. Furthermore, instructors must adapt their instructional techniques and materials to take advantage of distance learning opportunities and to minimize the impact of a remote teaching environment. In this approach, technology-based materials are initiated and developed by faculty. In the literature this sort of approach for planning and managing courses are called as 'Lone Ranger and Tonto's approach' (Porto and Aje 2004). Although this model has many advantages like maintaining the autonomy of the faculty, understanding the potential of the technology and thus leading the faculty to innovative ideas, its disadvantages must be considered while deciding to a model. It is stated that "amateurism rules in the design and production of educational materials" (p.2) under this kind of approach and it is not cost-effective, since faculty members might spend too much time dealing with technical issues, instead of focusing their energy on their mission at the institution (Porto and Aje 2004). In order to avoid these disadvantages, the 'Author-Editor' model, which is discussed by Moore and Kearsley (1996) is preferred. In this case, "a subject matter expert writes the draft of the study guide and an editor (or editorial staff) produces the final document" (p.104). In deciding what courses are going to be developed for web-based education, and which development model will be applied to each course should be determined by taking into consideration of the human resources of the institution.

On the other hand, administrators seem to believe that if they furnished the course with technology, the students will be readily available. Yet, the technological infrastructure should not be built without considering the academic and educational requirements of an distance education program (Rockwell et.al. 2000; Rumble 2000). Therefore, technological design should be developed with administrative and educational design.

Preparing materials for web delivery requires facilities for the collection of graphic, video, voice, and text content. Hardware and software tools capable of doing

this are readily available, but require some investment in adequate facilities. It is unreasonable to expect the development of adequate course materials without providing adequate support. While these technologies do not have to be "cutting edge", they should be current. It is also important to understand that new technologies are continually being introduced, and therefore continual update of course materials and methods is required.

The use of broadband, VoIP technologies, advanced authoring tools, etc. have enabled the use of multimedia and simulation as part of the web-based courses. “Interactive video, audio-graphics and audio-conferencing soon will not be considered as separate technologies, but embedded in web-based learning” (Porto and Aje 2004, p.2). The use of these media through the same medium is generally called convergence. Technological convergence is also the channel for intertwining course development and delivery such as software interface, medium capabilities, and a diverse set of software tools.

A number of companies have developed course delivery software that facilitates the organization and transmission of course materials. Selection of one of these products can greatly simplify the task of delivering and maintaining course materials. Although adoption of these platforms is attractive, it may also impose constraints on what you can do in delivering course materials and conducting a class. A needs assessment should help guide the selection of a course delivery platform. One factor making this process difficult is the continuing developments in this software. Nevertheless, each software package has strengths and weaknesses that must be assessed. An additional factor to consider is the technological infrastructure required to effectively implement the software. Some of the universities in Turkey developed their own course delivery software, however some of them preferred to use on-the-shelf ones. The forwarded questionnaire and the collected answers from some of the universities offering distance education (!) are evaluated in Chapter 6, please refer to it for the details.

Theoretically the Web allows us to maintain our course materials anywhere in the world. For practical purposes, however, it is important to select a site that can adequately deliver materials to the intended audience. Adequate facilities will insure that course content is delivered in a timely fashion, and that demand for these materials will not overwhelm the delivery site’s capabilities.

Although institutional facilities are usually assumed to be available to host a web-based curriculum, they may be inadequate. Depending on the mix of content that is

offered in web-based courses, it may be more economical to use commercial facilities that guarantee an appropriate level of service. Thoughtful consideration should be given to this decision, since course participants may be negatively impacted by poor or unreliable delivery of course materials (McAlister et.al. 2005). For example, Ass. Prof. M. Sekban from İstanbul Bilgi University stated that they had used a delivery site at the beginning of their distance education program, but because of its delivery problems they have to host their web based curriculum.

It is also important to make a cost analysis under the above alternatives. Actually, cost analysis should be done at every stage requiring a decision.

5.3.3.2.2.1. Main Topology

WBE system is used to educate people of various backgrounds to numerous education levels from vocational training to post doctoral studies. As target market shapes the necessary technology to be implemented, it is imperative for a market research to be finalized before this stage.

Before implementing distance education system, certain fundamental components should be identified. These components are namely curriculum and presentation of it, supplementary materials, the role of the instructor (guide, facilitator, etc.), means of student/student or student/instructor interaction are all identified in the conceptual model. Identification of these components clarifies the compatibility of these components with the institutions' goals. Therefore it enables the elimination of the incompatible components and adaptation of the compatible ones right at the start. For this reason, it is aimed to propose a main topology including all of these components of distance education and their equivalent in WBE. This topology is based on the topology proposed in the Final Report (1997) of the "Feasibility Analysis of Nation-Wide Distance Education Alternatives" project.

As the Figure 5.4. illustrates, all the components were previously mentioned as part of distance education system.

The concept of time is an important component in WBE. Education can be achieved synchronously (by real time or live events, for example, screen-sharing, white-board sessions) or asynchronously (by delayed time, for example permanently posted web pages). WBE is generally accepted as an asynchronous learning system, but the recent developments in technology made the synchronous tools usable in the Web.

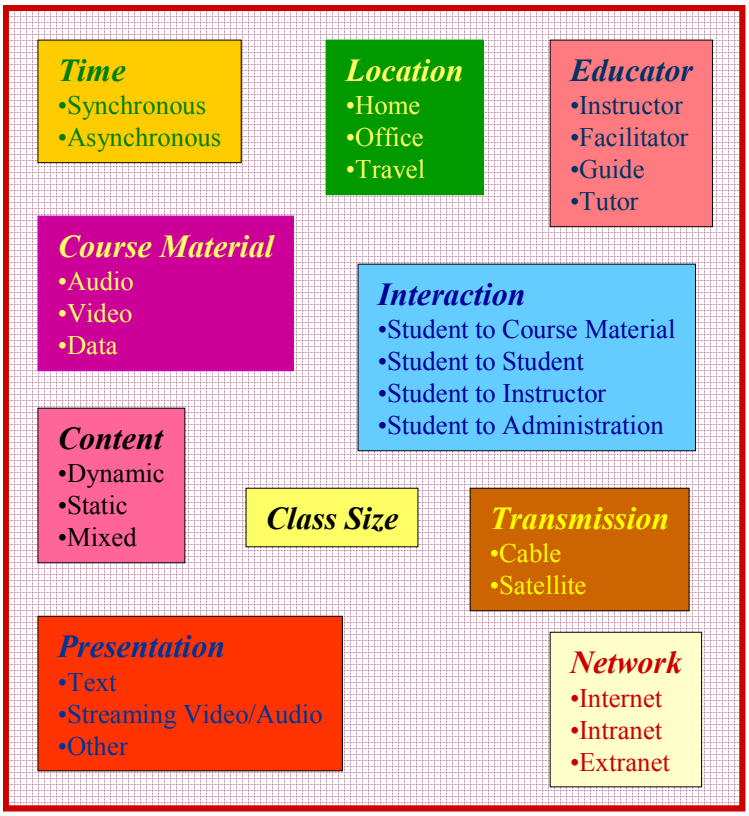

Figure 5.4. Main Topology

Curriculum supplementary materials are the means of presentation of the information. They can be texts, pictures or graphics or video presentations stored in the virtual medium.

The WBE designers must predict and design for where learners will actually take the courses. The choice can be the learner's office, a learning center, home, and even the road. According to the location where the lesson will be taken, the technical specifications of computer, the speed of network connection, the technical assistance facility, the effects of the environment, motivation of the learner, the technical requirements, interruptions and distractions will change accordingly. They all effect the design of a course.

Communication infrastructure of WBE can be either cable or satellite transmission. The choice here again depends on the target market. In regions, where there are no cable network capabilities, satellite transmission is the only option.

The web-based education via satellite is the very new technology and it is discussed in Chapter 7, Section 7.4. Ulak-Net and TTNet can facilitate this service in Turkey.

Interactivity is crucial for success in Web-based learning. The purpose of interaction is to promote explanation and challenging perspectives among two or more learners (Garrison 1993). Interaction must be designed intentionally into the Web-based course. Although there are some technological restrictions, if it is well-designed, it is possible to develop a successful Web-based course having interactivity. This subject is investigated in detail in Chapter 3, Section.4.6.

5.3.3.2.2.2. The Models of WBE

The institution would be able to direct the WBE models to different distance education targets according to its principles. The suggested models are examined in two sub groups; synchronous and asynchronous models, which are determined due to importance of time factor, in respect to the student. Generally web-based courses are not purely synchronous or asynchronous. Although some of their parts include synchronous activities, they can be designed as an asynchronous course. For example, "respond immediately" tests and "timed" tests can be included in an asynchronous course. Thus, the course can only be synchronous within a few hours.

However, while determining which way to go the cost factor should not be forgotten. "Scalability is the capability to serve a larger number of users without degradation or major changes in existing procedures" (Marsh et.al. 2003, p.3). Asynchronous delivery seems to be the only viable, scalable method. Synchronous technology cannot reduce costs because it requires the instructor and students to meet at a particular time, and it only marginally increases the number of students who may participate. The asynchronous model is potentially more cost effective if it can serve more students. As a capital-intensive strategy, many more students must be served with the same number or fewer instructors. An asynchronous model can be scalable to permit realignment of faculty resources with technology, rather than attempting to expand faculty resources to meet load demands. Even though it is not the primary objective of this thesis to go into the details of cost analysis of this sort, this issue is raised for it might effect the resource redistribution and reallocation significantly.

Synchronous WBE

Synchronous sub model promotes student to student and student to instructor interaction in real time in addition to course material to student interaction. This sub model allows the education to penetrate to any locality with the Internet facilities with either infrastructure of cable or satellite transmission.

"Streaming Video is one of the latest technologies applied on the Web. It is a one-way video transmission over a data network. It is widely used on the Web as well as private intranets to deliver video on demand or a video broadcast. Unlike movie files (MPG, AVI, etc.) that are played after they are downloaded, streaming video is played within a few seconds of requesting it, and the data is not stored permanently in the computer. If the streaming video is broadcast **live**, then it may be called "real-time video". However, technically, real-time means no delays, and there is a built-in delay in streaming video" (The Free Dictionary).

"Streaming Audio is also another technology used in recent years. It is one-way audio transmission over a data network. It is widely used on the Web as well as private intranets to deliver audio on demand or an audio broadcast (Internet radio). Unlike sound files (WAV, MP3, etc.) that are played after they are downloaded, streaming audio is played within a few seconds of requesting it, and the data is not stored permanently in the computer. If the streaming audio is broadcast **live**, then it may be called "real-time audio". However, technically, realtime means no delays, and there is a built-in delay in streaming audio" (The Free Dictionary).

In the case of streaming media, it is possible to have some problems with student's having the right software for receiving it, as well as being able to maintain an Internet connection consistent enough in its usage (Rivera and Rice 2002).

If learners need to discuss issues with other learners at length, most learners share the same needs and have the same questions, and learners need the motivation of scheduled events, then synchronous activities are chosen.

Most online course delivery systems like WebCT include a synchronous communication tool, such as the chat room.

On the other hand, synchronous communication is problematic in world-wide teaching, because of time-zone differences, poor connections (especially transatlantic), and Internet latency and congestion, as well as equipment differences. Asynchronous models are more effective (Thomas 2004).

Asynchronous WBE

The advantage of the asynchronous models is their flexibility as they allow the students to have an access to the education material at their own pace. However, they are limited as far as the interaction of involved parties are concerned. As It was mentioned before, most online course delivery systems include interactive asynchronous tools such as e-mail, news-group, threaded discussion, and bulletin board. When used effectively, each of these can be used to maintain high levels of communication between and among class members and the professor and to promote desired levels of interactivity.

Rivera and Rice (2002) stated that videotaped lectures available through the web in the form of streaming media were among the materials provided to the web based classes in their own programs. Using streaming media in a course helps to increase student's satisfaction.

It is extremely important to emphasize that web-based courses can be purely asynchronous but never synchronous. Purely asynchronous courses are not preferable because interactivity between the parties can only be achieved with the use of asynchronous tools such as e-mail and bulletin boards. This may cause losing the human touch of classroom instruction. Instead of building the web-based education program onto a pure asynchronous framework, inserting synchronous tools into this framework will increase the demand for this program in the market.

5.3.3.2.3. Educational Design

Educational design is concerned primarily in the curriculum development. The institution realizes its production by gathering inputs and then turning them into outputs during this design stage.

During the educational design the target market, namely the prospective students, provides most important inputs. The characteristics and the demands of the prospective students should be diligently analyzed in order to success an efficient design. Another important input at this stage is the available technology, which is limited by the capabilities of the Internet technologies. This could also determine the nature of the courses that can be offered.

In order to produce a successful web-based course, we should built its framework successfully. A framework of a web-based course consists of the web pages

which are specifically designed for a specific role or purpose. Please refer to Chapter 4, Section 4.5. for the details of it. In educational design phase, the designers of a course should decide the objectives of these pages.

Web delivered classes change the nature of the student-instructor interaction. Typically, this type of environment limits the amount of face-to-face and verbal interaction, while increasing the use of written communications. Students must quickly grasp the need to use web and e-mail resources to achieve the interaction level required to meet their needs. A framework for online interaction, suggested by Northrup (2002), is introduced in Chapter 4, Section 4.6., so we will not go into details of this subject. Interaction must be designed intentionally into the web-based course in this stage in coordination with the technological design stage.

Beyond the student's interaction however, students must also be prepared to accept the demands that are imposed on them by enrolling to web courses. In particular, Web based classes requires the students to exert a high degree of self-discipline and motivation. On the other hand, effective web-based education requires the instructor not only to have knowledge of the content area, but also to have interpersonal skills in effective online communication with their students. Instructors will be assuming a broader role as planners, designers, guides, mentors, and facilitators and will no longer be viewed as leaders and lecturers (Young 2002). Therefore, interaction attributes of an online course should facilitate to use some of the strategies for both the student and instructor.

Planning for distance education usually focuses on budget and personnel planning, rather than critical pedagogic issues (Bothel 2001). Course delivery through the Web imposes some limitations on the pedagogy and student interaction used when offering a course. These limitations should be considered when selecting courses for the Web. Classes requiring strong, personal instructor interaction will probably be more difficult to offer through the web. While all courses are not as suitable for Web delivery, taking a creative approach to pedagogy can overcome many of the inherent limitations imposed by this medium. Section 4.7.1 titled as "Which courses are ideal for web-based delivery" discusses this subject and the next section summarizes how a traditional course is converted to a web based course. Please refer to these sections for details.

Though the principles of educational design are not altogether different in web-based training than they are for the traditional classroom, instructors need training and support to show will in adopting this new teaching paradigm. Instructors need to know

how the details of their course will be implemented in the new environment. Courses for web-based education programs need to be clearly planned and designed (McNaught 2002).

Few instructors have the necessary technical expertise to prepare class materials in the appropriate format for Web delivery. Course design expertise must be available to help instructors in developing and organizing their course content. In Chapter 3, Section 3.6 describes the six dimensions of knowledge that should be possessed by an expert in order to develop a web site. It is evident that having these knowledge at the expert level is not possible for an instructor, for this reason recruiting a person or a team is more reasonable in developing an attractive and successful web-site. However, in reality this is not the case.

Due to current lack of adequate support at most institutions of higher education, web-based education instructors must have adequate technology skills. They often need to upload their own files, deal with hardware and software problems, and help students overcome their own problems in coping with technology. Instructors must be able to design their courses. Online lessons are also needed to run effectively on the student's computers. Instructors have to consider that computer memory and speed will vary greatly among students, lessons must not be too long to download, web pages must be proportional with the screen, and colors must be chosen carefully. Instructors, who have the frontline contact with students, will be the ones who will be required to solve the problems when they arise. This requires technological training which is not available to most instructors.

To gain the knowledge necessary to implement online curriculum effectively, instructors must have the necessary training, mentoring, and support, preferably on the programs they will use. Faculty training must be considered when institutions plan for an online distance education program.

Educational design needs to address important issues like how the curriculum will be delivered, which education methods (group discussion, cooperative learning, etc.) will be used, if the design is compatible with the characteristics and the demands of the prospective students, if there is a need for using supplementary materials to enhance the efficiency of education, what sort of supplementary materials can be used, if they need to be audio-visual in nature, how student's feedback is obtained.

Distance education is more than a teaching mode or method; it is a distinct and coherent field of education (Keegan 1986), focused on new delivery methods and

pedagogical philosophy (Levy 2003). The Web offers a wide range of methods for delivering content. These methods range from simple text based formats to audio and video formats. Although this wealth of methods exists for delivery, not everyone may be able to receive content in all forms. For example, the computing platform that they are using may play a role in this. It is therefore important to understand the facilities available to students who may enroll in these courses, and select content which they will be able to receive and comfortably use.

The choice of content delivery methods should also be periodically analyzed. As more people acquire high speed Internet access, and new, more capable hardware and software becomes widespread, content delivery should be altered to present a richer learning experience. However, it must not be forgotten that administrators are tending to put narrow limits on ways to make technology effective while expecting broad outcomes.

Intellectual property issues also arise when supplementary materials are used as part of a course's pedagogy. Indeed, arranging for the use of another's intellectual property or copyrighted materials should be part of the initial web-based curriculum development effort. A mechanism for acquiring and administering intellectual rights to these materials is important, since part of the administration of these materials may require restricting the dissemination of the materials. Putting in place the policies, procedures, and technologies to administer this area is an important part of a web-based curriculum.

In addition to the above-mentioned issues the following points also need to be considered to ensure the compatibility of educational design with target market analysis;

- If the course delivery software is going to be produced within the institution or provided from an outside source.
- Is scalability an important concern in course design?
- If it is necessary to use supplementary materials, how they are going to support the curriculum?
- What strategies are going to be used for the evaluation process, if it needs to be done in the form of small tests at the end of each section or by final examinations at the end of a designated period? If assignments are going to be used what sort of communication tools should be established between two parties?

5.3.3.3. Evaluation and Control

The last subsystem of the conceptual model involves the stage where evaluation takes place. The decisions made at the process of implementing WBE should be evaluated from point of efficiency, such as educational efficiency and cost efficiency. This would enable the true evaluation of the implementation of WBE.

It should not be forgotten that restructuring phase ends with reception of the education, which was planned according to a strategic plan, by the students. The most important element during this phase to be evaluated is the efficiency. In order to carry out this evaluation, there are many methods, but we will not go into detail about the efficiency measurement. However, we would like to emphasize that the efficiency can be evaluated in four areas; education, pedagogy, cost and administration. The educational efficiency which indicates the success of the curriculum is evaluated by measuring the learning gains; pedagogical efficiency is evaluated by judging the instructors, course materials, supplementary materials and WBE models' contribution to the student's success; cost efficiency is evaluated by calculating the costs; and administrative efficiency is evaluated by quantifying the contribution of the plans, policies and strategies to final outcome. The combination of all of those would give a true evaluation of the implementation of WBE.

