

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
SCHOOL OF INFORMATION STUDIES FOR AFRICA

APPROPRIATE TECHNOLOGY BASED INFORMATION SYSTEM
FOR DISTANCE EDUCATION IN THE ETHIOPIAN CIVIL
SERVICE COLLEGE

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF
ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE
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INFORMATION SCIENCE

BY
GIZACHEW KEBEDE
MAY 2000

ADDIS ABABA UNIVERSITY
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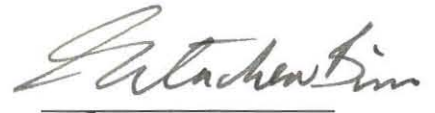
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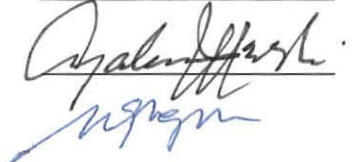
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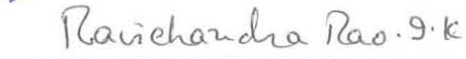
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DEDICATION

First to my mother with out her life could have been difficult. To my brothers Rezene Kebede who was Engineering M. Sc. Student but now sick and Yazezew Kebede who is Medicine student. Finally, to my sister.

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I would like to thank everybody who has contributed directly or indirectly to this thesis. However, it is difficult to pass with out mentioning my advisors Ato Ayelew Shibeshi and Ato Workshet Lamenuw.

List of Tables

TABLE 1 - ADVANTAGES AND DISADVANTAGES OF AUDIOCONFERENCING	30
TABLE 2 - ADVANTAGES AND DISADVANTAGES OF VIDEOCONFERENCING	31
TABLE 3 - ADVANTAGES AND DISADVANTAGES OF WEB/INTERNET	34
TABLE 4 - LOCAL CENTERS	52
TABLE 5 - PROPOSED DISTANCE EDUCATION	54
TABLE 6 - COST/ AFFORDABILITY COMPARISON.....	64
TABLE 7 - INFRASTRUCTURE SUPPORT COMPARISON	65
TABLE 8 – ACCESSIBILITY COMPARISON.....	66
TABLE 9 -SUITABILITY TO THE PLANNED DISTANCE EDUCATION COMPARISON.....	66
TABLE 10 – BENEFITS COMPARISON	67
TABLE 11 – CAPABILITIES COMPARISON.....	67
TABLE 12 - NUCLEUS NEEDS COMPARISON	68
TABLE 13 - CONTENT REQUIREMENT COMPARISON	68
TABLE 14 - CONTRIBUTION TO THE COLLEGE'S OBJECTIVE COMPARISON	69
TABLE 15 - SKILL AND FAMILIARITY OF STUDENTS & EDUCATORS COMPARISON	69
TABLE 16 – ACCEPTABILITY COMPARISON.....	70
TABLE 17 - LIFE LONG LEARNING COMPARISON	70
TABLE 18 - FLEXIBILITY (EXPANDABILITY) COMPARISON	70
TABLE 19 - IMPLEMENTABILITY (PRACTICALITY) COMPARISON	71
TABLE 20 – RISK COMPARISON.....	71
TABLE 21 – TECHNICAL EXPERTISE COMPARISON	72
TABLE 22 – CULTURAL COLONIZATION COMPARISON	72
TABLE 23 – SERVING AS A RESOURCE COMPARISON	72
TABLE 24 – TEAM PROBLEM SOLVING COMPARISON	73
TABLE 25– FILES AND DATABASES REQUIRED FOR THE WEB BASED EDUCATION SYSTEM.....	126
TABLE 26- ACADEMIC STAFF PROFILE	145
TABLE 27– STUDENT ENROLLMENT PROGRESS	145

List of Figures

FIGURE1- ORGANIZATION OF THE DISTANCE EDUCATION FACULTY	49
FIGURE 2 – DIAGRAMMATICAL OVERVIEW OF THE SYSTEM.....	123
FIGURE 3 – SUMMARY OF PRESENTATION STRUCTURE.....	124
FIGURE 4 – HOME PAGE	130
FIGURE 5 – INFORMATION PAGE	131
FIGURE 6 – APPLICANTS PAGE.....	131
FIGURE 7 – STUDENT IN CLASS PAGE	131
FIGURE 8 – STUDENT OUT CLASS PAGE.....	132
FIGURE 9 – SERVER UNITS PAGE.....	132

List of Abbreviations

AAU	Addis Ababa University
AACC	Addis Ababa Commercial College
CGI	Common Gateway Interface
DE	Distance Education
DEF	Distance Education Faculty
ECSC	Ethiopian Civil Service College
EMMA	Ethiopian Mass Media Agency
EthioInternet	Ethiopian Internet
InterDev	Internet Development
ISP	Internet Service Provider
IT	Information Technology
MOE	Ministry of Education
TCP/IP	Transfer Control Protocol/Internet Protocol
UML	Unified Modeling Language
URL	Unified Resource Locator
WBE	Web Based Education
WBES	Web Based Education System
WBI	Web Based Instruction
WBT	Web Based Training
WWW	World Wide Web.
XML	Extended Markup Language
VC	Videoconferencing
ESLCE	Ethiopian School Leaving Certificate Examination

Abstract

These days when, there are cost and access crises in on-campus education, it is not wise to continue with only on-campus education. However, distance education without technologies that reduces the time and distance limitations is likely to suffer a lot.