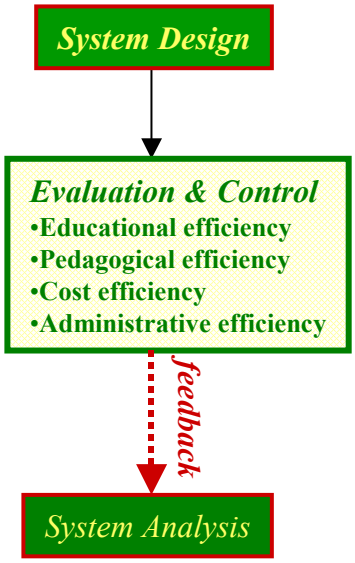

Figure 5.5. Evaluation and Control Phase

Like every system, this new system created to implement WBE should be monitored constantly and redesigned continuously to solve the problems as they show up. This can only be achieved by a well-structured feedback mechanism.

5.4. Using Conceptual Model in Decision Making

The conceptual model helps the institution and its decision makers during the implementation of WBE process by defining the problem and its potential solutions.

5.4.1. Decisions Regarding System Analysis

The most critical stage during system analysis is going to be the decision making to implement WBE. Before this stage the institution should have analyzed its internal and external environment and handled many problems that appeared during the analysis and required proper decisions. To reach its ultimate goal, the institution needs to think about on many alternatives and choices, this also requires a decision which determines the institution's vision and mission. Actually, this stage itself is decision making process of its own.

In order to achieve success during and after implementation of WBE it is important to analyze the institutional resources logistically. Number of decisions that are needed to be made within the scope of systems analysis are presented below;

- Are the resources sufficient enough to reach the institution's goals?
- How should the organizational culture be spread within the institution? Is there a need for WBE adaptation program?
- How should the human resources be redistributed? How should the wages and salaries be arranged?
- Is the existing technological infrastructure sufficient to handle WBE or is there need for upgrading it?
- Depending the characteristics of the target market, what level and what sort of educational programs and curriculums should be made?
- Are characteristics of the prospective students compatible with the distance education offered? For example their educational backgrounds or expectancies.
- How are the extra inputs be financed?

- Would the existing financial resource be able to cover the cost during implementation of WBE? Is there a need for creating additional resources?
- Could the institutional education resources (curriculum, course materials, personnel, building, etc.) be involved in the implementation stage as inputs in regard distance education activities?

Above mentioned questions mark the problems requiring institutional decision making during restructuring and before the system design stage commences. Therefore all these questions should be answered by integration of the institutional analysis with the institutional identity.

Depending on the goals set at the very start of the restructuring, curriculum establishment, resource management and the decision making options related to the encountered problems can vary.

5.4.2. Decisions Regarding System Design

Depending on the institutional distance education goals, the conceptual model helps the institutions by clearly showing what sort of WBE model could be used for a particular goal and which technologies would serve to what sort of goals. For example, an institution should consider the interaction between the students and instructor and in-between the students as beneficial for the education efficiency as the interaction between the students and education material. In this case the design should incorporate this level of interaction.

At the educational aspect of the system design, the process of changing inputs to outputs should be realized. During this stage it should be pointed out to the decision makers that there are quite a few issues, which need to be clarified, in order to achieve efficiency in the education. It would not be wrong to say this stage is the single most important stage regarding ultimate web-based distance education efficiency. The applied design at this stage determines the quality and efficiency of the level of education achieved and the consistency of the decisions made.

Some of the problems the institution is likely to encounter during system design are listed below;

- Should a course or a program be developed?
- Are any of the internal courses applicable to WBE? What sorts of adjustments need to be made on them?
- Who should be involved in the course development? How should the human resources be redistributed?
- Is the curriculum compatible with the needs of the target market? Is it possible to improve their learning ability?
- What sort of interaction should be developed? Is student and education material interaction sufficient or is there a need for student to student, student to instructor interaction?
- What sort presentation technologies could be utilized for different interactions?
- Is the existing technological infrastructure sufficient to handle WBE or is there need for upgrading it?
- Do the personnel need additional training?
- What are the important factors that should be taken into consideration by the institution while deciding on the course delivery software (cost, efficiency, etc.)?

As seen from the above examples, most of the decisions needed to be made focus on the technological side.

As the system design is put into application, the outputs like developed program, educated students and gained experience could be obtained and examined readily. Evaluating this data the institution will start to make decisions on issues like duration of the educational program, the ability of the program to engage in the target market successfully. Most of these decisions are going to determine the expansion of the program. The experience the institution gains after this process is going to help them to set more realistic goals and more consistent decisions. Because of the elimination of the unknown factors, the following decisions are going to become more programmed in nature.

5.4.3. Decisions Regarding Evaluation

The last sub system of the conceptual model is based on the evaluation activities after the program has been run and certain outputs have been achieved. Conceptual model fundamentally reflects the restructuring process by three aspects.

- Spreading understanding of the principles of WBE within the institution
- Efficiency of the developed education system
- Financial aspect of the restructuring process

The institution should evaluate all these aspects from the point of efficiency. Since the evaluation of efficiency needs a professional approach, we would like to draw the attention to this subject only.

However, if we briefly comment on this subject; during the evaluation of the efficiency, the investigation is about how well the task has been achieved. This could be measured by grades achieved by the students, by the graduation percentage or by the drop-out rates. The increase in the student success or the decrease in drop-out rates is going to be an evidence of the efficiency achieved.

Other important aspect of the evaluation is the financial evaluation where the institution judges its cost efficiency through its own institutional resources. Particularly if there has been additional investments made to implement WBE, the ability of the institutions cost recovery should be identified.

The financial efficiency of implementing WBE can truly be identified after the level of success (for example students grades) and cost of education are rationalized for both traditional education students and distance education students, and having all the results cross examined objectively.

5.5. Conclusion of the Proposed Model

In this chapter, a basic model structure has been proposed which will serve as a guide to the institutions planning to offer web-based education or are aiming to restructure in this direction. The subsystems (system analysis, system design, and evaluation&control) present in the model and the activities taking part in three subsystems actually designate the fields of decision. Therefore, it has been assumed that the proposed model will be helpful to the institutions in reaching consistent decisions.

Although in the beginning it was assumed that an institution will offer both traditional and distance education, the suggested model can also be applied to the institutions aiming to offer distance education only.

The realization of a distance education application by preparing a lesson or program according to this model will make it possible to reveal the effectiveness evaluations suggested in the evaluation & control subsystem taking part in the final phase of the model. The success of a web-based lesson or program can only be judged based on this evaluations. Since such an application was not foreseen in this thesis, a relevant conclusion has not been reached.

CHAPTER 6

SURVEY

The applications of universities and the experiences of their faculty members who have already developed and taught a web-based distance education course have great value to administrators and other instructors following their footsteps. To collect this data a questionnaire was e-mailed to the 15 university's instructors who are the lecturer of Distance Education Center, Informatics Institute or Computer Education and Instructional Technology (CEIT) department of the universities. In addition, 12 universities' related departments were also visited and their answers were collected.

The delivery of distance education on the WWW has a great potential that can not be fully understood until a distance education system is developed in the existing traditional educational system.

There are many factors encouraging the universities to deliver distance learning on the WWW (World Wide Web), such as: government support by making law, favorable conditions to get a high market-share, school restructuring, regulations, willingness to use new instructional methods. Some of them are mandating the delivery of distance learning on the WWW. However, these top-down pressures are creating a problem because the responsibility for developing and delivering web based distance learning courses is bottom-up and has to be shouldered by the unprepared faculty members of the University.

In order to develop effective programs, administrators and researchers should first assess the experiences and applications of the pioneering universities which have already developed and taught a web-based distance education course. The experiences of the early-adopters have great value to administrators and other instructors following their footsteps. In order to follow these footsteps, first of all, they have to be revealed. For this reason, this survey was tried to be carried out.

We couldn't find any resource in our literature, which reports a national survey of higher education institutions about their works on distance education and their future plans. This is not a surprise, because only 2 out of 15 universities replied the questionnaire and forwarded their answers by an e-mail (I was lucky because it was

stated that in another survey conducted by Anatolian University for a doctorate thesis, only 3 out of more than 300 questionnaires were replied by the participants) but the others did not even send an e-mail including their positive or negative responses. On the other hand, some of the personally visited peoples abstained from answering the questions. Therefore, this survey does only cover certain universities which are known for their distance education programs.

Because instructional delivery on the Internet is such a new application, there is no existing body of research available. For the most part, journal articles address broad policy issues or are anecdotal, describing the implementation of a particular course. The few surveys that have been done are mainly concerned with quantifying the number of courses and the number of students. There is a need for basic research in the delivery of distance education on the Internet. A logical place to start is to survey the pioneering universities which have developed and delivered a course on the WWW to realize their studies and to get the picture of these studies regarding web-based education.

6.1. Research Questions

The questionnaire is appended as Appendix B. The questions were prepared by taking into consideration the proposed model given in Chapter 5. The questions are especially aimed at the system design subsystem, because the other two require very specific, private and secret data such as financial status of the institution.

On the other hand, the questions in the first part of the questionnaire are the general ones which are examining institution's distance education studies.

Furthermore, in order to facilitate the technical understanding of the reader of the subject, the definition of most of the technical terms mentioned in the survey questions are given in Appendix B.

6.2. Research Method

The sample-space for this study was limited to the instructors of the universities listed on the Council of Higher Education's web site in which there are 53 state universities, 24 private universities, 4 Military Academies, 5 KKTC universities and 2 universities having special status. Although the total number of educational

institutions dependent to the Council of Higher Education is 77, only 28 of them could be chosen because they have informatics institutes and/or CEIT departments in their organizations. It was thought that it would be more suitable beginning to survey from such universities having these departments. The instructors' names and mailing addresses were obtained by following links from the web-sites of the universities or by personal efforts.

The participants are from the following universities: İstanbul Technical University (İTU), Middle East Technical University (METU), Yıldız Technical University (YTU), İstanbul Bilgi University (BİLGİ), Ankara University (ANKARA), Gazi University (GU), Anadolu University (AU), Sakarya University-Distance Education Vocational School of Adapazarı (ADAMYO), Dokuz Eylül University (DEU), Istanbul University (IU) and Eastern Mediterranean University (EMU).

6.3. Research Design

The survey instrument was developed over a period of two months and explored areas grounded in the previous chapters. The survey contained a mixture of multiple choice questions, fill-in-the-blanks questions, and open-ended questions. Information about the general distance education applications of the university, the attributes of the web course, course development issues, the used hardware and software units and tools, the evaluation methods, class management techniques etc. were collected. Some of the questions asked under attributes of the course were: number of student offered and number of course on the WWW. Some of the questions asked under course development were about: training received, technical support, software tools, programs, technologies used, design team. Some of the questions asked under evaluation techniques were about: question types used on-line testing and collection methods of student's opinions.

Not any statistical analysis tool like SPSS was used to evaluate the results. The purpose of this survey was not to do this anyway. The main purpose was to collect data from the universities as much as possible to get the picture of the studies carried out in the universities regarding of distance education and check the responses if there is a consistency between the proposed model and the real-life applications or not.

6.4. Weak Points of the Survey and Their Reasons

1) At the beginning, it was planned to carry out this survey for all the existing universities of Turkey, but later on, taking into consideration the drawbacks of this issue, it was decided to limit the participants. The criteria taken into consideration in the limitation are as follows:
   - Selection of known universities in DE
   - Hand-distribution of the survey to as many of university as possible, and receive results.
   - In case the hand-distribution was not possible, the posting of the survey by an e-mail to the universities known for having a Distance Education Center, Informatics Institute or Computer Education and Instructional Technology (CEIT) department.
2) The survey was prepared based on the assumption that a statistical data collection would be possible for the universities in general, but following the interviews carried out face to face, it seemed that in general a single unit did not exist, regarding the university, where all the statistical data was collected. This result is especially valid for universities not having a distance education center; thus, the answers given were limited with the studies carried out by the sections or persons.
3) Furthermore, the collection of the hand-distributed survey answers was very difficult and in some cases even not possible. This situation is widely observed in universities where the survey was distributed via e-mail; only 2 universities out of 15 answered the survey posted by e-mail.

In spite of all this unfavorable conditions, the 13 survey results shed a light to the studies carried out in the 11 universities. Especially, taking into consideration that these 11 universities are carrying out studies in distance education, the evaluation of those results will be indicative of the path followed in the related studies in Turkey and we believe that it will give an ideas if any correlation is existing between the suggested web-based education model in this thesis and the existing applications.

6.5. Survey Results

The respondents were from various departments: informatics institute (1) or distance education centers (5), CEIT departments (6), and other disciplines (2). They also taught in a variety of types of institutions: 9 state universities, 1 private university (and only one university from KKTC). The studies on distance education are generally carried out by the state universities, because the age of the private universities are very young in Turkey. It is possible that the owners of them may have thought first to become strong enough to withstand intellectual challenge of the other universities and then struggle with the distance education programs.

The instructors surveyed represent an experienced, teaching faculty. All of them are currently teaching in a position and they instructs web-based distance education courses. At the same time, some of them are the directors of their departments.

A convenient way to organize the survey data provided by these early-adopters is to report it around the questions aimed at three stages of the 'system design' subsystem and the general questions. The following results are classified according to this basis.

It is very important to point out that the collected data are mostly connected with that department which responded our questionnaire. The answers are not valid for the whole university. However, the truth is that there is no any statistical data or well-organized information about the university's studies on distance education in any university.

General

1) All of the 11 universities taking part in the survey stated that they all offer Distance Education (DE). The main reason for this is that these universities were selected purposely based on the assumption that they all offer DE. Thus, this result should not indicate that DE is available in all the universities in Turkey. Furthermore, the survey conducted is interesting based on its outcome because it showed that DE was realized generally on "course basis" and only the storage of the course material on the Web was considered as DE.
2) The first technologically performed DE was carried out via "video-conferencing" and this application is still valid in some of our universities (İTU, İU, AU). To give an example, since 1996 İTU is carrying out this synchronous

application as course receive and offer from University of Virginia (2000-2002) and as course receive from Georgia Institute of Technology (2003-2004).

3) 9 out of 11 of the universities stated that they offer web-based education (WBE).
4) The students receiving distance education are generally;
    - From Turkey
    - Bachelor of science level and
    - From their own university
5) Because the answers given were not on university basis, the figures received for the question of to how many students the WBE is given, are not indicative but only to give an idea; the answer of the ADAMYO is 4000 (started WBE in 2001) and this year providing WBE to 1815 students. In a similar way, BİLGİ is providing a web-based MBA program (started WBE in 2000). It has been stated that till now 700 students were educated and this year they have 550 students. The figures of these 2 universities are given purposely; because they have developed a full curriculum for granting a degree. The applications carried out in many other universities are limited in general by developing either a course or a series of lessons.

System Design (Administrative/Technological/Educational)

6) In Turkey, the distance education is carried out in two languages (according to the survey). Out of 13 instructors who participated in the survey, 11 stated that they basically tutored in Turkish and 7 in English.
7) The breakdown of the answers given to the question of "which criteria were taken into consideration in determining whether the instructor was eligible or not in providing DE" is as follows:
    a. Educational design 90%
    b. Programming knowledge 20%
    c. Writing skills 25%
    d. Leadership 25%
    e. Visual design 25%

    Furthermore, "volunteering" and "interest and curiosity" were also added to the criteria given above.
8) The question "whether a special training was given to the WBE instructors", was answered as 60% yes, and 40% no. Although training was basically technical

(100%), it was stated that besides this a pedagogical training (75%) was also provided. It would be good conducting a survey that will search the effectiveness of given training. This can be a subject of another thesis.

9) The evaluation of the answers given to the question regarding "the role of the instructors" are discarded because, to our opinion the meaning of the given listed roles were not fully understood.
10) In selecting the students for WBE, their familiarity to the computer together with their grades in the university entrance exam satisfying a certain basic grade is taken into consideration. ADAMYO has stated that provision of education to the handicapped students is among their goals; but this education is only valid for handicapped students who are not blind, deaf or disable to use a computer. A separate study, whether a law enforcement is existing or not regarding this matter together with the means of improving the education in Turkey, can be carried out.
11) The demand to WBE is basically from the individuals (48%). This is followed in order by private sector (36%), public sector (15%) and education institutions (1%). The reasons for not receive of DE of educational institutions from each other can be examined in a separate analysis. This situation is obvious from the scarcity of the "server" and the "client" universities.
12) It is understood that whether the WBE is provided as on a course basis or program-basis, the design is accomplished by a team.
13) The instructors' number one concern was the necessary time to develop and maintain their courses. We do not think that the instructors receive off time or financial incentive for developing the course. On the other hand, even maintaining a course is a time consuming task and needs compensation.
14) To our opinion, the spirit of the pioneering instructor is that "I must join the computer age & enhance my skills vs. being left behind". This sort of self-motivation and the willingness is very important in distance education because as it was stated in the previous chapters, the work load of the instructor is tremendously increasing in this system. For this reason, administrative support has a crucial importance on the success of the courses.
15) Lynch (2001) concluded that student orientation to online courses and student socialization with other online students greatly effect their success in the course.

The Internet has only been in existence since 1993, and online classes after 2000s in Turkey, so the majority of students are probably not familiar with how to take a class online or even how to use the Internet. This is why training and support for students is so essential. This subject was not examined in the survey, however there are some clues that training and support is not adequate in some universities. That is, one of the reasons of quitting the course is the insufficient technical support and technical difficulties in one university, and the computer knowledge is one of the required qualifications of the students to be accepted to the programs in a few ones.

16) It has been observed that "synchronous" and "asynchronous" concepts differ from person to person. Although web-based education in general is accepted as "asynchronous", as stated before, a successful model can not be fully asynchronous because of its synchronous elements. This dilemma was also observed in the answers.
17) Since the courses provided on the WWW are generally compulsory, the drop-out rate is mostly stated as "0"; but in some universities this percentage goes up to 20%. The reasons given for this are technical difficulties, insufficient technical support and not fulfillment of the expectations. In rare cases, drop out due to uncorrected selection of the course (0.2%) has been observed. Furthermore, especially at the master level, drop-outs occur due to lack of time.
18) Web-based education can be carried out via intranet or extranet as well as via the Internet. This is observable in the answers given. For example, Yıldız Technical University is carrying out their WBE via their intranet and is closed to the Internet. Similarly, GU and ADAMYO are tutoring via 'intranet'; but the common practice is to carry out the WBE via the Internet and all other universities conform this point.
19) For a course, an average class size is 30. Generally this figure goes up to max 50 and because of this in some cases a course can have 7 classes (example Sakarya-ADAMYO).
20) In distance education, the teacher becomes a mentor rather than a sage and directs student learning. This requires frequent communication with the students. The most common communication mediums cited in the survey were: e-mail, bulletin board, chat, and forum.

21) For a course, an average class size is 30. Generally this figure goes up to max 50 and because of this in some cases a course can have 7 classes (example Sakarya-ADAMYO).
22) The improvements in the technology, besides our daily life, effect also the material used in the distance education. As an example, VCD, DVD and CD-ROM have replaced the use of cassette and diskette. The most widely used is CD-ROM (65%). Printed materials are still in use, although "e-book" or the contents of the course are prepared and served on the Web.
23) As a visual material, we might state that the use of video-band use (10%) will soon be out similar to cassette (none), and DVD/VCD (30%) and CD-ROM (50%) are replacing it.
24) It is also possible to say that the use of diskette (20%) is almost out.
25) 10 out of 13 instructors have stated that in order to support the WBE given, they carry out face to face (F2F) class studies (example: Sakarya ADAMYO and Bilgi University). Similarly, 11 out of 13 universities have stated that in order to support the lectures given in the classes, they utilize the materials which have been transferred to the Web media. Based on this, we can conclude that the distance education instructors have a sympathy towards a "blended" application. A group at UCLA defined this concept as blended instruction: "Blended instruction is a term for the delivery of instruction based on the integration of face-based instruction and computer-based instruction. Blended instruction can be an important vehicle to begin to exploit the potential of technology to improve the quality of instruction, to increase access, to increase the amount of learning, and to maintain or reduce costs" (Instructional Technology Planning Board, 2003, para. 1).
26) Designs are performed taking into consideration that different browsers can be used by individuals receiving DE. For instance, it is possible to access without any problem to;
    a. 1 university with Netscape Navigator+Internet Explorer
    b. 3 universities with Internet Explorer+Netscape Navigator+Mozilla Firefox browsers.

    Netscape Communication Corporation tries to retain its position in browser-war with Netscape 7.2 (August 2004). Although Netscape Navigator is taken into

consideration as a browser in some universities' developments, Netscape Navigator's last version 4.08 (1998) is already out of date. Even if Internet Explorer 5 is used widely, the current version of IE6, mainly focusing on improving security, is also widely used. Since IE6 was included as part of Windows XP service pack 2 in August 2004, the user has to use Windows XP operating system.

27) As a web-design software, Macromedia-Dreamweaver is the most widely used program (75%). WebCT and IBM Lotus Learning Space are also widely used commercial e-learning platforms for course management. Half of the instructors stated that they used on-the-shelf program whereas the other half pointed out that they developed their own authoring-tool. Macromedia Flash is another popular program for developing dynamic web contents.

28) All the instructors pointed out that they provide interaction in their courses and almost all of them stated that interaction was accomplished within three-dimension (i.e. student-course material, student-student, student-instructor).

29) The breakdown of methods used for interaction is as following:

* e-mail	100%	* audio-conferencing	30%
* chat	80%	* white board	25%
* forum	80%	* news group	20%
* e-mail list	50%	* screen-sharing	15%

30) Streaming media technologies (streaming audio/video pls. refer to section 5.3..3.2.2.2) are used in a few universities. Avoiding any problem arising because of audio/video transmission performance on the Internet, is possible by utilizing streaming media. Some universities pointed out that they utilized these sort of services only on their Intranets, thus they avoided unpleasant situations.

31) The techniques, technologies or languages used in the preparation of a dynamic content is as follows:

* MS. ActiveServerPages	70%	* CGI Programs	20%
* JavaScript	50%	* PHP	20%
* CascadingStyleSheets	40%	*JavaServerPages(JSP)	10%
* DHTML	30%		

32) Except only the 3 universities that stated using XML, which is a W3C recommendation for creating special-purpose markup languages, HTML is used as a markup language in all the universities.

33) The mostly used web formats are;

Audio	:	MP3 (50%), WAV (30%)
Multimedia	:	Shockwave Flash (60%), AVI (40%)
Text	:	PDF (90%), RTF (20%)

34) For collaboration, generally the tools available in the WBE pack are used (60%), windows Net-Meeting is also a preferred tool (30%).

35) Flash (90%) and Macromedia Dreamweaver (75%) are on the top of the list of the mostly used software programs.

36) Half of the instructors use cooperative learning method whereas the other half does not.

37) Artificial Intelligence (AI) is not conducted in any university. Also, "Adaptive Hypermedia" applications, in which the presentation style is formed based on the needs and requirements of the student, are not carried out in any university.

38) Two universities are using a virtual laboratory and one university is developing it; nevertheless this will only lead us to the conclusion that virtual laboratories are used in education.

39) 3 universities are using packet programs for Course Administration whereas 6 universities stated that they developed their own programs.

40) Almost all of the universities (85%) utilize their own search engine for that course, and only 25% utilize other search engines (Net-based) such as Google.

41) No common database with any other university or establishment have been set up for library records (100%).

42) Databases are managed by using Relational Data Model (95%) or Object-Oriented Data Model (10%).

43) The following methods are used to determine the necessities or problems of a course:

a. Collection of stud. comments when the program or course is over 80%
b. The evaluation of logs generated by the system 50%
c. Collection of student comments on weekly basis 20%
d. The evaluation of the suggestion agencies inherent in the system 10%

In view of the data collected;

e. The course materials were improved 100%
f. The size of the files were modified 50%
g. Interaction was enhanced 40%

44) Instructors do not prefer to convert a course designed as static and asynchronous in the beginning to a synchronous and dynamic one (90%).

45) The examination methods used on WBE;

a. General examination at the termination of the course 75%
b. Examination following each topic 35%
c. Acc. to DE Regulation Art. 8 Item (g) and (h) 30%
d. Examination following each class session 10%

Although only 3 universities stated that they carry out examination in conformity with the DE Regulation, these universities are actually the ones developing programs for WBE and granting degrees, thus they are obliged to carry out their examinations according to this Regulation.

On the other hand, the other universities are the ones, who develop courses for the WBE, except the mid term examinations carried out via Internet, they apply the standard examination rules.

46) Examination questions are:

* Multiple choice	100%	* Simulation	30%
* True/False	50%	* Fill-in-the-blanks	30%
* Text Input	40%	* Drag and Drop	None
* Matching List	40%		

47) The tendencies of the student of forwarding a question via mail or another tool:

Low (01%-30%)	30%
Medium (31%-70%)	50%
High (70%-100%)	20%

48) Navigation supply tools;

Menu	85%	Lesson map	40%
Next/Back button	85%	Dictionary	15%
Index	50%	Resume	8%
Link	40%	Search	8%

49) Course structures on WBE;

* Classical structure 50%
* Based on a basic activity 40%
* A course structure formed according to the individual needs and knowledge of the student 15%
* The student self acquirement of the knowledge from a database in order to reach a given goal 8%

50) The copyright issue should be specially analyzed. According to the results of this survey, the instructors of the 6 universities have stated that nobody paid royalty for the courses they prepared whereas 3 instructors from different universities have stated that they got. In WBE, the course development is a team work and the effort and knowledge of each individual of the team should be awarded in a way.

On the other hand, while some universities pay royalty only for special programs, such as Macromedia Dreamweaver and WebCT, some of them pay for the course content, such as ECDL course content. Only one participant declared that there is a royalty fund in their own institution to cover their own staffs' royalty fees.

51) The server specifications of the three universities are as following:

Table 6.1. Server specifications

	Istanbul Bilgi	Sakarya ADAMYO (x 7 servers)	ITU (x 2 servers)
Processor Hard Disk RAM Ethernet Card	Xeon 3.02 3x36 GB (RAID) 1 Gbyte 2x1Gbps (Broadcom-Gigabit Ethernet)	2xPentium Xeon 30 GB (RAID) 1 Gbyte 2x10/100 Mbps	8xPentium Xeon 30 GB (RAID)+SAN 4 Gbyte 2x1 Gbps (Gigabit Ethernet)
Software	MS Windows 2003 MS IIS 6.0 MS SQL Server 2000	MS Win. NT Server 4.0 MS IIS 4.0 MS SQL server 7.0 Lotus Learning Space 4.0	Red-Hat AS3 IBM WebSphere DB2 LMS

Although the Xeon line of processors are 32-bit, to state only “Pentium Xeon” or only “Xeon” in the answers will not be sufficient to indicate the microprocessor used. The indication of CPU frequency, Frontside Bus Frequency/Theoretical Bandwith values would have been helpful in determining the microprocessors used; thus, because of these lacking data, the answers are shown as they are given.

52) The tools/technologies that are used for client-side design, server-side design and data-base design are as following:

Table 6.2. Tools and technologies used in design

	Istanbul Bilgi	Sakarya ADAMYO	ITU	EMU	GU
Client-side design	JavaScript	Mac. Dreamweaver	JScript	EMU-LMS	VBScript JavaScript
Server-side design	ASP	ASP IBM Lotus Learn.Space SAÜ-LMS, SAÜ-ADABİS	JSP	ASP.NET	ASP
Data-base design	RDBMS	MS SQL Server or MySQL	IBM DB2	MS SQL Server	MS SQL Server 2000
Query languages	SQL	SQL	SQL	SQL	SQL
Services	Exch. Server	ftp,http,irc,Ipv6,smtp			e-mail

53) The tools/technologies that are used in the components of a lesson are as following:

Table 6.3. Tools and tecnologies used in the components of a lesson

	Components of a lesson							
Tools and technologies	lab	lecture	discuss	simulation	Group work	assignment	presentation	text
plain text	10	70	30	10	10	30	40	30
hypertext	10	50	30	10		20	40	20
hypermedia	10	30	20	20	20	20	50	10
Interactive text		30	30				20	10
Chat room		60	70	10	10	10	10	20
Bulletin board		50	70		20	40		20
Groupware			10		20	10	10	10
Sound	10	50			10		10	
Voice		40	10		10			
Internet phone								
Audio graphic		60		10		10	30	
Animation		60		10			30	
Visualization		20		10	10		30	
Real-time-video		20		10	10		10	
Compressed video		30		10	10		10	

Note: The figures given in the table show the percentage.

6.6. Conclusion of the Survey

The main goal of this survey is to get a picture of the studies conducted in our universities regarding web-based education as of first half of year 2005. Even though the sufficiency of the collected data in reaching certain conclusions may be questionable, derivation of a general idea was mainly aimed. Also shedding some light to the people who were going to make thorough research in this topic was intended. The questionnaire was designed as consisting of general questions in the beginning and followed by questions in conformity with the subsystem of the suggested model, i.e. System Design.

As a matter of fact, each stage of this subsystem is a survey item by itself. In order to cover all these items in a single survey, whether one can like it or not, has negatively effected the quality and the quantity of the questions to be directed. For this reason we deeply apologize from all the people benefiting from this survey for the resulting inconsistencies or insufficiencies that might have arisen.

However, in the study the survey instrument exposed some of the studies of the early-adopters who developed a WWW distance education course or program and taught it after 2000s in their universities in Turkey.

We will considered this study to reach its goal, if it sheds some light to further studies to be conducted in the same field.

CHAPTER 7

EMERGING INSTRUCTIONAL DESIGN AND TECHNOLOGY AREAS

E-learning technologies continue to evolve as technology itself evolves. However, the developments on the technology used and continual upgrading of sophisticated computer-based programs have affected its instructional design. Web technologies are some of the ones used in E-learning programs. Although embedding any of media into the Web page and course management functions can be done almost effortlessly, quickly and efficiently, designing, developing and implementing an effective instructional courseware has never been easy. However, it is expected to make it easier by new emerging technologies.

In this chapter, three emerging instructional design and technology areas are briefly reviewed and discussed. First, we will deal with object-oriented distributed learning environments and artificial intelligence applications. John W. Jacobs and John V. Dempsey (2002) believe that the developments in these two subjects will have a profound influence on the field of instructional design, at least within the foreseeable future. As we discussed before designing interactivity into web-based instruction is very important and can be achieved with various methods. However, within these methods, visual interaction is a rarely used one because of the poor quality of video transmission. In this chapter we will also briefly discuss whether satellite-based solutions can be a possible alternative or not.

Please note that, all these developments are not discussed in detail. The purpose of this chapter is to inform the reader about these lately emerging educational technologies.

7.1. Object-Oriented Distributed Learning Environments

Object-oriented programming languages, such as C++ and Java, have been in use for several years. Sections 3.5.3. and 3.5.4. of Chapter 3 briefly explain why Java programming language is used in WWW design. Same reasons are also valid for other object-oriented programming languages. The most important reason of its usage in Internet applications development is its potential integration with HTML and XML. Program elements are linked rather than embedded. “The notion of “linked objects” is creating a revolution in the way the instruction is designed, developed, and delivered (Jacobs and Dempsey 2002)”.

In addition to the various definitions of the term “linked objects”, other terms that generally have the same meaning confuse the issue further. For example;

- “pedagogical documents” was used by ARIADNE project (ARIADNE 2004)
- “educational software components” was used by Educational Software Components of Tomorrow (ESCOT) project (ESCOT 2004)
- “learning objects” was used by David Wiley (Wiley 2002)

While each of these is slightly different from one another, they all conform to the LTSC’s broad “learning object” definition. Therefore, the term “learning object” is commonly used in academic literature.

7.1.1. Learning Objects

Object –Orientation highly values the creation of components that can be reused in multiple contexts. This is the main idea behind learning objects. Instructional designers can build small (relative to the size of an entire course) instructional components that can be reused in different learning contexts. Additionally, learning objects are generally understood to be digital and deliverable over the Internet, meaning that any number of people can access and use them simultaneously (as opposed to traditional instructional media, like a video tape, which can be used in only one place at a time). Moreover, those who use learning objects can benefit from the new versions immediately. These are the significant differences between learning objects and other instructional media previously used (Wiley 2002).

When people agreed on the benefits of “Learning Objects”, many organizations have afforded to define its standards. The LTSC of the Institute of Electrical and Electronics Engineers (IEEE) was formed in 1996 to develop and promote instructional technology standards, and to facilitate the widespread adoption of the learning objects - approach (LTSC 2004).

The Learning Technology Standards Committee describes “learning objects” as follows:

“Learning Objects are defined here as any entity, digital or non-digital, which can be used, re-used, or referenced during technology supported learning. Examples of technology-supported learning include computer-based training systems, interactive learning environments, intelligent computer-aided instruction systems, distance learning systems, and collaborative learning environments. Examples of Learning Objects include multimedia content, instructional content, learning objectives, instructional software and software tools, and persons, organizations, or events referenced during technology supported learning (LOM 2004).”

Since this definition is quite large, different groups outside the LTSC have created terms that generally narrow the scope of the official definition to something more specific. For example, while Educational Objects Economy takes a technical approach, only accepting Java Applets as Learning Objects (EOE 2004), Computer-Based Training (CBT) vendor Asymetrix defines learning objects as pre-scripted elements that simplify programming (Asymetrix 2004).

“Obviously, the field is still struggling to define the question; “What is learning object?” (Wiley 2000)”.

7.1.2. Meta-Data Tags

Meta-data tags refer to “data about data” (see www.imsproject.org/metadata.html) and are used to label the wide variety of learning resources (objects) needed to manage and deliver instruction within a distributed learning environment (Jacobs and Dempsey 2002, p. 326).

The meta-data tag facilitates the reuse of a learning object across various courseware boundaries. Thus, the same learning object can be used in other lessons within the same curriculum. Similarly, other course developers involved in developing

courseware supporting an entirely new curriculum can also use this same learning object.

"The IMS (Instructional Management System) standards will promote an open, distributed-learning structure supporting a wide variety of instructional development platforms (Jacobs and Dempsey 2002, p. 326)".

7.2. Artificial Intelligence Applications

Today, all technology-based instructional systems, including WBE, do not perform in any high-level activities involved in monitoring and regulating the instructional environment either at individual or group levels. However, instructional systems of the future will be able to support these functions.

The expected features of future instructional systems at the individual level are to diagnose learning needs, aptitudes, and styles; to modify the level and type of feedback and instructional strategy based on learner responses and progress; and to implement best practice guidelines based on the up-to-date research results.

At the group-level, future instructional systems will monitor and allocate instructional resources (e.g., schedule team activities); collect and analyze data across individuals, tasks, and settings; and generates lessons learned, best practices guidelines, etc., for use by instructional design and technology researchers and practitioners (Jacobs and Dempsey 2002, p. 327).

These high-level functions can only be accomplished by integrating some form of an Artificial Intelligence (AI) within the course management component of instructional systems architecture.

The effects of the developments in Artificial Intelligence to instructional systems is a gigantic subject that should be discussed in another thesis. The purpose of including this subject here is to give an idea about how the innovations in AI applications will shape the instructional design in the future.

Whenever artificial intelligence learning systems are discussed, a question invariably materializes. When will AI systems truly demonstrate human-like "intelligence" in the form of learning (i.e. the ability to change behavior based on past experience) and flexible problem solving? Jacobs and Dempsey (2002) believe that these big achievements will occur at a simple level within the next decade due to the

developments in related fields. “First, AI researchers have used a variety of cognitive modeling approaches that more closely mimic the functioning of human information processing. Secondly, recent advances in parallel processing offer a possible breakthrough in raw computing power, which has impeded the ability of AI researchers to write programs performing relatively simple cognitive tasks (e.g., object recognition) under real-time constraints. In addition, there are alternative technologies offering great promise. One such technology is Field-Programmable Gate Array (FPGA), a relatively new type of integrated circuit that can be considered as an intelligent hardware. (Jacobs and Dempsey 2002, pp. 327-329)”.

7.3. Web-Based Instruction via Satellite

The fundamental infrastructure in encountering the instructor with the student is the network in distance education. Networks suitable for distance education implementations include satellite systems, telephone networks- copper cables (asymmetric digital subscriber line (ADSL) modems and cable modems), and wireless networks.

Collins states in the article (2002) that the National Education Association (NEA)in the U.S.A. conducted a comprehensive study in Distance Learning and found out that most Web-based courses did not make extensive use of video. Similarly, the survey conducted in Turkish universities concludes the same result (pls. refer to Chapter 6 for details).