Therefore, this study, after some literature review, questionnaire survey and discussion with users and management body of the Ethiopian Civil Service College, and analysis of different documents, a Web technology based distance education is proposed. The technology was selected by first narrowing the candidate technologies to interactive technologies (those that let bi-directional flow of information) and then selecting one by evaluating the two candidate technologies: videoconferencing and Web and put Web as dominant technology to be used in distance education.

Based on the requirement analysis made this study proposed a Web based information system and designed a framework for such a system which would enable the users to meet their needs. A Web based prototype, based on the framework, was also developed. The system development steps employed are **analysis** (analysis of anticipated problems, and activities, information need in the distance education, analysis of critical components), **planning** (listing goals, deciding how to perform and prioritizing) and **designing** the structure of the Web based system. The prototype was developed mainly using a tool called Visual InterDev.

Table of Contents

DEDICATION	III
ACKNOWLEDGEMENT	IV
LIST OF TABLES	V
LIST OF FIGURES	VI
LIST OF ABBREVIATIONS.....	VII
ABSTRACT	IX
TABLE OF CONTENTS	X
1 INTRODUCTION	1
1.1 THE STUDY	1
1.1.1 <i>Background of the Study</i>	1
1.1.2 <i>Statement of the Problem</i>	3
1.1.3 <i>Justification of the Study</i>	5
1.2 OBJECTIVES OF THE STUDY	6
1.2.1 <i>General Objective</i>	6
1.2.2 <i>Specific Objectives</i>	6
1.3 METHODS	7
1.3.1 <i>Data Collection Methods</i>	7
1.3.2 <i>Technology Selection Approach</i>	8
1.3.3 <i>Development Approach</i>	9
1.4 LIMITATIONS OF THE STUDY.....	10
1.5 APPLICATION OF RESULTS.....	10
1.6 ORGANIZATION OF THE PAPER	12
2 TECHNOLOGY SUPPORT FOR DISTANCE EDUCATION.....	14
2.1 OVERVIEW OF DISTANCE EDUCATION	14
2.2 ADVANTAGES AND LIMITATIONS OF DISTANCE EDUCATION	18
2.2.1 <i>The Advantages of Distance Education</i>	18
2.2.2 <i>Limitations of Distance Education</i>	20
2.3 ADVANTAGES AND LIMITATIONS OF INFORMATION TECHNOLOGY.....	22
2.3.1 <i>Advantages of Information Technology for Distance Education</i>	22
2.3.2 <i>Limitations of Information Technology for Distance Education</i>	24
2.4 AVAILABLE TECHNOLOGIES FOR DISTANCE EDUCATION.....	28
2.5 IT IN DE IN DEVELOPING COUNTRIES	36
2.5.1 <i>IT in Distance Education in South Africa, and others</i>	37

2.5.2	<i>Distance Education in Ethiopia</i>	39
3	TECHNOLOGY SUPPORT FOR ECSC DISTANCE EDUCATION	41
3.1	THE COLLEGE.....	41
3.1.1	<i>Overview of the College</i>	41
3.1.2	<i>Organization of the College</i>	43
3.1.3	<i>Academic Division</i>	44
3.2	DISTANCE EDUCATION AT THE COLLEGE.....	46
3.2.1	<i>The Nucleus</i>	46
3.2.2	<i>The Proposed Distance Education</i>	48
3.2.3	<i>The Ethiopian Civil Service College Distance Education Proposal</i>	53
3.2.4	<i>Technology Support Plan Conflict</i>	54
3.3	SELECTING APPROPRIATE TECHNOLOGY.....	55
3.3.1	<i>Approaches</i>	56
3.3.2	<i>Videoconferencing versus Web</i>	63
3.3.3	<i>Decision</i>	73
4	WEB BASED TECHNOLOGY	76
4.1	WEB BASED EDUCATION.....	76
4.2	WEB.....	77
4.2.1	<i>What is Web?</i>	77
4.2.2	<i>How the Web works?</i>	80
4.2.3	<i>Web Distribution Mechanisms</i>	80
4.3	WEB BASED EDUCATION SYSTEM DEVELOPMENT APPROACH.....	82
4.3.1	<i>Introduction</i>	82
4.3.2	<i>Web Based Education System Development Steps</i>	83
4.3.3	<i>Web Application Development Tools</i>	90
4.3.4	<i>Design Considerations</i>	91
5	ANALYSIS OF ECSC DISTANCE EDUCATION	93
5.1	INTRODUCTION.....	93
5.2	PROBLEMS FROM THE EXISTING ON CAMPUS EDUCATION.....	93
5.2.1	<i>Admission Department</i>	93
5.2.2	<i>Regional Centers</i>	94
5.2.3	<i>Registrar Department</i>	95
5.2.4	<i>Nucleus Problems/ Anticipated Problems</i>	96
5.3	ACTIVITIES, INFORMATION NEEDS & PROBLEMS IN PROPOSED DE.....	96
5.3.1	<i>Admission and Registration</i>	97