Historically, video has not been widely used in Web pages because of the production and workstation requirements, the considerable size of the video files, and the download times due to slow modem network connections. High-quality video over the Web will not become widespread until homes and offices are connected to the Internet via affordable broadband-access technologies, such as ADSL modem. On the other hand, as we mentioned before having an ADSL modem does not mean that we will be able to connect at a speed written on its specifications. The connection speed will be determined by the other equipments between the server and the ADSL modem. Furthermore, the number of terrestrial router hops, each of which can lose packets or cause additional delay and poor video quality, is also important. In order to avoid these problems, a satellite-based solution can be a possible alternative, since satellite

technology can be used to distribute content directly to the end user or closer to the edge of a network to reduce the number of terrestrial router hops.

However, “the long-latency and error-prone characteristics of satellite links, complicate the interoperation of satellite systems and the existing Internet infrastructure. Consequently, further development and adaptation of protocols and standards are required to resolve these technical challenges (Collins 2002, p.4)”. “While video streaming is an attractive tool for higher education, required bandwidth, quality of service (QoS), Internet congestion, and interoperability standards represent major obstacles in Internet protocol (IP) network implementations (Cunningham & Francis, 2001)”.

Besides these problems, the broadcast capabilities of satellite networks make them inherently multicast-enabled (Ray, 2001). The Internet2, a high-speed QoS-enabled network, and IP multicasting, the scheduling of video streaming at a particular time to a group of users, should facilitate the widespread use of video (Collins 2002).

Consequently, satellite-based Internet solutions can play a significant role in equalizing access to educational programs and resources within Turkey and globally.

CHAPTER 8

CONCLUSION

In this study, a basic model structure has been proposed which will serve as a guide to the institutions planning to offer web-based education or are aiming to restructure in this direction. The subsystems (system analysis, system design, and evaluation&control) present in the model and the activities taking part in three subsystems actually designate the fields of decision. Therefore, it has been assumed that the proposed model will be helpful to the institutions in reaching consistent decisions.

Although in the beginning it was assumed that an institution will offer both traditional and distance education, the suggested model can also be applied to the institutions aiming to offer distance education only.

The realization of a distance education application by preparing a lesson or program according to this model will make it possible to reveal the effectiveness evaluations suggested in the evaluation & control subsystem taking part in the final phase of the model. The success of a web-based lesson or program can only be judged based on this evaluations. Since such an application was not foreseen in this thesis, a relevant conclusion has not been reached.

In order to fulfill the second goal of this study, sections have been prepared to serve as a basis to the system design subsystem of this proposed model as well as to be a guide in the distance education and web-based education topics. In the collection of the information, numerous references have been covered and the conveyance of these information in the shortest and the briefest way was aimed. Nevertheless, since most of the information regarding design are prepared without taking into consideration the disabled people, the relevant information are not complete. In another study, the offering of the web based education to the disabled people, especially for deaf, hard of hearing or speech impaired, and blind students, has to be investigated.

In order to get a current picture of the studies that are conducted in the Turkish universities regarding web-based distance education topic, a questionnaire was prepared and was answered by 13 participating educators from 11 universities. The questions prepared were mostly about system design.

While the research was conducted, a single center where all the data and results are to be collected regarding web-based education on institution basis, was not encountered. Thus, because of the assumption made in the beginning regarding the existence of such a center, there was a huge problem in the collection of the answers and therefore some answers are binding only the relevant persons or sections rather than the university in general.

Besides the face to face interviews conducted in 9 universities, receiving of answers, for questionnaire posted by e-mail, from only 2 out of 15 universities selected according to certain criteria, arose a doubt that the relevant studies in this field do not receive adequate support from the academic staff. On the other hand, since all the interviewed instructors are staff of the distance education, working in this field and contributing to it; judging only according to this example will not be appropriate. Academic and administrative staff support is essential in developing an institutional culture.

In order to run a successful program on web-based education, faculty support solely is not sufficient. The students must also be ready to receive distance education. As an example, in one of our universities, it was stated that a lesson which was converted to be offered on the Web, had to be re-given in class in the following term because the students were not prepared for such an education. With this example, in the effectiveness of the web-based education, the importance of the student model, mentioned in the thesis with "ideal student" term, is once more understood.

In the e-learning field, one of the futuristic studies is the preparation of the reusable "learning objects" and the formation of an "Open Courseware". Studies to be carried out in this field will probably start a new era in educational design. However, from most of the universities there was not any information available regarding the conduction of any study in the relevant subject. "Learning Object"s and their effect to the web-based education can also be analyzed in another study.

After the finalization of this research, the evaluation of the data collected have led us to the results lined up under the following brief headings. The object of mentioning these in this section is to emphasize the point that the one who is a winner of the competition existing in many fields in the world is also dominant in the field of educational design. Thus, the institutions which observe the competition between the firms, will be able to guess better the direction of the trend in the design.

Browser

Nowadays, the browser wars are still going on. Although Microsoft Spyglass Inc., Mozilla Foundation, and Netscape Communication Corporation are the leading firms, Opera Software has also taken its place in this war. From the point of view of browser specialties, cost, operating system supported, image formats, web technologies and protocols, Internet Explorer, supported only by Windows operating system, which can be considered "inferior" or with a little more optimistic statement "insufficient" compared to the others, is actually dominating the market. The preparation of their design according to IE5 (March 1995) of all the participating universities in this research, is also an indication of this domination. However, it has been observed that, Windows, Mac OSX, Linux, Unix, BSD operating systems regarding web technologies supported, protocols and other properties, Opera or Mozilla Firefox which have superior features compared to IE, are less considered by the universities in their design. Actually, this situation is not very surprising taking into consideration the wide use of other MS products.

Server

The running software on the servers are generally MS products. As an example, according to the data collected from the three universities, although in one the university Red Hat AS3 (Advanced Sever 3/Linux like OS) is used, the use of MS products used in the other two universities is noticeable. Although this number is not adequate for stating a percentile, taking into consideration the use of MS products used in the other universities, it can be assumed that MS products software are also used in their servers.

Processors

While Microsoft is prevailing in operating systems, Intel's domination is reigning in the processor wars. Intel's processors (Pentium Xeon) is existing in the servers of our leading universities. The Xeon line of processors, whose production started after 1998, are 32-bit server-class microprocessors for PCs. Intel started to produce 64-bit processors after year 2001. The first 64-bit processor architecture (IA-64) performance, developed jointly by Intel and Hewlett Packard, was disappointing (www.freedictionary.com). However, Itanium2 put the architecture back on the track and achieved leadership performance in many benchmarks (www.freedictionary.com).

Database

Also in database design, the wide use of MS products is seen. Following the emergence of the object-oriented programming languages, studies commenced on object-oriented database management systems (ODBMSs), but later on, object databases were merged with relational databases (RDBMSs), providing a single environment for traditional business transactions, multimedia data and complex structures. Most modern DBMS products, such as IBM's DB2, Oracle database, and Microsoft SQL Server, make claims to support this technology and do so with varying degrees of success (www.freedictionary.com). We can observe the use of object-relational DBMSs (ORDBMSs), like DB2, MS SQL Server, in some of our universities. In web-based education where multimedia technologies are widely used, it is required to use DBMS that manages objects which are abstract data types, and handles multimedia data types (like images, audio and video). In addition, an object-relational DBMSs is suited for data with complex relationships that are difficult for modeling and processing in a relational DBMSs. We believe that it will be useful to investigate in a separate study the use of ORDBMSs in web-based education design.

Authoring Software

On the other hand, according to the research results, in the competition between Macromedia Dreamweaver and MS FrontPage, Macromedia Dreamweaver is leading. One of the reasons for this is that it is currently available for MAC and Windows. In addition, rumors persist that Macromedia has built a version of Dreamweaver that runs on the Linux platform, although the company has made no formal announcement on the matter (www.freedictionary.com). In another study, this sort of software can be comparatively examined in order to shed light to those who are going to decide which software to use.

Although it might seen insignificant from the learner's point of view which programs were utilized in the background of the lessons prepared, it is very important from the designer's point of view which tools were used in the software utilized and the easiness in the use of these tools. Since the richness in the quality and quantity of the tools used will also effect the characteristic of the design positively, eventually it will contribute to the achievement of the success foreseen in the web-based education. For this reason, the institutions which develop their own authoring and administrative software should pay great attention to this point.

Furthermore, in order to avoid the struggle of a learner receiving a web-based education with lessons from different institutions having different frameworks, the possibility of whether the educational institutions can develop a common framework having a joint understanding, is also a subject worth to investigate. Although a framework has been included in this thesis, it is only aimed to facilitate a better understanding of the web-based education design.

This thesis which is aimed to investigate the web-based education in a broad aspect, is naturally confined to a specific point of view and based on evaluations made with a certain level of knowledge. In spite of these drawbacks, for those aiming to learn independent from location and/or, for institutions which offer web-based education in order to provide equal chance in reaching the sources of education and learning, the use of this proposed basic model is humbly recommended in supporting their systematic academic studies. Furthermore it is also expected and hoped that this thesis will also serve as a useful source of knowledge for those who have an interest in this field.

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APPENDIX A

A BRIEF HISTORY OF THE INTERNET AND THE WORLD WIDE WEB

In the following, certain technological developments are orderly arranged. The time schedule is consciously extended to the date 1836 because it was the date of the innovation of telegraph which uses Morse Code to communicate between humans. There is a similarity between Morse Code and Binary Codes used for communication between computers today. Afterwards, all key innovations and the developments related to communication and dissemination of information are especially included to expose the relationship between succeeding developments resulting in today's technologies.

The reference sources used to produce this time schedule are separately given at the end of this Appendix A.

1800s

1836

Telegraph. Cooke and Wheatstone patented it.

- Revolutionized human (tele)communications.
- Morse Code is a series of dots and dashes used to communicate between humans. This is not a million miles away from how computers communicate via (binary 0/1) data today.

1858

The Atlantic cable was established to carry instantaneous communications across the ocean for the first time. Although the laying of this **first transatlantic cable** was seen as a landmark event in society, it was a technical failure. It only remained in service for a few days.

1866

Subsequent cables laid in 1866 were completely successful and remained in use for almost 100 years.

- Today, cables connect all continents and are still a main hub of telecommunication.

1876

Telephone. Alexander Graham Bell Exhibits.

- Telephones exchanges provide the backbone of Internet connections today.
- Modems provide Digital to Audio conversions to allow computers to connect over the telephone network.

1925 - 1945

1925

First radio courses are offered by the State University of Iowa

1945

- Vannevar Bush writes an article "As We May Think" for Atlantic Monthly about a photo-electrical-mechanical device called a **Memex**, for memory extension, which could make and follow links between documents on microfiche.
- The **concept of hypertext** has been invented.

1950s

1957

USSR launches Sputnik (the first artificial satellite). (Oct 4)

- The start of global telecommunications. Satellites play an important role in transmitting all sorts of data today.

1958

In response to the launch of Sputnik, the US government sets up the **Advanced Research Projects Agency (ARPA)** within the Department of Defense (DoD) to establish US lead in science and technology applicable to the military.(Feb 7)

1960s

1961

Leonard Kleinrock of the Massachusetts Institute of Technology (MIT) publishes "*Information Flow in Large Communication Nets*". This is the first paper on "packet-switching" theory – a key technology of the Internet.

Packet switching

In the 1960s, communication between two computers involved setting up a circuit (like a telephone circuit) between them and keeping it "open" while the communication took place. Packet switching opened an era because;

- the Internet relies on packets to transfer data.
- The origin is military : for utmost security in transferring information of networks (*no single outage point*).
- Data is split into tiny packets about 1500 characters long that may take different routes to a destination. If one of the packets is missing the destination computer sends a message asking the originating computer to send it again.
- Hard to eavesdrop on messages.
- More than one route available -- if one route goes down another may be followed.
- Networks can withstand large scale destruction (Nuclear attack - This was at the time of the Cold War).

1962

In 1962, Dr. J.C.R. Licklider was chosen to head ARPA's research in improving the military's use of computer technology. J.C.R. Licklider publishes his ideas about the future role of **multiaccess interactive computing**. He looked beyond the existing limitations of punched cards and paper tape to a time when computers would interact in real time with the human user. "*On-Line Man Computer Communication*" (August, 1962) is published by J.C.R. Licklider&W. Clark, MIT.

The RAND Corporation begins research into robust,, distributed communication networks for military command and control.

1964

- Paul Baran of the RAND publishes "*On Distributed Communications Networks*".
- Doug Engelbart develops the **NLS (oNLine System)** aimed at structured information that can be easily and immediately manipulated. This system was used to store all research papers, memos, and reports in a shared workspace that could be cross-referenced with each other.

1965

ARPA gets interested in computer networks and sponsors a study on a "**cooperative network of time-sharing computers**"

- TX-2 at MIT Lincoln Lab and AN/FSQ-32 at System Development Corporation (Santa Monica, CA) are directly linked (without packet switches) via a dedicated 1200bps dial-up telephone line, the first-ever (though small) wide-area computer network
- Digital Equipment Corporation (DEC) computer at ARPA later added to form "The Experimental Network"

Ted Nelson coins the word **Hypertext** for linked information in *A File Structure for the Complex, the Changing, and the Indeterminate*. 20th National Conference, New York, Association for Computing Machinery, 1965.

1966

The **first plan of the ARPANET** (forerunner of the Internet) is published by Lawrence G. Roberts, MIT: "*Towards a Cooperative Network of Time-Shared Computers*" (October).

1967

- The first design paper on ARPANET is published by Larry Roberts: "*Multiple Computer Networks and Intercomputer Communication*".
- Doug Engelbart created the ARPANET NIC (Network Information Center) at Stanford's Research Institute.
- National Physical Laboratory (NPL) in Middlesex, England develops NPL Data Network under Donald Watts Davies who coins the term packet. The **NPL network**, an experiment in packet-switching, used 768kbps lines.
- The first meeting of the three independent packet network teams (RAND, NPL, ARPA) is held.
- Andy van Dam and others build the HES and FRESS.

HES: HES (Hypertext Editing System) was used by Houston to produce documentation for the Apollo Space Program. Arbitrary length pieces of text could be linked together (unidirectional links). It allowed boiler plate (a standard formulation of legal documents or news stories) text to be edited and the results appear in all the documents that used that text.

FRESS: FRESS (File Retrieval and Editing System) was based on NLS and ran on an IBM mainframe. It separated the internal formats from the I/O by having virtual input/output devices. It had bidirectional links so that it was possible to know what people were linking to your information. Links could be typed to indicate their purpose and protection was implemented down to the byte level. It was one of the first systems to have an undo operation.

1968

- PS-network presented to the Advanced Research Projects Agency (ARPA).
- Bob Karn's team at BBN builds first Interface Message Processor (IMP) later known as a "**router**".
- A famous demonstration of NLS showed the world the **mouse** (invented by Doug Engelbart), cooperative working, the use of ARPANET, and linked information.

1969

- ARPANET commissioned by DoD for research into networking.
- ARPANET connects first 4 universities in the United States. Researchers at four US campuses create the first hosts of the ARPANET, connecting Stanford Research Institute, UCLA (Los Angeles), UCSB (Santa Barbara), and the U of University of Utah. Birth of the Internet. (!?)
- First packets sent by Charley Kline at UCLA as he tried logging into Stanford Research Institute (SRI). The first attempt resulted in the system crashing as the letter G of LOGIN was entered. (October)
- First RFC written.

1970s

1970

- The first publication of the original ARPANET Host-Host protocol "HOST-HOST Communication Protocol in the ARPA Network" is published by C.S. Carr, S. Crocker and V.G. Cerf.
- ALOHAnet, the **first packet radio network**, developed by Norman Abramson, Univ of Hawaii, becomes operational (July).
- ARPANET hosts start using Network Control Protocol (NCP), **first host-to-host protocol**.
- First cross-country link in the USA installed by AT&T between UCLA and BBN at 56kbps. This line is later replaced by another between BBN and RAND. A second line is added between MIT and Utah.
- The **Unix** operating system is developed at Bell Labs.

1971

- The ARPANET grows to 15 nodes (23 hosts) (UCLA, SRI, UCSB, Univ of Utah, BBN, MIT, RAND, SDC, Harvard, Lincoln Lab, Stanford, UIU(C), CWRU, CMU, NASA/Ames) connecting universities and government research centers around the US.
- Peggy Karp conceived of "host mnemonics" (RFC 226), or more simply, Internet names. She created look up table called "HOST.TXT" which contains all of the hostnames and their related IP addresses.
- Ray Tomlinson of BBN(Bolt Beranek and Newman, Inc.) invents **email** program to send messages across a distributed network. The original program was derived from two others: an intra-machine email program (SENDMSG) and an experimental file transfer program (CPYNET).
  - E-mail is still the main way of inter-person communication on the Internet today.
- Project Gutenberg was started by Michael Hart with the purpose of making copyright-free works, including books, **electronically available**. The **first text** is the US Declaration of Independence. This project is the forerunner of computer-mediated and even web-based distance education.

1972

- Ray Tomlinson of BBN modifies e-mail program for use on ARPANET where it becomes a quick hit. The **@ sign** was chosen from the punctuation keys on Tomlinson's Model 33 Teletype for its "at" meaning. (March)
- Larry Roberts writes **first email management program** to list, selectively read, file, forward, and respond to messages (July)
- ARPA renamed Defense Advanced Research Projects Agency **(**DARPA**).**
- First public demonstration of ARPANET between 40 machines. (October)
- **First computer-to-computer chat** takes place at UCLA, and is repeated during ICCC, as psychotic PARRY (at Stanford) discusses its problems with the Doctor (at BBN).
- ALOHAnet is connected to ARPANET.
- **ARPANET grows into the Internet**. The Internet is a network of networks that work along the same lines as the ARPANET. The original ARPANET is the "backbone" of this broader network.
- The **idea of open-architecture networking**—introduced by Kahn in late 1972 —was guided by four critical ground rules:
  - Each distinct network had to stand on its own,
  - Communications would be on a best-effort basis.
  - Black boxes (later called gateways and routers) would be used to connect the networks.
  - There would be no global control at the operations level.
- The InterNetworking Working Group (INWG) becomes the first of several standards-setting entities to govern the growing network. Vinton Cerf is elected the first chairman of the INWG, and later becomes known as a "Father of the Internet."
- Internetworking Working Group (INWG) created to address need for establishing agreed upon protocols.
  - **Telnet specification**
  - Telnet is still a relevant means of inter-machine connection today.

1973

-- Global Networking becomes a reality

- The ARPANET goes international with connections to University College of London (England) via NORSAR (Norway) and the Royal Radar Establishment in Norway.
- Bob Metcalfe's Harvard PhD Thesis outlines idea for **Ethernet** (a way to connect small groups of computers in what is known as a "local area network"). The concept was tested on Xerox PARC's Alto computers, and the first Ethernet network called the Alto Aloha System. (May)
- ARPA study shows e-mail composing 75% of all ARPANET traffic.