5.3.2	<i>Material Distribution</i>	100
5.3.3	<i>Core activities</i>	101
5.3.4	<i>Assessment</i>	102
5.3.5	<i>Grade point Average (GPA) processing</i>	103
5.3.6	<i>Outing</i>	105
5.3.7	<i>Others</i>	106
5.4	ANALYSIS OF THE CRITICAL COMPONENTS	107
5.4.1	<i>College</i>	107
5.4.2	<i>Subject</i>	108
5.4.3	<i>Educators/ Instructor</i>	109
5.4.4	<i>Student</i>	111
5.4.5	<i>Technologies</i>	112
6	PLANNING AND DESIGN	113
6.1	PLANNING	113
6.1.1	<i>Listing Goal and Objectives</i>	113
6.1.2	<i>Decide How to Perform</i>	117
6.1.3	<i>Prioritize The List</i>	122
6.2	DESIGN	123
6.2.1	<i>Diagrammatical Overview of The System</i>	123
6.2.2	<i>Design of Presentation Structure</i>	124
6.2.3	<i>Deign of Storage Structure</i>	125
7	DEVELOPMENT OF PROTOTYPE	129
7.1	INTRODUCTION	129
7.2	THE PAGES IN THE WEB SITE	130
7.2.1	<i>The Home Page</i>	130
7.2.2	<i>Information page</i>	130
7.2.3	<i>Applicants page</i>	131
7.2.4	<i>Student In Class page</i>	131
7.2.5	<i>Student Out Class Page</i>	132
7.2.6	<i>Server Units page</i>	132
7.3	DEMONSTRATING THE PROTOTYPE	133
7.3.1	<i>To Access Information</i>	133
7.3.2	<i>Application, Entrance Examination, and Registration</i>	133
7.3.3	<i>Course Online, Resource, Interaction, Assessment, FAQs</i>	134
7.3.4	<i>Semester Registration, Withdrawal, Course Add/Drop, Readmission, Show Me Result</i>	135
7.3.5	<i>Server</i>	136

8 SUMMARY, CONCLUSION AND RECOMMENDATIONS.....137

8.1 SUMMARY AND CONCLUSION137

8.2 RECOMMENDATIONS.....138

REFERENCES.....141

APPENDIX.....145

CHAPTER ONE

1 INTRODUCTION

1.1 The Study

1.1.1 Background of the Study

Ethiopia is one of the developing countries in the world. However, the economic development of a country is based on its skilled and knowledgeable manpower. Skills and knowledge are achieved through education. Therefore, in achieving development, the improvement of education system is important.

These days when, there are cost and access crises in on-campus education, it is not wise to continue only with on-campus education, especially in developing countries where cost is sensitive. Moreover, on-campus education seems inappropriate to train individuals with time limitation like employees at urban areas and individuals with distance limitation like rural people. Such limitations could be overcome by distance education.

Distance education is defined by Virginia Steiner as follows (Wisconsin, 1999):

Distance education is instructional delivery that doesn't constrain the students to be physically present in the same location as the instructor.

However, distance education without technologies that solves the time and distance problems suffers a lot. As a result, distance education highly depends on technologies that reduces the time and distance limitation. It is for this reason that information technology is being employed in distance education. Scholars like Vught (1997) agrees that information technologies can alleviate the double crises of cost and access in higher education

Information technology is described by Mulkeen (-) as follows:

A technology that has emerged from the integration of the previously separate technologies of computers, including microcomputers, and large mainframe computers; communications technology, including the telephone, satellite communications, video and computer communications, fax and the field of fiberoptics; data storage technologies; network technologies; and technologies relating to robotics, Artificial Intelligence, hypertext, remote sensing, voice recognition, artificial vision and scanning.

There are many technologies that can support distance education. Typical examples are videoconferencing and Web/ Internet. While these technologies are being used even in African countries like South Africa, in Ethiopia there is only some experience in distance education itself. With these experiences, the Ethiopian Civil Service College has planned to start distance education in 2001 in Accounting, in 2002 in law and in 2003 in Management. The number of students in 2001 is expected to be 1200. This number is anticipated to increase dramatically. For example, in 2005 there will be 15,700 students. For more information see appendix 2.

However, this will not be easy with out the use of appropriate technology. There are problems in the on campus education which could be anticipated to be problems in the

distance education. For example, the admission department of ECSC reported that, in 1997 and in 1999, applicants from Afar and Oromia regions have not been allowed to take the entrance examination for being late to apply to the college. There is no reason that these kinds of problems and others that can arise from the nature of distance education may not be happened even in the distance education program if appropriate measure is not taken.

Therefore, the need for an appropriate solution for the distance education, with large number of entrants, seems clear.

1.1.2 Statement of the Problem

According to the discussion conducted with the people in admission department, regional centers, the registrar department, and the nucleus (a body responsible for the planning and implementation of the distance education) and the management the following problems have been noticed:

1. The admission has problems like receiving incomplete information, unclear and information in languages other than English, rejecting some applicants who are late to send information, the entrance examination is costly, delayed and risky. Finally reporting those passed will be delayed.
2. Regional centers, regional states and applicants are not free from problems. Some of the problems are regional centers receive incomplete and unclear information; late information flow between applicants and regional centers/states; the

recommendation/selection by regional states is time taking, needs much effort and not free from bias; applicants don't know how they can be prepared for the entrance examination; and regions are unable to give pre-exam for fear of manual examination handling and lack of time.

3. The registrar, on the other hand, has problems like late and mistaken decisions in course registration, withdrawal, clearance, readmission, and graduation, course add/drop. In addition, the manual task needs much effort.
4. The nucleus has anticipated that the above problems in admission, registration, and regions will increase with the increase of students as the distance education starts.
5. In the distance education, additional problems are expected
 - Late material distribution and misallocation of teaching materials, examinations and assignments.
 - Lack of qualified tutors at backward regions.
 - Less quality of education as there is no interaction between student to student and student to course coordinator
 - Problems related to the assignments to be taken at local centers and corrected there and result to be transferred to the college; and examination to be held at regional centers and corrected at the college like delay; risk; unfair grades, limiting the number of exams and assignments for fear of manual handling; and displacement students to the regional towns.
 - And late information flow among the distance education faculty, other faculties, the remote centers, admission, registrar, management, instructors and students.

Therefore, in this study an attempt has been made to identify an appropriate Technology and develop information system that would enable students, instructors, registrar, admission, remote centers, distance education faculty, and regional states to collect, organize, process and provide information based on their requirements and that eventually alleviates the problems currently the college is faced and foreseeable problems of the distance education activities that the college is going to face.

1.1.3 Justification of the Study

As education is one factor of development, without solving problems in educational institutions in general and higher institutions in particular, development of the country is difficult. Indeed to identify the right technology for the teaching & learning process will save the college from unnecessary cost and effort that can come in the name of using information technology.

Moreover, the information system which is to be developed based on the need of the user is expected to avoid the anticipated problems and will enhance the distance education activities.

Hence, I strongly believe that the distance education will be positively affected by the study, and ultimately, the study aids the development of the country.

1.2 Objectives of the Study

1.2.1 General Objective

The main objective of the research is to select an appropriate technology for the distance education at the Ethiopian Civil Service College; and then to develop an information system which can collect, store, organize, process information to users involved in the distance education.

1.2.2 Specific Objectives

The specific objectives of this research are the following:

To further justify

- The need of distance education in the college
- The need of Information technology for the distance education

To answer the question

- What are the available technologies that support the distance education?
- What is the status of developing African countries in using information technology for education?
- Is the plan of the distance education in the college is acceptable or not?
- What are the potential users?

Based on the above

- To select the appropriate information technology for the distance education at the college by evaluating different technologies for their appropriateness.

By selecting appropriate system development approach

- To identify problems from the existing on-campus education
- To identify activities, information need and problems in the proposed distance education.

- To analyze the components of distance education (college, subject, educator, students and technologies).
- To plan and to prepare a framework for the system based on requirements.
- To develop the prototype based on the selected technology

Finally, to make recommendations on what to be done next.

1.3 Methods

To achieve the above stated objectives the following data collection methods and development approach are employed.

1.3.1 Data Collection Methods

Data from the staff in admission department, regional centers which are expected to be distance education regional centers, nucleus of the distance education; first year students

in the college who are similar to the potential students of the distance learning; instructor and management of the college was collected. Moreover, data from Ethiopian Mass Media Agency and EthioInternet was important. Therefore the following tools are employed.

1.3.1.1 Questionnaire

The questionnaire is distributed to randomly selected 87 freshmen (potential) students in and 73 returned. Moreover, to 30 instructors of the college was provided and 27 returned.

1.3.1.2 Interview

To gather additional information there was a discussion with freshmen students, and instructors. Moreover, an interview has been conducted with the users, People in EMMA and EthioInternet.

1.3.1.3 Document Analysis

Documents of the different department of the college, and the EthioInternet has been reviewed.

1.3.1.4 Observation

Observing how the different departments of the college works was also important.

1.3.2 Technology Selection Approach

For the selection of the technology the combination of different approaches are taken. The combination included about 20 criteria. The detail of this will be discussed later

1.3.3 Development Approach

The development approach includes analysis, planning, and design and prototype development as explained as follows.

1.3.3.1 Analysis

This phase includes identifying of problems of the existing system that can be problems in the distance education, identifying activities, information needs and problems of the distance education of the college and analysis of critical components of the distance education.

1.3.3.2 Planning and Design

While the Planning involves listing the goals to be achieved, deciding how to implement each goal and prioritizing the list, the design includes designing the presentation structure and storage structures.

1.3.3.3 Development of Prototype

This step mainly focuses on designing the page layout and interfaces. For prototype development, Visual InterDev is used.

1.4 Limitations of the Study

During the study some limitations has somehow influenced the research. Therefore, the full system is not developed for the following limitaions.