1974

-- Packets become mode of transfer

- Vint Cerf and Bob Kahn publish "*A Protocol for Packet Network Interconnection*" which specified in detail the design of a Transmission Control Program (**TCP**). [IEEE Trans. Comm. Tech 5 (May 1974), 627-641]
- **BBN opens Telenet**, the first public packet data service (a commercial version of ARPANET). ARPANET grows to 62 hosts.

1975

- Internet operations transferred to the Defense Communications Agency
- First ARPANET mailing list, **MsgGroup**, is created by Steve Walker.
- John Vittal develops MSG, the first all-inclusive e-mail program providing replying, forwarding, and filing capabilities.
- Satellite links cross two oceans (to Hawaii and UK) as the first TCP tests are run over them by Stanford, BBN, and UCLA.

1976

-- Networking comes to many

- Elizabeth II, Queen of the United Kingdom goes online with the first royal e-mail message.
- Multiprocessing Pluribus IMPs are deployed,
- **UUCP** (Unix-to-Unix CoPy) developed at AT&T Bell Labs and distributed with UNIX. UNIX was and still is the main operating system used by universities and research establishments.
  - These machines could now ``talk'' over a network.
  - Networking exposed to many users worldwide.

1977

-- E-mail takes off, Internet becomes a reality

- **The birth of the Internet** is usually given as July 1977 when there is a large scale demonstration of internetworking using the ARPANET, packet radio networks and satellite transmission. A message is sent from a van on the San Francisco highway by radio to ARPANET. From there, it goes by satellite to Norway, by a land line to UCL, by satellite back to the USA and by ARPANET to Los Angeles. A round trip of 94000 miles across several networks and technologies to deliver a message 800 miles away!
- THEORYNET created by Larry Landweber at Univ of Wisconsin providing electronic mail to over 100 researchers in computer science (using a locally developed e-mail system over TELENET).
- ARPANET grows to 111 hosts.

1978

- TCP is split into TCP and IP. (March)
- The first version of TCP worked fine for file transfer and remote login applications, but did not work on advanced network applications (packet voice) because in some cases packet losses could not be corrected by TCP. This insight led to a reorganization of the original TCP into two protocols —the simple IP providing only for addressing and forwarding of individual packets and the separate TCP concerned with such service features as flow control and recovery from lost packets. For applications that did not require the services of TCP, an alternative called the User Datagram Protocol (UDP) was added to provide direct access to the basic IP service.

1979

-- News Groups born

- Tom Truscott and Jim Ellis, two grad students at Duke University, and Steve Bellovin at the University of North Carolina establish the **first USENET newsgroups** by using UCCP. Users from all over the world join these discussion groups to talk about the net, politics, religion and thousands of other subjects.
- USENET still thrives today.
  - A collection of discussions groups, *news groups*.

- 3 news groups established by the end of the year
- Almost any topic now has a discussion group.

– The first recorded use of “emotions” such as ;-) (☺) in an e-mail from Kevin MacKenzie.

1980s

1980

– ARPANET grinds to a complete halt on 27 October because of an accidentally-propagated status-message virus.
– The first working draft of the **SGML** standard is published.
– While consulting for CERN June-December of 1980, Tim Berners-Lee writes a notebook program, "Enquire-Within-Upon-Everything", which allows links to be made between arbitrary nodes. Each node had a title, a type, and a list of bidirectional typed links. "ENQUIRE" ran on Norsk Data machines under SINTRAN-III.

1981

BITNET, the "Because It's Time (?Original acronym stood for 'There' in reference to the free NJE protocols) NETwork" started as a cooperative network at the City University of New York, with the first connection to Yale.

- Provides electronic mail and listserv servers to distribute information, as well as file transfers

CSNET (Computer Science NETwork) established to provide networking services (specially E-mail) to university scientists with no access to ARPANET. CSNET later becomes known as the Computer and Science Network.
TCP/IP formalized.

1982

-- TCP/IP defines future communication

– Bob Kahn and Vint Cerf are key members of a team that created TCP/IP, the common language of all Internet computers. For the first time the loose collection of networks, which made up the ARPANET is seen as an "internet", and the Internet as we know it today is born.
– Exterior Gateway Protocol (RFC 827) specification. **EGP** is used for gateways between (different architecture) networks.
– EUnet (European UNIX Network) is created by EUUG to provide E-mail and USENET services. Original connections between the Netherlands, Denmark, Sweden, and UK
– The experimental use of TCP/IP is complete.

1983

-- Internet gets bigger

– Desktop workstations come into existence.
- Many with Berkeley UNIX which includes IP networking software.
- Need switches from having a single, large time sharing computer connected to Internet per site, to connection of an entire local network.

TCP/IP becomes the universal language of the Internet.

– Berkeley releases new version of UNIX 4.2BSD incorporating TCP/IP.
– The transition of ARPANET from NCP to TCP/IP permitted it to be split into an ARPANET supporting research needs and a MILNET supporting operational requirements of civilian use. 68 of the 113 existing nodes went to MILNET

1984

The **Domain Name System (DNS) is invented** by Mockapetris to provide a scalable mechanism for resolving hierarchical host names into Internet addresses.

Users do not need to know the numerical address of a computer – just its name (e.g.: www.iyte.edu.tr)

- Large number of nodes.
- Hard to remember exact paths
- Use meaningful names instead.

The requirement for scalable routing approaches led to a hierarchical model of routing, with an Interior Gateway Protocol (IGP) used inside each region of the Internet and an Exterior Gateway Protocol (EGP) used to tie the regions together.

- William Gibson coins the term "cyberspace" in his novel "Neuromancer."
- The number of Internet hosts exceeds 1,000.
- **Moderated newsgroups** introduced on USENET.

1985

- Internet e-mail and newsgroups now part of life at many universities.
- **T1 Internet backbone formed.**
- There are 2000 hosts attached to the Internet.
- The National Centre for Supercomputing Applications (NCSA) is established at the University of Illinois.

1986

-- Power of Internet Realised

- 5, 000 Hosts. 241 News groups.
- Network News Transfer Protocol (NNTP) designed to enhance Usenet news performance over TCP/IP.

SGML becomes an ISO standard.

- Case Western Reserve University in Cleveland, Ohio creates the first "Freenet" for the Society for Public Access Computing.
- The U.S. National Science Foundation (NSF) initiated the development of the **NSFNET** (backbone speed of 56 Kbps) which, today, provides a major backbone communication service for the Internet.
- NSF establishes 5 super-computing centers to provide high-computing power for all -- This allows an explosion of connections, especially from universities.
- Commercial network providers in the U.S. and Europe are beginning to offer Internet backbone and access support on a competitive basis to any interested parties.
- *Turkey connected to Earn/Bitnet via a Egean-Italy fiber link – the first WAN connection.*

1987

The number of Internet hosts exceeds 28,000.

1988

- November 2nd - **Internet worm** burrows through the Net, affecting ~6,000 of the 60,000 hosts on the Internet.
- The Computer Emergency Response Team (CERT) is formed to address security concerns raised by the Worm.

- NSFNET backbone upgraded to T1 (1.544 Kbps).
- TCP/IP become a supported infrastructure at CERN
- Internet Relay Chat (**IRC**) developed by Jarkko Oikarinen.

1989

- The number of Internet hosts exceeds 100,000.
- Tim Berners-Lee- **HTTP**
- CERN is connected to the Internet in January.
- First relays between a commercial electronic mail carrier and the Internet
- Internet Engineering Task Force (IETF) and Internet Research Task Force (IRTF) comes into existence under the IAB

March

"Information Management: A Proposal" written by Tim Berners-Lee and circulated for comments at CERN. Paper "HyperText and CERN" produced as background.

1990s

1990

- The ARPANET ceases to exist. The **backbone of the Internet becomes NSFNET** (the National Science Foundation Network).
- CERN is the largest Internet site in Europe.
- The World comes on-line (world.std.com), becoming the **first commercial provider of Internet dial-up access**.
- There are 2000 networks in the Internet.
- 300,000 Hosts. 1,000 News groups
- Archie released files can be searched and retrieved (FTP) by name.

May

"Information Management: A Proposal" written by Tim Berners-Lee circulated again. He proposed the **WorldWideWeb** based on distributed computing and the Internet.

October

Tim starts work on a hypertext GUI browser+editor using the NeXTStep development environment. He makes up "WorldWideWeb" as a name for the program. This was a "what you see is what you get" (**wysiwyg**) browser/editor with direct inline creation of links. The first web server was nxoc01.cern.ch, later called info.cern.ch, and the first web page http://nxoc01.cern.ch/hypertext/WWW/TheProject.html. Unfortunately CERN no longer supports the historical site.

December

Line mode browser and WorldWideWeb browser/editor demonstrable. Access is possible to hypertext files, CERNVM "FIND", and Internet news articles.

1991

At the University of Minnesota, a team led by computer programmer Mark McCahill releases "**gopher**", the first point-and-click way of navigating the files of the Internet in 1991. Originally designed to ease campus communications, gopher is freely distributed on the Internet. McCahill calls it "the first Internet application my mom can use." It never became as popular as the World Wide Web mainly because it is a proprietary standard rather than open standard.

    - Text based, menu-driven interface to access internet resources.
    - No need to remember or even know complex computer command.
  - **PGP** (Pretty Good Privacy) is released by Philip Zimmerman. This is an encryption program that allows people to exchange messages securely. The US government describes it as a military technology and bans its export.
  - NSFNET backbone is upgraded to **T3** (44.736Mbps). NSFNET traffic passes 1 trillion bytes/month and 10 billion packets/month.
  - Commercial Internet eXchange (CIX) Association, Inc. formed after NSF lifts restrictions on the commercial use of the Net.
  - Wide Area Information Servers (**WAIS**)
    - Provides a mechanism for indexing and accessing information on the Internet.
    - Large bodies of knowledge available: E-mail messages, text, electronic books, Usenet articles, computer code, image, graphics, sound files, databases *etc.*.
    - These form the basis of the index of information we see on WWW today.
    - Powerful search techniques implemented. Keyword search.
  - ***TR-NET*** *project is started by TÜBİTAK and METU.*

March

Line mode browser (www) released to limited audience on vax, rs6000, sun4.

May

  - **General release of WWW** on central CERN machines (May 17).
  - Tim Berners-Lee, working at CERN ("Conseil Européen pour la Recherche Nucléaire" - the European Particle Physics Laboratory in Geneva) in Switzerland, posts the first computer code of the World Wide Web. The ability to combine words, pictures, and sounds on Web pages excites many computer programmers who see the potential for publishing information on the Internet in a way that can be as easy as using a word processor.
    - Originally developed to provide a distributed hypermedia system.
    - Easy access to any form of information anywhere in the world.
    - Initially non-graphic (this came later, MOSAIC, 1993).
    - Revolutionized modern communications and even our, way of life (?).

June

CERN Computer Seminar on WWW (June 12).

August

  - Files available on the net by FTP, posted on alt.hypertext (6, 16, 19th Aug), comp.sys.next (20th), comp.text.sgml and comp.mail.multi-media (22nd).
  - The number of hits on the CERN server, info.cern.ch grown from 100 a day in the summer of 1991 to 1,000 a day by the summer of 1992 and 10,000 a day in the summer of 1993.

October

VMS/HELP and WAIS gateways installed. Mailing lists www-interest (now www-announce) and www-talk@info.cern.ch started. Anonymous telnet service started.

December

Paul Kunz installs first Web server outside of Europe, at SLAC (Dec 12).

1992

-- Multimedia changes the face of the Internet

- The first audio (March) and video (November) broadcasts take place over a portion of the Internet known as the "MBONE."
- More than 1 Million hosts are part of the Internet. 4,000 News groups.
- The term "**surfing the Internet**" is coined by Jean Armour Polly.

January

Line mode browser release 1.1 available by anonymous FTP (Jan 15).

February

Line mode v 1.2 announced on alt.hypertext, comp.infosystems, comp.mail.multi-media, cern.sting, comp.archives.admin, and mailing lists.

1993

-- The WWW Revolution truly begins

- Traffic on the Internet expands at a 341,634% annual growth rate.
- Internet Talk Radio begins broadcasting.
- Number of Hosts 2 Million. 600 WWW sites.
- InterNIC created by NSF to provide specific Internet services
  - directory and database services
  - registration services
  - information services
- Business and Media really take notice of the Internet.

January

- By now, Midas (Tony Johnson, SLAC), Erwise (HUT), and Viola (Pei Wei, O'Reilly Associates) browsers are available for X; CERN Mac browser (ECP) released as alpha. Around 50 known HTTP servers.
- Marc Andreesen and a group of student programmers at NCSA (the National Center for Supercomputing Applications located on the campus of University of Illinois at Urbana Champaign) developed the **first graphics-based Web browser called Mosaic**(January 23). Early versions of Mosaic allowed you to annotate Web pages giving the cooperative working. PC and MAC versions released by November.
  - User Friendly Graphical Front End to the World Wide Web.
  - Develops into Netscape -- most popular WWW browser to date.
  - WWW proliferates at a 341,634

March

- WWW (Port 80 HTTP) traffic measures 0.1% of NSF backbone traffic.
- WWW presented at Online Publishing 93, Pittsburgh.

April

- April 12: ***Turkey (TR) connected to the Internet via a 64K connection between Ankara and Washington. An introductory session held in Bilişim'93.***
- April 30: Date on the declaration by CERN's directors that WWW technology would be freely usable by anyone, with no fees being payable to CERN. A milestone document.

July

Ari Luotonen at CERN implements access authorization, proceeds to re-write the CERN httpd server.

September

- WWW (Port 80 http) traffic measures 1% of NSF backbone traffic.

- NCSA releases working versions of **Mosaic browser for all common platforms: X, PC/Windows and Macintosh.**

October

Over 200 known HTTP servers. The European Commission, the Fraunhofer Gesellschaft and CERN start the first Web-based project of the European Union (DG XIII): WISE, using the Web for dissemination of technological information to Europe's less favored regions.

December

- **WWW receives IMA award**. John Markov writes a page and a half on WWW and Mosaic in "The New York Times" (US) business section. "The Guardian" (UK) publishes a page on WWW, "The Economist" (UK) analyses the Internet and WWW.
- Robert Cailliau gets go-ahead from CERN management to organize the First International WWW Conference at CERN.
- By the end of December, the Web grew to being nearly 2.5% of all Internet traffic.

1994

-- Commercialization begins

Shopping malls, banks arrive on the Internet

- First Virtual, the first cyberbank, becomes available for business.
- Radio stations start broadcasting on the Internet.
- NSFNET traffic passes 10 trillion bytes/month.
- WWW edges out telnet to become 2nd most popular service on the Net (behind ftp-data) based on % of packets and bytes traffic distribution on NSFNET
- Number of Hosts 3 Million. 10,000 WWW sites. 10,000 News groups.
- Top 10 Domains by Host #: com, edu, uk, gov, de, ca, mil, au, org, net

January

O'Reilly, Spry, etc announce "**Internet in a box**" product to bring the Web into homes.

March

Marc Andreessen and colleagues leave NCSA to form "Mosaic Communications Corp" (later Netscape).

May 25-27

First International WWW Conference, CERN, Geneva. Heavily oversubscribed (800 apply, 400 allowed in): the "Woodstock of the Web". VRML is conceived here.

June

Over 1500 registered servers.

Load on the first Web server (info.cern.ch) 1000 times what it has been 3 years earlier.

September

The European Commission and CERN propose the WebCore project for development of the Web core technology in Europe.

1 October

World Wide Web Consortium founded.

A new coordination organization is formed—the World-Wide Web Consortium (W3C), initially led from MIT's Laboratory for Computer Science by Al Vezza and Tim Berners-Lee, the Web's inventor. Today, the W3C is responsible for evolving the various protocols and standards associated with the Web. In the USA,

companies like Microsoft, IBM, Sun, Hewlett Packard, Apple, Adobe and Boeing are members. In the UK, membership includes BT, Oxford Brookes, BBC, Sema, APACS, ECA, RAL, Southampton, Bristol, Edinburgh Univ, RivCom, AND-Data, Brunel, etc. In Europe, Philips, Nokia, Ericcson, Reuters, Siemens etc are members. In Asia, Fujitsu, NEC, Matsushita, Mitsubishi, Hitachi, Honda etc are members.

October

Second International WWW Conference: "Mosaic and the Web", Chicago. Also heavily oversubscribed: 2000 apply, 1300 allowed in.

December

- **First W3 Consortium Meeting** at M.I.T. in Cambridge (USA). (Dec 14)
- CERN decides not to continue WWW development, and by mutual agreement with the European Commission and INRIA (the Institute National pour la Recherche en Informatique et Automatique, FR) transfers the WebCore project to INRIA.

1995

-- Microsoft enter

- 12.8 Million Hosts, 0.5 Million WWW Sites.
- Microsoft woke up to the Web and produced the first version of **Internet Explorer**.
- NSFNET reverts back to a research project, leaving the Internet in commercial hands.
- Traditional on-line dial up systems such as Compuserve and American Online begin to offer Internet access too.
- **Sun launches JAVA** – a programming language- on May 23. Java applications known as applets can be embedded in Web pages. Java radically alters the way applications and information can be retrieved, displayed, and used over the Internet.
- **WWW search engines** (e.g. Yahoo, Infoseek, etc.) take off.
- RealAudio, an audio streaming technology, lets the Net hear in near real-time.
- **WWW surpasses ftp-data in March** as the service with greatest traffic on NSFNet based on packet count, and in April based on byte count.
- A standard for distributing interactive 3D models on the Web is established. It is called **VRML** (Virtual Reality Modeling Language).
- The number of hosts on the Internet exceeds 14 million.
- The number of networks on the Internet exceeds 134 000.
- *Technologies of the Year:* WWW, Search engines
- *Emerging Technologies:* Mobile code (JAVA, JavaScript), Virtual environments (VRML), Collaborative tools

February

The Web is the main reason for the theme of the G7 meeting hosted by the European Commission in the European Parliament buildings in Brussels (BE).

March

CERN holds a two-day seminar for the European Media (press, radio, TV), attended by 250 reporters, to show WWW. It is demonstrated on 60 machines, with 30 pupils from the local International High School helping the reporters "surf the Web".