- As testing of the system needs the presence of actual users, the system that this study proposes, is not in a position to undergo the actual test as the distance education at the college is at a plan level.
- Since there are no remote centers, only the existing regional centers are considered for interview.
- There are no clear procedures concerning readmission, course add/drop and financial processing.
- Time limitation.
- Specialized tools are not found like quizzing programs such as CyberExam which is used to create examination.

1.5 Application of Results

The result of the study is Web technology as appropriate technology and Web based education system. As a result the distance education problems will be solved as follows:

- The admission department accepts application form online; entrance examination will not be delayed, costly and risky for it is online. Moreover, applicants can check whether they are admitted online.
- The remote centers and regional states will accept application form and recommend online. Moreover, applicants can be prepared for the entrance examination based on past entrance examination. Regional states can give their own pre-entrance examination.
- Registrar will accept registration form, withdrawal form, and course add/drop form online. Moreover, the internal system will solve much of its problems.
- DEF will use the system to distribute teaching materials, assignments and exams; the system alleviates the misallocation of materials.
- Instructors can update their materials, can create assignments and exams online
- DEF will not limit the number of assignments and exams. The system will avoid delay, unfair grade and displacement of students to take examination at regional centers.
- Lack of tutors will be alleviated for students can interact with their course coordinators. And quality of education will increase.
- The system will provide information about the distance education. Moreover, it lets smooth communication among admission department, registrar department, remote centers, DEF, other faculties and the management. This is done via the proposed Intranet. And moreover, this Intranet is expected to bring efficiency in the college.
- On-campus students/applicants can use the system to apply, to take entrance examination, and to be registered. Moreover, other components can be used for

private purpose like online lecture in case of absence from class, and resources, Frequently asked questions, past exams and assignments.

- The work will be used as input to the team to be formed to set up technology support for the distance education of the college in particular and computerize the system of the college.
- The analysis of activities through interview and document review will be beneficial to the nucleus.

1.6 Organization of the paper

Chapter one of the paper deals with the background, statement of the problem and justification, objectives of the study, methodology, limitation and application of the result. The rest six chapters can be divided into two parts: part I and Part II.

The first part discusses issues which are more important to the selection of technology. The beginning chapter of this part i.e. chapter two, the need of distance, the role of technology in distance education, the available technologies, and status of Information technology in distance education in developing countries, and experiences of the university of south Africa. The next chapter discusses the college (mission), functional units and distance education plan of the college. It also discusses the criteria to select the appropriate technology that are suitable to the college, and why the technology is selected. The final chapter of this part, i.e. chapter four, examines the Web based education, and Web based education system development approaches.

The second part which focuses on the system development steps (analysis, planning & design, and prototype development). The starting chapter of part two is on identifying the problems of the existing system that are anticipated to be the problems of distance education, analysis of the activities, information need and problems in the ECSC distance education and identifying problems, and analysis of the critical components of distance education. Then a chapter on planning and designing follows while the seventh chapter presents the prototype.

And finally, chapter eight presents conclusion & recommendation on what to be done next.

CHAPTER TWO

2 Technology Support for Distance Education

2.1 Overview of Distance Education

Distance education is simply education but educator and student are not at the same physical classroom; that is, there is gap (space and/or time) between them.

To bridge the gap between the educator and the student some form of communication is used. It is this dependence on some form of communication that distinguishes distance education from other forms of education (Deveries & Tella,-). Today modern technologies like audio, video and computer are used, but not always (Wisconsin, 1999). Print materials are also used, even now when information technology is highly used. Especially before the introduction of these modern technologies print material was dominant in distance education. As a result of its dominance, at the beginning, distance education was meant correspondence study.

From the existing technologies, what is suitable for one distance education institution is not suitable for the other. So different distance education institutions use different technologies. At the same time, it is difficult to anticipate that there will be one best technology for all distance education unless all the technologies come together into one.

Similarly, there is no agreement on the definition of distance education. Some of the definitions are as follows:

1. The California Distance Learning Project define distance education as an instructional delivery system which connects learners with educational resources (Wisconsin, 1999).
2. Virginia Steiner define Distance education as an instructional delivery that doesn't constrain the students to be physically present in the same location as the instructor (Wisconsin, 1999).
3. The Instructional Telecommunications Council define distance education as the process of extending learning, or delivering instructional resource sharing opportunities, to locations a way from a classroom, building or site, to another classroom, building or site, by using video, audio, computer, multimedia communications, or some combinations of these with other traditional delivery methods (Wisconsin, 1999).
4. University of Idaho states that distance education takes place when a teacher and students(s) are separated by physical distance and technology (i.e., voice, video, data, and print), often in concert with face to face communication, is used to bridge the instructional gap (Wisconsin, 1999).

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5. Distance education is the transmission of knowledge whereby the instructor and/or students participate in different places and /or at different times (Goldman & Olmstead, -).

All of the above definitions agree on that there is some form of physical separation between educators and learners.

Furthermore, the differences with On-campus education can be put as follows:

1. Distance education/ On-campus education

To facilitate distance education, it needs on site facilitators who set up equipment, collect assignments (if not online), proctor test, and act as the instructor's on site eyes and ears (Gottschalk,-).