November

*TURKEY : TURNET tender finalized. Sprint-Satko-METU consortium won the bid to set up and operate the **TURNET**.*

1996

- Malaysian Prime Minister Mahathir Mohammad, PLO Leader Yasser Arafat, and Philippine President Fidel Ramos meet for ten minutes in an online interactive chat session on 17 January.
- MCI upgrades Internet backbone adding ~13,000 ports, bringing the effective speed from 155Mbps to 622Mbps.
- **Users in almost 150 countries around the world are now connected to the Internet.** The number of computers on the Internet exceeds 21 million. Approximately 40 million people are connected to the Internet.
- There are 94000 networks in the Internet.
- More than $1 billion per year changes hands at Internet shopping malls,
- The Internet Ad Hoc Committee announces plans to add 7 new generic Top Level Domains (gTLD): .firm, .store, .web, .arts, .rec, .info, .nom.
- The WWW browser war, fought primarily between Netscape and Microsoft, has rushed in a new age in software development, whereby new releases are made quarterly with the help of Internet users eager to test upcoming (beta) versions.
- *TURKEY : TURNET is in the service with a 2 Mbps backbone.*
- *Technologies of the Year:* Search engines, JAVA, Internet Phone
- *Emerging Technologies:* Virtual environments (VRML), Collaborative tools, Internet appliance (Network Computer)

1997

- The number of computers on the Internet exceeds 29 million in the USA.
- Domain name business.com sold for US$150,000.
- The number of web sites passes 1,000,000.
- Using the **Web for commerce** started early in 1997.
- *TURKEY : A decision is taken to constitute an Internet Committee.*
- *Technologies of the Year:* Push, Multicasting
- *Emerging Technologies:* Push

1998

- The number of Web pages is estimated at between 275 million and 320 million.
- The number of Internet hosts passes 30,000,000.
- *TURKEY : TTNet is announced by Türk Telekom (TT) in January.*
- **Open source software comes of age**.
- *Technologies of the Year:* E-Commerce, E-Auctions, Portals
- *Emerging Technologies:* E-Trade, XML, Intrusion Detection

1999

- First Internet Bank of Indiana; the first full-service bank is available only on the Net, opens for business on 22 February.
- *Technologies of the Year:* E-Trade, Online Banking, MP3
- *Emerging Technologies:* Net-Cell Phones, Thin Computing, Embedded Computing

2000s

2000

- 218 of 246 countries as of Jan 2000 in the Internet.
- Internet2 backbone network deploys **IPv6**. (16 May)
- Various domain name hijackings took place in late May and early June, including internet.com, bali.com, and web.net.
- Over 407 million users as of Nov 2000.
- *Technologies of the Year:* ASP, Napster
- *Emerging Technologies:* Wireless devices, IPv6

2001

- Over 115 million Hosts as of Jan 2001.
- More than 31 million Domain names.(March)
- About 100 TB of Data.
- Radio stations broadcasting over the Web go silent over actor royalty disputes.(10 Apr)
- First uncompressed real-time gigabit **HDTV transmission** across a wide-area IP network takes place on Internet2 (12 Nov).
- 150-175 million hosts on Internet.
- **W3C is recognized as the controlling body for the Web.**
- *Emerging Technologies:* Grid Computing, P2P

2002

Internet2 now has 200 university, 60 corporate, and 40 affiliate members (2 Sep).

Over 200 million IP nodes, 840 million users.

2003

- The SQL Slammer **worm** causes one of the largest and fastest spreading DDoS attacks ever. Taking roughly 10 minutes to spread worldwide, the worm took down 5 of the 13 DNS root servers along with tens of thousands of other servers, and impacted a multitude of systems ranging from (bank) ATM systems to air traffic control to emergency (911) systems (25 Jan). This is followed in August by the Sobig.F virus (19 Aug), the fastest spreading **virus** ever, and the Blaster (MSBlast) worm (11 Aug), another one of the most destructive worms ever
- k.root-servers.net changes to using nsd vs. bind to increase diversity of software in the root name server system (19 Feb).
- By 2010 about 80% of the planet will be on the Internet.

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APPENDIX B

QUESTIONNAIRE

AIM : To find out the applications of web-based distance education in Turkish Universities.

Name of the University (please indicate) :

Name of the person answering the questionnaire (optional) :

QUESTIONS :

1. Do you provide distance education?

□Yes □No

If your answer is "Yes", please continue on.
If it is "No", the questionnaire is over for you.

THANK YOU

2. When did you start technology-aided distance education?

.....

3. What kind of distance education are you providing?

	Starting Year
□Computer-Assisted Education	.....
□Audio/video Mediated Education	.....…
□Computer-Mediated Education	.....
□Web-Based Education	.....…
□Others	.....…

4. Which format are you using in distance education?

□Synchronous □Asynchronous □Mixed

5. What materials are you using in Distance Education?

Printed
□Textbook □Workbook □Others.....…….
Audio
□Cassette □Radio □DVD/VCD □CD-ROM □Others…
Visual
□Slides □Video band □DVD/VCD □CD-ROM □Others...
Data
□Diskette □CD-ROM □Others.....

6. In which language do you provide your distance education?

□Turkish □English □French □German □Other....

7. We are a

□Server □Client

university in distance education.

If you are a Server university;

8. Being a server we offer ..... subjects.

Name of the Subject	DE Model	Client (univ./association/foundation)
.....	.....	.....
.....	.....	.....

If you are a Client university;

9. As a client we receive ..... subjects.

Name of the Subject	DE Model	Server (univ./association/foundation)
.....	.....	.....
.....	.....	.....

10. Students that receive distance education from ;

	Number of Students (General)%	(Web-based)%
□Our country	.....	.....
□Abroad		
□Our university	.....	.....
□Other universities		
□Bachelors degree	.....	.....
□Masters degree		
□Doctor's degree	.....	.....
□Others		

11. Do you provide Web-based education?

□Yes □No

If your answer is "Yes", please continue on.
If it is "No", the questionnaire is over for you.

THANK YOU

12. On which network do you provide web-based education?

□Intranet □Extranet □Internet

13. To how many people have you provided web-based education?

Number of people : .....

14. To how many people are you providing web-based education this year?

Number of people : .....

15. What is the average number of people taking a subject?

Average number of people : ..... (min. : ..... max. : .....)

16. Do you give support to a web-based subject by class studies?

□Yes □No

17. Do you give support to the subject given in the class by preparing some of the relevant materials on the Web?

□Yes □No

18. Which information format are you using in web-based education?

□Text □Audio □Visual

19. What criteria is used when deciding on the instructor who will provide distant education?

□Educational design □Knowledge of programming
□Writing skill □Leadership
□Visual design capability □Others....

20. Have you given special training to your instructors?

□Yes □No

If Yes; On which subjects?

□Pedagogy □Technology □Other.....

21. What is the role of the teacher in your web-based subjects?

□Instructor □Moderator □Observer
□Facilitator □Guide □Other....……..

22. Does the cost of web-based education for a person influence the choice of technologies to be used?

□Yes □No

If Yes; If there is an extra cost besides lesson fees, do you give a financial aid?

□Yes □No

23. Do you have a strategy in determining a student-profile of the students to whom you will provide distance education?

□There is □There is not

If there is, please explain briefly :.....…….

24. In WBE, we develop

□Lessons □Programs

If you develop programs; What are the degrees/titles?

.....

25. The requests for your web-based subjects come from

	%
□Private sector	.....
□Public sector	.....
□Educational institutions	.....
□Individual	.....

26. Have you received any support regarding DE from any institution, association, firm or foundation?

□Yes □Hardware □Software □Training □Other...
□No

27. Who are the members of your web-based design team?

□Technical personnel □Content developers □Instructors
□Graphic designers □Code writers □Others .....

28. What is the drop-out rate in your web-based education?

%.....

29. What are the reasons for drop-outs?

□Technical difficulties □Insufficient technical support
□Incorrect course selection □unanswered expectations
□Software problems □Other .....

30. Can you give the address of the home page of the subject that you have prepared on the Web.

Home page : .....

31. According to which browsers have you designed your subject?

	version
□Netscape Navigator	.....
□Internet Explorer	.....
□Mozilla	.....
□Other	.....

32. What are your server specifications?

Hardware			Example (Sakarya Un. - 1. e-Learning Meeting 2002)
Processor	:	.....	2 x Pentium Xeon
Hard disk	:	.....	30 Gigabyte (RAID)
RAM	:	.....	1 Gigabyte
Ethernet Card	:	.....	2 x 10/100 Mbps
Other	:	.....	

Software

.....	MS Windows NTServer 4.0
.....	MS Inter. Inform. Server 4.0
.....	MS SQL Server 7.0
.....	Lotus Learning Space 4.01

33. What are the tools/technologies you use?

	Tools	Example
Client-side design		VBScript
Server-side design		ASP
Data-base design		MS Access
Query language		SQL
Services		e-mail, chat

34. The authoring tool we used in preparing a subject;

is developed by us Name :.....
is from an on-the-shelf program Name :.....

35. Is there any interaction in the subject that you have prepared?

□Yes □No

If yes; Among whom?

□Student- Course material □Student-Student
□Student-Instructor □Other .....

36. How do you achieve interaction?

	Student-Student	Student-Instructor
a. E-mail	□	□
b. Discussion Groups		
– e-mail list	□	□
– newsgroup	□	□
– forum	□	□
c. chat	□	□
d. whiteboard	□	□
e. screen sharing	□	□
f. audio conferencing	□	□
g. video conferencing (one-way)	□	□
h. video conferencing (two-way)	□	□

37. If you are using an audio and/or visual conference, because of the transmission and connection speed limitations, what might be your solutions for a high quality transmission?

38. What technologies, techniques, and programs do you use for a dynamic content?

□JavaServerPages (JSP)
□Netscape Server-side Java Script (SSJS)
□Microsoft Active Server Pages (ASP)
□Java Servlets
□CGI
□DHTML
□JavaScript
□CascadingStyleSheet

39. Which markup language do you use?

□HTML □XHTML □XML □Other.....

40. What programs do you use in WBE?

□Microsoft FrontPage
□Macromedia Flash
□Macromedia Dreamweaver
□Others .....
□WebCT
□Lotus Learning Space
□GoLive

41. Which tools do you use for collaboration and messaging?

□Microsoft's Exchange
□Windows NetMeeting
□IBM's Lotus Notes
□Tools in WBE package WBE package : .....
□Others .....

42. Which web formats are you using?

Audio	:	□WAV □Real Audio	□MP3 □Other
Multi-media	:	□Macromedia Director	□Macromedia Flash
		□Macromedia Authorware	□QuickTime
		□AVI	□Other
Text	:	□Adobe Acrobat PDF	□RichTextFormat(RTF)
		□Other	

43. Do you use Cooperative Learning method by forming teams among students?

□Yes □No

44. Are you using Adaptive Hypermedia? ie., is the content and the presentation dynamically structured according to the needs of the students?

□Yes □No

45. Do you have any applications for Artificial Intelligence?

□Yes □No

If you do; In which areas?

.....

46. Do you have a virtual laboratory?

□Yes □No

If yes; Have you designed the application program?

□Yes, we have.
□No, we use on-the-shelf program.
□The package program contains it.

Which subjects do you instruct in the laboratory?

.....

47. For the course administration;

	Name
□We use a package program	.....
□We developed our own program	.....

48. Your web-based subjects contain which searching mechanisms?

□Interior – search-motor special for the subject
□Exterior – Net-based motors (like Google)

49. Have you formed a common database with other universities and associations for the library recordings?

□Yes □No

If yes; Which university and society libraries can you access for information?

.....

50. The database you use depends on which data model?

□Relational data model
□Object-oriented data model

51. What procedures do you use to find out the shortages and the problems of your course?

□Collection of student comments on weekly basis
□Collection of student comments when the program or course is over
□The evaluation of logs generated by the system
□Others .....

What are the results of the data obtained?

□The course materials were improved.
□The size of the files were modified.
□Interaction was enhanced.
□Others .....

52. Have you changed a subject, that was prepared statically and asynchronized, to a subject which is dynamic and synchronized in structure?

□Yes □No

If yes; Why?

□To make it more interesting for the student
□The dynamic formation makes it easier to learn.
□Technological improvements facilitate the communication.
□Others .....

53. The examination methods used on WBE?

□Acc.to DE Regulation Art. 8 Item (g) and (h)
□Examination following each class session.
□Examination following each topic.
□General examination at the termination of the course.

54. Examination questions ;

□True/False □Simulation
□Multiple-choice □Fill-in-the-blanks
□Text-input □Drag-and-drop
□Matching-list □Others .....

55. What are the tendencies of the student of forwarding a question via e-mail or another tool?

□None □Low (%1 - %30) □Medium (%31-%70) □High (%71-%100)

56. How do you supply navigation in the subject?

□Menu □Link
□Index □Search
□Next/Back buttons □Resume button
□Dictionary □Lesson Map

57. What course structure do you use in WBE?

- Classical structure
- Based on a basic activity
- A course structure formed according to the individual needs and knowledge of the student
- The student self acquirement of the knowledge from a database in order to reach a given goal.
- A course structure formed acc. to the tests or questionnaires answered by the student at the beginning of the course.

58. Did you get a copyright for the subjects you have prepared?

Yes No

59. Do you pay any royality to another association for a copyright?

Yes No

If yes; For what?

60. In the table given below, the horizontal axis is comprising of many components of a course and the vertical axis shows the tools and technologies that can be utilized in a web-based education. Taking into consideration the web-based courses you offer, would you please kindly indicate which tools or technologies you use in which course component by marking an "X" in the intersection box?

Components of a lesson

Tools and technologies	lab	lecture	discuss	simulation	Group work	assignment	presentation	text
plain text								
hypertext								
hypermedia								
Interactive text								
Chat room								
Bulletin board								
Groupware								
Sound								
Voice								
Internet phone								
Audio graphic								
Animation								
Visualization								
Real-time-video								
Compressed video								

APPENDIX C

DEFINITIONS

Apache

Apache HTTP Server is an open source HTTP for Unix platforms (BSD, Linux , and UNIX systems), Microsoft Windows, and other platforms.
Initially, Apache was the only viable open source alternative to the Netscape web server (currently known as iPlanet). It has since evolved to rival (and probably surpass) any other Unix based HTTP server in terms of functionality and speed. Since April 1996 Apache has been the most popular HTTP server on the Internet : in May 1999 it was running on 57% of all web servers; by August 2004 this percentage had increased to 67%.
Apache is the web server component of the popular web server set of programs called LAMP: Linux, Apache, MySQL and PHP.
The Apache 2.x core has several major enhancements over Apache 1.x. They include UNIX threading, better support for non-Unix platforms, new Apache API, and IPv6 support.

Artificial Intelligence-AI

Artificial intelligence, also known as machine intelligence, is defined as intelligence exhibited by anything manufactured (i.e.) by humans or other sentient beings or systems (should such things ever exist on Earth or elsewhere).

ASP-Active Server Pages

Active Server Pages (ASP) is Microsoft's server-side technology for dynamically-generated web pages that is marketed as an adjunct to Internet Information Server (IIS). ASP has gone through four major iterations, ASP 1.0 (distributed with IIS 3.0) on December 10, 1996, ASP 2.0 (distributed with IIS 4.0) in March of 1998 , ASP 3.0 (distributed with IIS 5.0) and ASP.NET (part of the Microsoft .NET platform). The pre-.NET versions are currently referred to as "classic" ASP.

Authoring program

Software that allows for the creation of tutorials, CBT courseware, Web sites, CD-ROMs and other interactive programs. Authoring packages generally provide high-level visual tools that enable a complete system to be designed without writing any programming code, although a proprietary authoring language may also be included.

Authorware

A popular courseware authoring program for Windows and the Mac from Macromedia. Widely used for creating interactive material for CDs, DVDs and the Web. Authorware generates output that conforms to various learning management systems (see LMS).

AVI-Audio Video Interleave

AVI is a file format designed to store both audio and video data in a standard package to allow its simultaneous playback. It was introduced by Microsoft in November 1992, as part of the Video for Windows technology.

Blended Learning

Blended learning refers to using multiple approaches to teaching. Examples include combining technology-based materials and traditional print materials, group and individual study, structured pace study and self-paced study. With today's prevalence of high technology in many countries' schools, blended learning often refers specifically to the provision or use of resources which combine e-learning with other educational resources.

CAE/CAI-Computer Assisted Education/Instruction

Computer-Assisted Education/Instruction - ("aided", "learning", CAL). The use of (personal) computers for education and training.

CBT-Computer-Based Training

Using the computer for training and instruction. CBT programs are called "courseware" and provide interactive training sessions for all disciplines. Using graphics extensively, CBT was originally introduced on LaserDiscs, then CD-ROMs and, later, online. CBT courseware is typically developed with authoring languages that are designed to create interactive question/answer sessions. See CMI and e-learning.

CCS-Cascading Style Sheet

Cascading Style Sheets (CSS) is a computer language used to describe the presentation of a structured document written in HTML, XHTML or XML. The CSS specification is maintained by the World Wide Web Consortium (W3C). CSS is used by both authors and readers of web pages to define colors, fonts, layout, and other aspects of document presentation.

CD-ROM-Compact Disk Read-Only Memory

The CD-ROM is a non-volatile optical data storage medium using the same physical format as audio compact discs, readable by a computer with a CD-ROM drive. A CD-ROM is a flat, plastic disc with digital information encoded on it in a spiral from the center to the limit, the outside edge.

Chat

Online chat is a generic term for what are now mostly known as instant messaging applications - computer programs that enable two-way typing to connect users to each other.

Chat Room

A chat room is an online forum where people can chat online (talk by broadcasting messages to people on the same forum in real time).

Chat systems include Internet Relay Chat (where rooms are called "channels"), Jabber, and several proprietary systems implemented on the Microsoft Windows and Java platforms.

CGI-Common Gateway Interface

Common Gateway Interface (CGI) is an important World Wide Web technology that enables a client web browser to request data from a program executed on the Web server. CGI specifies a standard for passing data between the client and the program. Originally, CGI was invented by NCSA for the NCSA HTTPd web server in 1993. This web server used UNIX shell environment variables to store parameters passed from the web server execution environment before spawning the CGI program as a separate process.

Collaborative Learning

Collaborative learning is an umbrella term for a variety of approaches in education that involve joint intellectual effort by students or students and teachers. Groups of students work together in searching for understanding, meaning or solutions or in creating a product. The approach is closely related to cooperative learning, but is considered to be more radical.

Collaborative Software

Collaborative software, also known as groupware, is application software that integrates work on a single project by several concurrent users at separated workstations (see also Computer supported cooperative work). It was pioneered by Lotus Software with the popular Lotus Notes application running in connection with a Lotus Domino server. Collaborative software becomes more valuable when more people use it and thus Metcalfe's law applies. For example, calendaring becomes more useful when more people are connected to the same electronic calendar and choose to keep their individual calendars up-to-date.

Cooperative Learning

The term computer supported cooperative work (CSCW) addresses how collaborative activities and their coordination can be supported by means of computer systems. A lot of confusion in the field of CSCW raises from the different interpretations of the terms collaboration and cooperation. Once again, many authors simply consider both terms as synonyms, while others draw a distinction between them:

Cooperation and collaboration do not differ in terms of whether or not the task is distributed, but by virtue of the way in which it is divided; in cooperation the task is split (hierarchically) into independent subtasks; in collaboration cognitive processes may be (heterarchically) divided into intertwined layers. In cooperation, coordination is only required when assembling partial results, while collaboration is « ...a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem ».

CMI-Computer-Managed Instruction

Using computers to organize and manage an instructional program for students. It helps create test materials, tracks the results and monitors student progress.

CSJS-Client-Side Java Script

A JavaScript interpreter that runs in the browser and turns JavaScript source code into machine code and executes it. Contrast with SSJS.

DB2

IBM's DB2 product is a database management system. It has a long history and was what some consider to be the first database product to use SQL. Technically, today, DB2 can be considered to be an object-relational database. Even though DB2 started out on the mainframe it migrated down through UNIX and Windows servers and finally became available on Linux and on PDAs.

Currently, there is a dogfight going on between DB2 and Oracle for the number 1 position in the market. On May 3, 2004 IBM's head of database development and sales, Janet Perna, claimed their main competitors were Oracle in the context of advanced transaction handling, and Teradata in the context of decision-making systems (e.g. data warehousing).

DHTML-Dynamic HTML

Dynamic HTML is really just HTML with a few new elements plus access to those elements via a scripting language. The new elements give you more precise control over how your page looks and the new object model lets you manipulate those elements programmatically using scripts.

DHTML has added elements that give you precise control over the look of your page. These elements are:

- Style Sheets let you define different styles for text presentation, such as color, margin size and fonts.
- Content Positioning let's you determine exactly where elements of your page appear within the browser window. Elements can even overlap, be hidden or be moved dynamically.
- Downloadable Fonts ensure that the font you choose for text will be used even if that font is not available on the client's machine.

Diskette

A floppy disk is a data storage device that comprises a circular piece of thin, flexible (hence "floppy") magnetic storage medium encased in a square or rectangular plastic wallet. Floppy disks are read and written by a floppy disk drive or FDD.

DVD-Digital Versatile Disk

DVD is an optical disc storage media format that is used for playback of movies with high video and sound quality and for storing data. DVDs are similar in appearance to compact discs.

e-learning

E-learning most often means an approach to facilitate and enhance learning by means of personal computers, CDROMs, and the Internet. This includes email, discussion forums, and collaborative software, e.g. BSCW or CSCW. Advantages are seen in that just-in-time learning is possible, courses can be tailored to specific needs and asynchronous learning is possible. E-learning may also be used to support distance learning through the use of WANs (Wide area networks), and may also be considered to be a form of flexible learning. Often, but not always, e-learning will also attempt to be a student-centered learning solution.

e-mail

E-mail, or email, is short for "electronic mail" (as opposed to conventional mail, in this context also called snail mail) and is a method of composing, sending, and receiving messages over electronic communication systems. Most e-mail systems today use the Internet, and e-mail is one of the most popular uses of the Internet.

Exchange Server

Messaging and groupware software for Windows from Microsoft. Exchange Server is an Internet-compliant messaging system that runs under Windows NT/2000 and can be accessed by Web browsers, the Windows Inbox, Exchange client or Outlook. Exchange Server is also a storage system that can hold anything that needs to be shared.

Extranet

An extranet could be described as two or more intranets with network connectivity. Generally, and as with intranets, an extranet will be based on Internet Protocols . The underlying network technology does not really matter, for instance it may be that organizations use the internet for carrying data but restrict access to resources from the general public via firewalls. A virtual private network could be set up over the Internet to achieve the same result.

Facilitator

Someone who makes progress easier.

Fast Ethernet

Fast Ethernet is a collective term for a number of Ethernet standards that carry traffic at the nominal rate of 100 Mbit/s, against the original Ethernet speed of 10 Mbit/s.

Firefox

Mozilla Firefox (originally known as Phoenix and briefly as Mozilla Firebird) is a free cross-platform web browser developed by the Mozilla Foundation and hundreds of volunteers. With Firefox, the Mozilla Foundation aims to develop a small, fast, simple, and highly extensible web browser (separate from the larger Mozilla Suite). Firefox has become the main focus of Mozilla development along with the Mozilla Thunderbird e-mail client, and it has replaced the Mozilla Suite as the official browser release of the Mozilla Foundation. Firefox has attracted attention as an alternative to Internet Explorer, which has come under fire for its alleged poor program design and insecurity —detractors cite IE's lack of support for certain Web standards, use of the potentially-dangerous ActiveX component, and vulnerability to spyware and malware installation. Microsoft has responded by releasing Windows XP Service Pack 2, which adds several important security features to Internet Explorer. Internet Explorer also lacks many features that Firefox's proponents consider essential, such as tabbed browsing.

FrontPage

Microsoft FrontPage is a WYSIWYG HTML editor and web site administration tool from Microsoft for the Windows operating system. It is part of Microsoft Office and included in some versions of the popular bundle.

Gigabit Ethernet

Gigabit Ethernet is a term describing various technologies for implementing ethernet networking at a nominal speed of one gigabit per second.

Gigabit Ethernet is supported over both optical fiber and twisted pair cable. Whilst it is currently deployed in high-capacity backbone links (for instance, on a high-capacity campus network) its speed is largely not yet required for small network installations. Gigabit Ethernet has begun to penetrate the desktop (as of 2004), shipping standard on Apple's Power Mac G5, and built into some high-end Pentium and Athlon motherboards. Desktop applications for it include professional video editing. It is no longer the fastest Ethernet standard, with the ratification of 10 Gigabit Ethernet in 2002.

GoLive

Adobe GoLive is a Web page development application from Adobe Systems. The latest version, which replaces 7.0, is called "CS" by Adobe, indicating its integration with the rest of the Adobe Creative Suite. Its main competition is from Macromedia's Dreamweaver, which has a larger market share.

Guide

Someone who shows the way by leading or advising.

HomeSite

HomeSite is a HTML editor currently owned by Macromedia. HomeSite isn't a WYSIWYG HTML editor like FrontPage or Dreamweaver, more a handcoder's tool. It is only available for the Windows platform.

The last versions: Macromedia HomeSite 5.0 (2001), Macromedia HomeSite 5.5 (September 2003).

There is also another version called HomeSite+ which is included in Dreamweaver MX 2004. HomeSite+ has additional functionality for application development.

Features: Customizable interface that includes dockable toolbars and "tag snippets", Colour coding for PHP , JavaScript, ASP, Perl, SQL, and DHTML.

HTML-Hypertext Markup Language

HyperText Markup Language (HTML) is a markup language designed for the creation of web pages and other information viewable in a browser. Originally defined as a simple application of SGML, which is used by organizations with complex publishing requirements, HTML is now an international standard (ISO/IEC 15445:2000). The HTML specification is maintained mainly by the World Wide Web Consortium (W3C).

HTML Editor

An HTML editor is a software application for creating web pages. Although the HTML code of a web page can be written with any text editor, HTML editing software offers convenience and functionality. For example, most HTML editors have features for creating Cascading Style Sheets and templates. There are two flavors of HTML editors: text and WYSIWYG. Text editors usually provide syntax highlighting, toolbars and keyboard shortcuts for quickly inserting HTML elements. Wizards and dialogue boxes help with cumbersome tasks like adding the basic page structure or creating tables.

Hypertext

In computing, hypertext is a user interface paradigm for displaying documents which contain automated cross-references to other documents called hyperlinks. Selecting a hyperlink causes the computer to display the linked document within a very short period of time. A document can be static (prepared and stored in advance) or dynamically generated (in response to user input).

IBM Lotus Notes

Messaging and groupware software from Lotus that was introduced in 1989 for OS/2 and later expanded to Windows, Mac, Unix, NetWare, AS/400 and S/390. Notes provides e-mail, document sharing, workflow, group discussions and calendaring and scheduling. It also accepts plug-ins for other functions.

The heart of Notes, and what makes it different from other groupware, is its document database. Everything, including mail and group discussions, are maintained in a Notes database, which can hold data fields, text, audio and video.

IBM Web Sphere

IBM WebSphere refers to a brand of IBM software products, although the term also popularly refers to one specific product: WebSphere Application Server. WebSphere helped define the middleware software category and is designed to set up, operate and integrate e-business applications across multiple computing platforms using web technologies.

IBM constructs WebSphere using open standards such as the Java 2 Platform Enterprise Edition(J2EE), XML and Web Services standards. Multiple IBM labs around the world participate in designing and developing WebSphere products.

Instructor

A person whose occupation is teaching.

Internet Explorer

Internet Explorer, abbreviated IE or MSIE is a web browser from Microsoft currently sold as part of Microsoft Windows. As of 2005 Internet Explorer is by far the most widely-used web browser, although in 2004 it began losing market share to Mozilla Firefox.

Internet Forum-Message Board-Discussion Board

An Internet forum, also known as a message board or discussion board, is a web application that provides for online discussions, and is the modern descendant of the bulletin board systems and existing Usenet news systems that were widespread in the 1980s and 1990s. An Internet forum typically exists as part of a website and invites users to start topics and discuss issues with one another. Sometimes, a forum even comprises most, if not all, of the content of a site.

Internet Relay Chat (IRC)

Internet Relay Chat is a form of instant communication over the Internet. It is mainly designed for group (one-to-many) communication in discussion forums called *channels*, but also allows one-to-one communication.

Today there are several thousand running IRC networks in the world. They run various implementations of IRC servers, and are administered by various groups of

IRC Operators, but the protocol exposed to IRC users is very similar, and all IRC networks can be accessed by the same client software.

Intranet

An intranet is a local area network (LAN) used internally in an organization that is sometimes access restricted. Typically the term refers to the internal web site. The same concepts and technologies of the world wide web such as web browsers and servers running on the internet protocol suite are used to build an intranet. Other internet protocols are commonly used as well, especially ftp and email.

IPv6

IPv6 is version 6 of the Internet Protocol ; it was initially called IP Next Generation (IPng) when it was picked as the winner in the IETF 's IPng selection process. IPv6 is intended to replace the previous standard, IPv4 , which only supports up to about 4 billion (4 × 109) addresses, whereas IPv6 supports up to about 3.4 × 1038 (3.4 dodecillion) addresses. This is the equivalent of 4.3 × 1020 addresses per inch² (6.7 × 1017 addresses/mm²) of the Earth 's surface. It is expected that IPv4 will be supported until at least 2025, to allow time for bugs and system errors to be corrected.

The compelling reason behind the formation of IPv6 was lack of address space, especially in the heavily populated countries of Asia such as India and China .

Java

Java is an object-oriented programming language developed primarily by James Gosling and colleagues at Sun Microsystems. The language, initially called Oak (named after the oak trees outside Gosling's office), was intended to replace C++, although the feature set better resembles that of Objective C. Specifications of the Java language, the JVM and the Java API are community-maintained through the Sun-managed Java Community Process.

Java Script

JavaScript is an object-oriented scripting language based on the concept of prototypes. The language is most well known for its use in websites. It was originally developed by Brendan Eich of Netscape Communications under the name Mocha and then LiveScript but then renamed to "JavaScript". JavaScript has a syntax close to that of Sun Microsystems' Java language. But beside name and syntax the language has more in common with Self than with Java. JavaScript was first standardized in 1997–1999 by ECMA under the name ECMAScript. The standard (as of December 1999) is ECMA-262 Edition 3, and corresponds to JavaScript 1.5. This is also now an ISO standard.

Java Servlet

The Java Servlet API allows a software developer to add dynamic content to a web server using the Java platform. The generated content is commonly HTML, but may be other data such as XML. Servlets are the Java counterpart to dynamic web content technologies such as CGI or ASP. However, unlike CGI, (but like PHP), it has the ability to maintain state after many server transactions. This is done using HTTP Cookies, session variables or URL rewriting.

JScript

JScript is Microsoft's implementation of ECMAScript. It is available through both Internet Explorer and the Windows Scripting Host. The most recent version is JScript .NET, which is based on the yet-unfinished version 4 of the ECMAScript standard, and can be compiled for the Microsoft .NET platform.

JSP- Java Server Pages

JSP or JavaServer Pages is a Java technology that allows developer s to dynamically generate HTML, XML or some other type of web page. The technology allows Java code and certain pre-defined actions to be embedded into static content.

The JSP syntax adds additional XML tags, called JSP actions, to be used to invoke built-in functionality. Additionally, the technology allows for the creation of JSP tag libraries that act as extensions to the standard HTML or XML tags. Tag libraries provide a platform independent way of extending the capabilities of a web server. JSPs are compiled into Servlets by a JSP compiler. A JSP compiler may generate a servlet in Java code that is then compiled by the Java compiler, or it may generate byte code for the servlet directly.

Learning Object

A learning object is a reusable unit of instruction for e-learning. In order to use it in different contexts, the presentation has to be separated from the content. which calls for specific data formats. SCORM is such a format. Alongside SCORM, a draft learning object metadata scheme is underway in the UK. The UK Learning Object Metadata Core attempts to create a consistent tagging system which enables educationalists to tag their learning objects.

listserver

A file server that is used in the management of e-mail for members of a discussion group.

LMS-Learning Management System

An information system that administers instructor-led and e-learning courses and keeps track of student progress. Used internally by large enterprises for their employees, an LMS can be used to monitor the effectiveness of the organization's education and training.

Macromedia Authorware

Today, one of the most widely used Authorware development applications is Macromedia Authorware . Authorware programs like Macromedia Authorware are mainly used for producing instructional interactive guides such as explaining how to replace a tire, or other forms of instruction. Because there is very little programming involved, although there is some, this makes it appealing to businesses and schools that want to make training tools, but don't want to spend more money training their staff to use a complicated program.

Macromedia Authorware replaces code with simple dialog boxes and explains what everything does.

Macromedia Director

Macromedia Director is a powerful media application created by Macromedia. Its proprietary scripting language Lingo motivated some to use this application. Many companies deliver demonstrations or use it as a user interface (UI) for content on CDs and DVDs. It can incorporate many different formats (e.g. AVI, BMP, QuickTime, PNG, JPEG, RealVideo) thus making it possible to integrate without re-encoding files. It also supports vector graphics and 3D interactivity, which is great for producing games. Version MX and its successors are also easily linked with Flash animation. Since version MX 2004, one can use JavaScript instead of the Lingo.

Macromedia Dreamweaver

Macromedia Dreamweaver is a web design software application developed by Macromedia. It uses a powerful editing system that incorporates both WYSIWYG and HTML editing. It is currently available for Mac and Windows. The latest version is Macromedia Dreamweaver MX 2004. Rumors persist that Macromedia has built a version of Dreamweaver that runs on the Linux platform (using WINE), although the company has made no formal announcement on the matter. As a part WYSIWYG editor, Dreamweaver can hide the details of pages' HTML code from the user, making it possible for non-experts to easily create web pages and sites. Some web developers criticize this approach as producing HTML pages that are much larger than they should be and cause Web browsers to perform poorly. In addition, some web site developers have criticized Dreamweaver in the past for producing code that often does not comply with W3C standards. However, in recent versions of Dreamweaver, it has been at the front edge of HTML formats, including the powerful XHTML format.

Dreamweaver allows you to pick most browsers installed on your computer to preview websites.

Competitors are Microsoft FrontPage and Adobe GoLive.

Macromedia Flash

Macromedia Flash or Flash is a graphics animation program, written and marketed by Abayomi Tepede Macromedia, that uses vector graphics to deliver animated and interactive content to the web. The resulting files, called SWF (said like swiff) files, may appear in a web page to view in a web browser, or standalone Flash players may "play" them. Flash files occur most commonly in animated advertisements on web pages and rich-media web sites, although prank flash has become common. There are many sites which forego HTML and are done entirely in Flash.

Its detractors claim that Flash websites tend to be poorly designed, and often use confusing and non-standard user-interfaces. Search engines cannot index Flash pages, which can prevent stores from having their products easily found. Finally Flash websites cannot take into account many usability features, such as respecting the browser's font size and allowing deep-linking, and they outright fail any accessibility tests for blind users using screen readers.

Macromedia Shockwave

Macromedia Shockwave is frequently confused with Macromedia Flash. This is largely due to an aggressive marketing campaign in late 1990s. Shockwave is Macromedia's first and most successful multimedia player. In an attempt to leverage its market presence and help promote other multimedia formats all Macromedia

players started prepending 'Shockwave' to their names - as in 'Shockwave Flash', which led to a blurring of product lines. As of 2004 there are several distinct browser player plugins available from Macromedia. Although Flash is now the most widely recognized, promoted and developed player, Shockwave continues to be a strong presence.

- Macromedia Shockwave: Installed on 60% of browsers, uses ".DCR" files, created using Macromedia Director
- Macromedia Flash: Installed on 90% of browsers, uses ".SWF" files, created using Flash, FreeHand, Generator, and other tools.

Markup language

A markup language is a kind of text encoding that represents text as well as details about the structure and appearance of the text. A modern one with widespread use is HTML.

Metadata

Metadata is data about data. An example is a library catalog card, which contains data about the nature and location of a book: It is data about the data in the book referred to by the card.

Metadata has become important on the World Wide Web because of the need to find useful information from the mass of information available. Manually-created metadata adds value because it ensures consistency. If one web page about a topic contains a word or phrase, then all web pages about that topic should contain that same word. It also ensures variety, so that if one topic has two names, each of these names will be used. For example, an article about sports utility vehicles would also be given the metadata keywords '4 wheel drives', '4WDs' and 'four wheel drives', as this is what they are known as in Australia, South Africa, and Namibia.

Microsoft Exchange

Messaging and groupware software for Windows from Microsoft. Exchange Server is an Internet-compliant messaging system that runs under Windows NT/2000 and can be accessed by Web browsers, the Windows Inbox, Exchange client or Outlook. Exchange Server is also a storage system that can hold anything that needs to be shared.

The Exchange client includes an e-mail client with server based rules, forms design, threaded discussions and group calendaring and scheduling. The Inbox is a limited version of the Exchange client that comes on Windows 95 and NT desktops.

Microsoft's Outlook can also be used as the Exchange client, adding features such as richer forms design, group contact and task management, journaling (tracking hourly billing), message recall (unread messages can be pulled back), shared folders and freeform notes.

Microsoft Internet Information Server/or Services (MS IIS)

IIS is a set of Internet based services for Windows machines. Originally supplied as part of the Option Pack for Windows NT, they were subsequently integrated with Windows 2000 and Windows Server 2003. The current (Windows 2003) version is IIS 6.0 and includes servers for FTP, SMTP , NNTP and HTTP/HTTPS . Earlier versions also included a server.