The other difference is that on-campus education places responsibility on the instructor unlike most distant education that places responsibility on the student (Cook's Institute, 1998).

2. Distant student /On campus student

Distance students feel isolated because they are separated from others who share their backgrounds and interests, and have few opportunities to interact with teachers; they rely on technical linkage to compensate their isolation (Gottschalk,-; Cook's institute, 1998). In addition to the above, distance education students have high post education goals like

promotion; and they are highly motivated and self disciplined (DeVries & Tella, -). Finally, it has been agreed that distant students perform as well as or better than on-campus (DeVries & Tella, -).

3. Distance instructor /on campus instructor

Distance instructor is supposed to understand the characteristics and needs of diversified distant students with limited interaction and with no or limited face to face contact and modifies his teaching styles accordingly. Moreover, he/she should develop a working understanding of delivery technology. Finally, even there are facilitators who can serve as eyes and ears, and he is expected to function effectively as a skilled facilitator (Gottschalk,-).

4. Effectiveness

However, it seems convincing that if the physical distance between instructors and students and among students is wisely addressed, there is no reason why distance education cannot be as effective as on campus education. Gottschalk say that education at a distance can be as effective as on-campus 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. It is according to this that technologies that allow only one way flow of information like television and radio are excluded to be candidate technologies, in this paper.

As a result of the differences between on-campus and distance education, traditional universities, traditional professors, and traditional students have a problem with distance education (Goldman & Olmstead, -)

1. Traditionals feel that learning must take place via direct contact with professor;
2. It is difficult for traditional universities to adjust their mission statement to include distant education;
3. Traditional professors have a mind set of 'three courses per semester, no night or weekend classes, nine months contacts;
4. Traditionals see the infrastructure for education (curriculum development, student advising, etc.) as more challenging when there is a distance education component.

2.2 Advantages and Limitations of Distance Education

2.2.1 The Advantages of Distance Education

Institutions that have distance education are many in number. And some others are planning to start. The reason to start or plan to continue distance education differs from one institution to another. However, it seems that most have one or more of the following reasons: less cost, more access, avoid time and distance limitation.

1. Less Cost

The cost of higher education is increasing from time to time all over the world. The cost of higher education in Europe is rising (Vught, 1997). The American education system is also challenged with providing increased educational opportunities without increased

As a result of the differences between on-campus and distance education, traditional universities, traditional professors, and traditional students have a problem with distance education (Goldman & Olmstead, -)

1. Traditionals feel that learning must take place via direct contact with professor;
2. It is difficult for traditional universities to adjust their mission statement to include distant education;
3. Traditional professors have a mind set of 'three courses per semester, no night or weekend classes, nine months contacts;
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budgets (Gottschalk,-). The world bank has concluded that the sub Saharan African universities cannot longer afford to continue to exist along the lines of the traditional educational model(Vught, 1997).

In distance education, although there is cost like cost for technology, cost for transmission, maintenance, infrastructure, material production, support, and personnel, there are no cost for buildings, classrooms, library holdings, stadiums, increased instructors, students expense like dorm, food, etc. Therefore, it seems convincing that the cost of distance education is not as high as on campus education. Maddex et al agree that although the costs of offering distance education courses may be high the cost for conventional courses is higher. As a result as indicated by Gottschalk, many institutions are answering this challenge by introducing distance education programs.

2. Increased access, no limitations on space

The world population is outpacing the capacity to give people access to universities. To keep up in higher education with growth of the world population, we would need to pen up a new university every week (Vught, 1997). However, in case of distance education space/access is not a problem.

3. Reach students time limitation

Distance education can reach those disadvantaged by time limitation since it provides asynchronous exchange or learning fits with various schedules; that is, it lets flexible schedule. This lets on employment training, worker students study with out loss of salary.

4. Reach students with distance limitation

It solves the problem of those that are disadvantaged by distance limitation like students in rural areas. It avoids relocation.

5. The opportunity to work with better prepared and more motivated students, and the ability to use a broader range of media-based resources can also be a reason for distance education (DeVries & Tella, -).

6. Moreover, distance education is appealing for those with physical disabilities.

2.2.2 Limitations of Distance Education

However, distance education is not without the following limitations:

1. Traditionals resist distance education for different reasons. Some traditionals prefer education by direct contact; they feel that it is difficult to start distance education; they feel that distance education makes a university a second class learning environment; and traditional instructors have a mindset that doesn't match the operations of distance education (DeVries & Tella, -; Goldman & Olmstead, -).

2. In distance education, specially, initially time, effort and training are required for educators/tutors, students, facilitators and support staff in the distance education program to adopt to the method (DeVries & Tella, -).
3. In on-campus education, educators know who is confused or bored, and who is ready for more and they make adjustments accordingly. In distance education it is difficult, even we use videoconferencing.
4. Students of distance education feel isolated, as a result drop out is high.
5. Distant education is not appropriate for all fields (DeVries & Tella, -).
6. And if the distance education uses only ink and paper for all activities, there are many problems indicated in the next sections.