Internet Information Services is designed to run on Windows server operating systems. A restricted version that supports one web site and a limited number of connections is also supplied with Windows XP Professional.
Apache is the dominant software in the web server market and IIS's main competitor. Solaris Operating Environment/J2EE also competes in the enterprise web services arena.

Microsoft SQL Server

Microsoft SQL Server is a database management system produced by Microsoft . It supports a dialect of SQL, the most common database language. It is commonly used by governments and businesses for small to medium sized databases, and competes with other SQL databases such as Oracle, DB2, MySQL and PostgreSQL for this market segment.
The current version, Microsoft SQL Server 2000, was released in August of 2000. Microsoft is beta testing its successor, SQL Server 2005. No release date has been announced, although a beta version is now available for free download.
MS SQL Server uses a variant of SQL called T-SQL, or Transact-SQL, a superset of SQL-92

Moderator

Someone who presides over a forum or debate.

Mozilla

Mozilla (Mozilla Suite or the Mozilla Application Suite) is a free, cross-platform Internet software suite, whose components include a web browser , an email client, an HTML editor and an IRC client . Its development was initiated by Netscape Communications Corporation based on the source for their Netscape Communicator, but the Mozilla Foundation now spearheads development.

Multimedia

Multimedia is the use of several different media to convey information (text, audio, graphics, animation, video, and interactivity). Multimedia also refers to computer media. As the information is presented in various formats, multimedia enhances user experience and makes it easier and faster to grasp information. Presenting information in various formats is nothing new, but multimedia generally implies presenting information in various digital formats. It is also used in visual arts to describe works created using more than one medium.

MP3

MP3 (or, more precisely, MPEG-1/2 Audio Layer 3) is an audio compression algorithm capable of greatly reducing the amount of data required to reproduce audio, while sounding like a faithful reproduction of the original uncompressed audio to most listeners.

MPEG-Moving Picture Experts Group

The Moving Picture Experts Group (MPEG) is a small group charged with the development of video and audio encoding standards. Since its first meeting in 1988, MPEG has grown to include approximately 350 members from various industries and universities. MPEG's official designation is ISO/IEC JTC1/SC29 WG11.

MySQL

MySQL is a multithreaded, multi-user, SQL relational database server (RDBS).

NAS-Network Attached Storage

A specialized file server that connects to the network. A NAS device contains a slimmed-down (microkernel) operating system and file system and processes only I/O requests by supporting popular file sharing protocols such as NFS (Unix) and SMB/CIFS (DOS/Windows). Using traditional LAN protocols such as Ethernet and TCP/IP, the NAS enables additional storage to be quickly added by plugging it into a network hub or switch. As network transmission rates have increased from Ethernet to Fast Ethernet to Gigabit Ethernet, NAS devices have come up to speed parity with direct attached storage devices.

General-purpose computers with a full-blown operating system such as Windows or Unix are sometimes labeled as NAS products, but the true NAS is built from scratch as a dedicated file I/O device.

NetMeeting

One of the early collaboration and conferencing programs introduced in 1996 by Microsoft and retired in late 2003 by the company. NetMeeting was bundled as part of Windows and included point-to-point telephony and videophone capability over the Internet as well as multipoint whiteboard and application sharing.

The advent of instant messaging (IM) and other alternatives for online, realtime communication contributed to its demise. Microsoft announced a replacement online meeting service called Office Live Meeting, formerly from PlaceWare, a company Microsoft acquired in 2003.

Netscape Navigator

Netscape Navigator is a web browser that once dominated the market but now has only a relatively small number of users.

Newsgroup

A newsgroup is a repository, usually within the Usenet system, for messages posted from many users at different locations. The term is somewhat confusing, because it is usually a discussion group. Newsgroups are technically distinct from, but functionally similar to, discussion forums on the World Wide Web.

Newsgroups are often arranged into hierarchies, theoretically making it simpler to find related groups.

Object Oriented Database

A database in which the operations carried out on information items (data objects).

Object-Oriented DBMS

A database management system (DBMS) that manages objects, which are abstract data types. An object-oriented DBMS (ODBMS) is suited for data with complex relationships that are difficult to model and process in a relational DBMS. It is also capable of handling multimedia data types (images, audio and video).

A relational DBMS is designed to handle numbers, alphanumeric text and dates. It may also support a BLOB field, which holds any binary data (image, video, etc.), but the database program may not manipulate the BLOB directly. Another application

often has to be written or some middleware has to be used to process the BLOB. In an object database, a picture or video clip object can include the routine to display it, which is dynamically invoked by the DBMS.
Some ODBMSs are entirely object oriented and are accessed from an application program written in an object-oriented programming language. Others allow access via an SQL-like language or derivative.

Observer
An expert who observes and comments on something.

Opera
Opera is a cross-platform internet software suite consisting of a web browser, e-mail/news client, address book, newsfeed reader, IRC chat client, and download manager. It is actively developed by Opera Software of Oslo, Norway. Its core layout engine ("Presto") is licensed by business partners such as Adobe and Macromedia for previewing webpages in GoLive and Dreamweaver. Opera has gained a leading role in browsers for Smartphones and PDAs with its Small Screen Rendering technology. Opera is also used in iTV platforms, and a special voice controlled multimodal browser is in co-development with IBM.

PDF-Protable Document Format
Portable Document Format (PDF) is a file format developed by Adobe Systems for representing documents in a manner that is independent of the original application software, hardware, and operating system used to create those documents. A PDF file can describe documents containing any combination of text, graphics, and images in a device independent and resolution independent format. These documents can be one page or thousands of pages, very simple or extremely complex with a rich use of fonts, graphics, colour, and images. PDF is an open standard, and anyone may write applications that can read or write PDFs royalty free

Prank Flash
Also called shock flash, a screamer, or an ambush flash, a prank flash is a Macromedia Flash movie created specifically designed to scare the viewer, often perpetuated by direct URL links to *.swf (flash) files by unknown users without clear information about the content; many Internet users make effort not to follow even safe links for this reason. Hence a prank flash is a type of shock site.

QuickTime
QuickTime is a multimedia technology developed by Apple Computer , capable of handling various formats of digital video, sound , text, animation, music, and immersive virtual reality panoramic images. There are three main components to the QuickTime technology. There is the QuickTime file format itself which is openly documented and available for anyone to use royalty-free. Apple develops a QuickTime media player which they make available for free download on their website, as well as bundle with every one of their computers. Lastly there are software development kits available for the Macintosh and Windows platforms, that allow people to develop their own software to manipulate QuickTime and other media files.

RAID-Redundant Array of Independent Disks

A disk subsystem that is used to increase performance or provide fault tolerance or both. RAID uses two or more ordinary hard disks and a RAID disk controller. In the past, RAID has also been implemented via software only.

RAID subsystems come in all sizes from desktop units to floor-standing models (see NAS and SAN).

RAID improves performance by disk striping, which interleaves bytes or groups of bytes across multiple drives, so more than one disk is reading and writing simultaneously.

RDBMS-Relational Database Management System

A relational database management system (RDBMS) is a database management system(DBMS) that is based on the relational model as introduced by Edgar F. Codd. Popular commercial DBMSs sold as RDBMSs include Oracle, Microsoft SQL Server, Sybase SQL Server, IBM's DB2, and Microsoft Access. MySQL, PostgreSQL and Firebird are free RDBMSs. Today, all RDBMSs with any degree of popularity employ SQL as their query language.

Real Audio

RealAudio is a proprietary audio codec developed by RealNetworks. It is especially designed to conform to low bandwidths, and it can be used as a streaming audio format, i.e. played at the same time as it's downloaded. Many radio stations use RealAudio to stream their programming over the internet in real time. The first version of RealAudio was released in 1995. As of 2004 , the current version of the codec is RealAudio 10.

RealAudio files normally have a file extension of .ra, .rm or .ram. The main player for RealAudio content is RealNetworks' RealPlayer. With RealPlayer, it is however not possible to save an audio stream to a file. The free programs MPlayer and StreamBox VCR can be used for this purpose.

RealVideo

RealVideo is a proprietary video codec developed by RealNetworks. It was first released in 1997 and as of 2004 is at version 10. RealVideo has historically been used to deliver streaming video across IP networks at low bit rates to desktop personal computers. Today's prevalence of broadband is seeing RealVideo put to even greater use as bigger pipes allow video to be encoded at higher bitrates resulting in increased quality and clarity. With mobile carriers starting to offer data services to customers with enabled handsets, it enables consumers to watch video on their mobile phones, be it today's news highlights or even live television.

Red Hat AS-Advanced Server

Red Hat Enterprise Linux (often abbreviated to RHEL) is a Linux distribution created by Red Hat and targeted toward the business market. It was spun off from the original Red Hat Linux project in 2002 . Additional features include better technical support and updates through the Red Hat Network. There are four flavors of RHEL: WS (workstation), ES (edge server, or a departmental- and entry-level server), AS (advanced server) and Red Hat Desktop.

Relational Database

A database organization method that links files together as required. Routine queries often require data from more than one file. For example, to obtain the names of customers who purchased a particular product, data must be extracted from both the customer and order files. A relational system has the flexibility to "join" two or more files by comparing key fields such as account number and name and generating a new file from the records that meet the matching criteria .

RTF-Rich Text Format

RTF, a document file format developed by Microsoft at least as early as 1987 for cross-platform document interchange that most text processing programs are able to read and write. RTF uses the ANSI, PC-8, Macintosh, or IBM® PC character set to control the representation and formatting of a document, both on the screen and in print. With the RTF Specification, documents created under different operating systems and with different software applications can be transferred between those operating systems and applications.

SAN-Storage Area Network

A network of storage disks. In large enterprises, a SAN connects multiple servers to a centralized pool of disk storage. Compared to managing hundreds of servers, each with their own disks, SANs improve system administration. By treating all the company's storage as a single resource, disk maintenance and routine backups are easier to schedule and control. In some SANs, the disks themselves can copy data to other disks for backup without any processing overhead at the host computers.

Scripting language

Scripting programming languages (commonly called scripting languages or script languages) are computer programming languages designed for "scripting" the operation of a computer. Early script languages were often called batch languages or job control languages.

SGML-Standard Generalized Markup Language

The SGML is a metalanguage in which one can define markup languages for documents. SGML is a descendant of IBM's Generalized Markup Language (GML), developed in the 1960s by Charles Goldfarb, Edward Mosher and Raymond Lorie (whose surname initials also happen to be GML).

SSJS-Server-Side Java Script

A JavaScript interpreter for running JavaScript programs on the server. It includes a library of objects and functions for accessing databases, sending e-mail and performing other tasks. Contrast with CSJS.

SQL-Structured Query Language

SQL is the most popular computer language used to create, modify and query databases.

USENET-USEr NETwork

A public access network on the Internet that provides user news and group e-mail. It is a giant, dispersed bulletin board that is maintained by volunteers who provide news and mail feeds to other nodes. All the news that travels over the Internet is

called "NetNews," and a running collection of messages about a particular subject is called a "newsgroup." Usenet began in 1979 as a bulletin board between two universities in North Carolina. Today, there are more than 50,000 newsgroups. News can be read with a Web browser or via newsreaders such as nn, rn, trn and tin.

VBScript

VBScript (short form of Microsoft Visual Basic Scripting Edition) is a subset of Visual Basic used in Active Server Pages and in Windows Scripting Host as a general-purpose scripting language. VBScript is often used as a replacement for DOS batch files. VBScript is interpreted by a script engine, either ASP in a web environment, wscript.exe in a Windows environment, and cscript.exe in a command-line environment

VCD-Video CD

VCD is a standard format for storing video on a Compact Disc . Video CDs are playable in dedicated players, personal computers, and many DVD players.

The VCD standard was created in 1993 by a consortium of Japanese electronics manufacturers, and is referred to as the White Book standard.

WAV

WAV (or WAVE), short for WAVEform audio format, is a Microsoft audio file format standard for storing audio on PCs. It is a variant of the RIFF method for storing data in "chunks", and thus also close to the IFF and the AIFF format used on Macintosh computers. It takes into account some peculiarities of the Intel CPU such as little endian byte order. The RIFF format acts as a "wrapper" for various audio compression codecs. It is the main format used on Windows systems for raw audio.

Though a WAV file can hold audio compressed with any codec, by far the most common format is PCM audio data. Since PCM uses an uncompressed, lossless storage method which keeps all the samples of an audio track, professional users or audio experts may use the WAV format for maximum audio quality. WAV audio can also be edited and manipulated with relative ease using software.

As file sharing over the Internet has become popular, the WAV format has declined in popularity, primarily because uncompressed WAV files are quite large. More frequently, compressed but lossy formats such as MP3, Ogg Vorbis and Advanced Audio Coding are used to store and transfer audio, since their smaller file sizes allow for faster transfers over the Internet, and large collections of files consume only a conservative amount of disk space.

WC3-World Wide Web Consortium

The World Wide Web Consortium (W3C) is a consortium that produces standards—"recommendations", as they call them—for the World Wide Web. The Consortium is headed by Tim Berners-Lee, the original creator of URL (Uniform Resource Locator), HTTP (HyperText Transfer Protocol) and HTML (HyperText Markup Language), the principal technologies that form the basis of the Web.

Web application

In software engineering, a web application is an application delivered to users from a web server over a network such as the World Wide Web or an intranet. Web applications are popular due to the ubiquity of the web browser as a client, sometimes called a thin client. The ability to update and maintain web applications

without distributing and installing software on potentially thousands of clients is another reason they are popular. Applications like webmail, Amazon.com and eBay are well known examples of web applications but they have uses in many other areas of business and science.

Web authoring software

A Web site development system that allows Web pages to be visually created like a desktop publishing program. It generates the required HTML code for the pages and is able to switch back and forth (in varying degrees) between the page layout and the HTML. At a high level, the software is judged by its GUI tools used for designing the page. At a low level, the clarity of HTML code that is generated determines how easily people can modify and maintain the site. Comprehensive products can read an entire, existing Web site and display it as a graphical hierarchy of pages. Such products are used to manage the site from that point forward.

Web Browser

A web browser is a software package that enables a user to display and interact with documents hosted by web servers. Popular browsers include Microsoft Internet Explorer and Mozilla Firefox. A browser is the most commonly used kind of user agent. The largest networked collection of linked documents is known as the World Wide Web. Web browsers communicate with web servers primarily using the HTTP protocol to fetch web pages identified by their URL

WebCT

Web Course Tools (integrated package for higher education).

Web Page

A webpage or web page is a "page" of the World Wide Web, usually in HTML format (the file extensions are typically htm or html) and with hypertext links to enable navigation from one page or section to another. Webpages often use associated graphics files to provide illustration, and these too can be clickable links. A webpage is displayed using a web browser, and can be designed to make use of applets (subprograms than run inside the page) which often provide motion graphics, interaction, and sound.

Web Publishing

Creating a Web site and placing it on the Web server. A Web site is a collection of HTML pages with the home page typically named INDEX.HTML. Web sites are designed using Web authoring software which provides a graphical layout capability or by hand coding in HTML or both. Distributing the site requires copying the resulting HTML pages and graphic elements into the appropriate directories on the server.

Web Server

The term web server can mean one of two things:

1. a computer responsible for serving web pages, mostly HTML documents, via the HTTP protocol to clients, mostly web browsers;
2. a software program that is working as a daemon serving web documents.

Every web server (sense 1) is running a web server program (sense 2).

The most common web or HTTP server programs are:

- Apache HTTP Server from the Apache Software Foundation
- Internet Information Server (IIS) from Microsoft
- Zeus Web Server from Zeus Technology
- Sun ONE from Sun Microsystems (formerly Netscape's iPlanet nee Enterprise)

Web Service

A web service is a collection of protocols and standards used for exchanging data between applications. Software applications written in various programming languages and running on various platforms can use web services to exchange data over computer networks like the Internet. This interoperability (eg. between Java and Python, or Windows and GNU Linux applications) is due to the use of open standards. OASIS and the W3C are the steering committees responsible for the architecture and standardization of web services. To improve interoperability between web service implementations, the WS-I organization has been developing a series of profiles to further define the standards involved..

Web Site

A website, Web site or WWW site (often shortened to just site and sometimes the acronym, w3s) is a collection of webpages, that is, HTML documents accessible via HTTP on the Internet. The pages of a website will be accessed from a common root URL, the homepage, and usually reside on the same physical server. The URLs of the pages organize them into a hierarchy, although the hyperlinks between them control how the reader perceives the overall structure and how the traffic flows between the different parts of the site.

Whiteboard

The electronic equivalent of chalk and blackboard, but between remote users. Whiteboard systems allow network participants to simultaneously view one or more users drawing on an on-screen blackboard or running an application. This is not the same as application sharing where two or more users can interactively work in the application. Only one user is actually running the application from his or her computer.

WYSIWYG

WYSIWYG (pronounced "wizzy-wig" or "wuzzy-wig") is an acronym for What You See Is What You Get, and is used in computing to refer to the technology that makes sure the image seen on the screen corresponds to what is printed out on paper. Today this is expected for word processors but in other situations, like web (HTML) authoring, this is not always the case.

WWW-World Wide Web-Web

The World Wide Web ("WWW", or simply "Web") is an information space in which the items of interest, referred to as resources, are identified by global identifiers called Uniform Resource Identifiers (URI).

Hypertext is viewed using a program called a web browser which retrieves pieces of information, called "documents" or "web pages", from web servers and displays them, typically on a computer monitor. One can then follow hyperlinks on each page to other documents or even send information back to the server to interact with it.

The act of following hyperlinks is often called "surfing" or "browsing" the web. Web pages are often arranged in collections of related material called "web sites."

XHTML

Extensible Hypertext Markup Language (XHTML) is a markup language that has the same expressive possibilities as HTML, but a stricter syntax. Whereas HTML was an application of SGML, a very flexible markup language, XHTML is an application of XML, a more restrictive subset of SGML. XHTML 1.0 became a World Wide Web Consortium (W3C) Recommendation on January 26, 2000.

XML- Extensible Markup Language

The Extensible Markup Language (XML) is a W3C recommendation for creating special-purpose markup languages. It is a simplified subset of SGML, capable of describing many different kinds of data. Its primary purpose is to facilitate the sharing of structured text and information across the Internet. Languages based on XML (for example, RDF, RSS, MathML, XSIL and SVG) are themselves described in a formal way, allowing programs to modify and validate documents in these languages without prior knowledge of their form.

Note : All definitions are from the site *Online Dictionary, Encyclopedia and Thesaurus* http://www.freedictionary.com