Some of the above problems can be reduced using modern technologies, taking time and training the traditionals. Hence the advantage of distance education outweighs its disadvantages. Therefore, in some cases it is recommended. For example, for Ethiopian Civil Service College, with problems like cost and access, with main aim of educating remote civil servant students, with problems like time and distance limitation, it is appropriate.

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2.3 Advantages and Limitations of Information Technology

2.3.1 Advantages of Information Technology for Distance Education

Which one is the right technology for a given distance education program, and how to exploit it is a challenging task. However, the use of technology is unquestionable. The following can be some of the reasons:

1. Avoid time and distance limitations

One of the reasons for distance education is its ability to reach students with time and distance limitations. Information technology provides the convenience for both educators and learners of any time and anywhere. That is, it avoids the time limitation and distance limitation by making education to be independent of time and space.

2. Lifelong learning – education after formal education

Information technology/ Internet encourages learning throughout life for it lets users to learn even after the formal education. Some students will not leave the e-mail list even after the course has been completed. They stay subscribed and involved with each new course cycle (Hopkins, 1996).

3. Interaction

Distant students value timely feedback of assignments, exams, and projects; they are motivated and don't feel isolated if they are in frequent contact with instructor. Without

modern technologies this is difficult. Technologies like fax machines, computers and telephones provide this interaction opportunity (Idaho, -). Vught (1997) also say that distance education is becoming more and more popular as a result of the ease of commination afforded by the Internet

4. Team learning

Modern technology allows an active rather than a passive learning mode, and stimulates team learning and team problem solving, rather than individual learning (Vught, 1997).

5. Flexibility

The student will have a greater control over the learning process. Modern technology enables self-paced learning for the student. It can accommodate individual differences in student goals, learning styles, and abilities. For example, students can follow different paths along the Web based education system.

6. Resource

Information technologies allow access to enormous quantities of information. Using IT access is not limited to resources of a distance giving faculty but also to outside libraries, articles.

7. Future

The use of modern technologies like computer, Internet in modern society is increasing. Therefore, to make the distant students able to use these technologies after education, it is wise to make use of it at their study (Byron & Gagliardi, 1998).

8. Catalytic

Modern technology can also improve the overall performance of education (administration) (Byron & Gagliardi, 1998). These administrative activities includes admission, registration, and material distribution.

2.3.2 Limitations of Information Technology for Distance Education

Even information technologies have the above advantages they are not without the following limitations:

1. New Technologies

New technologies introduce new way of doing things. Therefore, it will be exploited slowly. That is, the participation of the students will not be high.

2. Affordability

Information technologies constitute very expensive resources. In addition there are maintenance cost, upgrading cost, transmission cost, and teacher and student training (Byron & Gagliardi, 1998). Freyfeld & Mitson (1996) say that cost, in addition to skill

to use and maintain the technology, should be considered in extending IT in education. Affordability is really a problem of developing countries. For example, Internet connectivity costs are too far too high for the average person in Africa (Naidoo & Schutte, -)

3. Technical Expertise

The modern technology demands expertise to identify the right technology, to implement this technology and to maintain the system. Therefore, lack of expertise is an obstacle to implementing modern information technologies. Developing countries have neither capacity to develop the necessary human resources and unable to attract the highly skilled experts. Rather they lose their local experts to more highly paid jobs abroad. So this is more of a problem of developing countries.

4. Teacher Resistance

Teachers are likely to resist the introduction of the IT into the classroom for a variety of reasons, including their unfamiliarity with the technologies, the additional time and effort necessary for their effective use, and perhaps the feeling that IT pose a threat to their professional role (Byron & Gagliardi, 1998)

5. Culture

The authorities in some countries may oppose the use of some technologies like Internet in the formal education system for fear of its potential for cultural colonization. This is so because the material in the Internet is culturally irrelevant in various ways to much of the

non-western world (Byron & Gagliardi, 1998). Moreover, the English dominance in the computer field is an obstacle to the widespread use of computer technologies in education (Byron & Gagliardi, 1998).

6. Lack of Information

A significant obstacle to use IT in education is the lack of information about the role of these technologies in education and how to use it in the education (Byron & Gagliardi, 1998). Byron & Gagliardi say that lack of information about the use of information technology in education by decision-makers is also high in developing countries.

7. Skill to Use The Technology

As a result of lack of funds, lack of experts, lack of information and appreciation of technology in top officials, and sometimes political instability, the deployment of new technology is lower in developing countries (Naidoo & Schutte, -). This lack of infrastructure made the emphasis of, specially, developing countries to acquire infrastructure like telephone, not training. Therefore, skill in using these technologies is low. In short, virtual activity (to make use of Information Communication Technology in education) in Africa is limited to the experimentation or initial stage (Byron & Gagliardi, 1998; Naidoo & Schutte, -).

However, the researcher believes that if a right technology is identified, and used properly then the use of technology in distance education is unquestionable. The justification for this is as follows:

1. Some of the above problems can be reduced. For, teacher education, in addition to equip them with necessary skill, can be a solution for teacher's resistance toward the technology. However, this will not be an overnight task. For example Byron & Gagliardi (1998) say that teachers need up to five to seven years to become sufficiently comfortable with technologies to use them effectively in classroom.

Moreover, the other problems can be reduced by introducing students, instructors to new technologies, by selecting affordable technologies, by training technical expertise and giving appropriate salary, by orienting decision makers about the role of information technology in distance education.

2. Second, if we are not to use the technology, the existence of the technology will harm us because it will increase the gap between technology haves and havenots. This results in difficulty to communicate and to live together. Naidoo & Schutte say,

If African countries cannot take advantages of the information revolution and surf this great wave of technological change, they may be crushed by it. In that case, they are likely to be even more marginalized and economically stagnant in the future than they are today.

However, Africa in general and Ethiopia in particular should be able to use the technology where there is a real need. Naidoo & Schutte say that

It seems unrealistic to foresee the large-scale introduction of IT into education any time in the future in poor developing countries when the obstacles to their implementation are so great. It seems more reasonable to suggest that focus be placed on introduction them so as to respond to needs in specific areas where they may have considerable impact such as in distance education.

3. The indicated advantages, possibility to reduce the problems and the need reduce gap justifies the use of information technology in distance education. For this other reasons, many distance education programs are using it. It is being used not only in advanced countries but also in some African countries like South Africa. Other African countries are also at experimentation stage.

Therefore, the researcher believes that we are not too early to experiment this technology, if we are not too late to use it. It is in this regard that the goal of this paper is designed to experiment the use of technology in distance education.

2.4 Available Technologies for Distance Education

As the experience of distance education giving institutions and capabilities of the technologies, one or the combination of the following technologies are used or can be used in distance education. Some of these are Audiotapes, radio, Audioconferencing (teleconferencing), Audiographics, videotapes, television, and videoconferencing, CD-ROM and Web.

The above can be classified as

1. Recorded (offline) like audiotapes, videotapes and CD-ROM
2. Those that support one way flow of information like radio, television
3. Those that support two way flow of information (communication) like audioconferencing (voice to voice), videoconferencing (face to face) and Web (text to text, for the time being) which are candidate technologies for further comparison.

Moreover, they can be classified according to the information it deals (audio, video and data (text)) which is discussed in the following section.

2.4.1.1 Voice/Video/ Data Classification

2.4.1.1.1 Voice (Audio) – Audioconferencing

Audioconferencing is a real time voice to voice interaction (Gottschalk, -). Audioconferencing can be audio-only or supported by image or data. Audio-only conferencing uses telephone system to link people at two or more locations. It uses telephone handsets, speaker phones or microphones; and audio bridge that interconnects multiple phone lines and controls noise.

Audiographic conferencing combines voice to voice communication with image or data transmissions. Therefore, it includes the electronic blackboard.

Advantages and disadvantages of Audioconferencing are as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> ➤ Supports voice to voice communication. ➤ it can reach many students; ➤ And it is familiar technology to teachers and students. 	<ul style="list-style-type: none"> ➤ It eliminates body language such as smiles, frowns, arm and hand movements, etc. ➤ Lack of ability to perform most of the activities in the distance education. ➤ Students cannot revise, once the session has passed (in case of audio only conferencing). ➤ Don't support multimedia
<ul style="list-style-type: none"> ➤ Skill independent 	<ul style="list-style-type: none"> ➤ Demands audiences to be at the same time and place ➤ Interaction is only real time. No delayed interaction. ➤ Not easily updated if recorded.

TABLE 1 -ADVANTAGES AND DISADVANTAGES OF AUDIOCONFERENCING

2.4.1.1.2 Video- videoconferencing

Videoconferencing is face to face communication. Among the things required are network, television monitors, cameras, videocassette recorders/players, microphones, and speakers.

Advantages and disadvantages of videoconferencing is as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> • It supports face to face 	<ul style="list-style-type: none"> • The initial cost of the equipment and leasing the lines

<p>communication</p> <ul style="list-style-type: none"> • It also Supports the use of diverse media. Accommodates visual teaching tools including charts, videotapes, photographs and sound. • The videoconference space 	<p>to transmit is high</p> <ul style="list-style-type: none"> • If the pipe that carries the transmission among sites is not large enough, the students may observe ' ghost images' when rapid movement occurs in real time • If the system is not properly configured, class members may observe an audio 'echo' effect which disturbs the class. • Lack of ability to perform most of distance education
<p>can be configured to hold a panel of experts, lectures or interviews. It is an excellent way to incorporate guest speakers.</p> <ul style="list-style-type: none"> • Skill independent 	<p>activities.</p> <ul style="list-style-type: none"> • VC demands audiences to be at the same time and place • Not easily updated if recorded. • It allows interaction but only real time. There is no delayed discussion.

TABLE2 - ADVANTAGES AND DISADVANTAGES OF VIDEOCONFERENCING

2.4.1.1.3 Computers (data)

Computers store, process, send and receive information (data) electronically. For this reason, 'data' is used to describe this category (computers).

The use of computer for distance education includes the following (Idaho, -)

- Computer Assisted Instruction (CAI)- the use the computer as a self-contained teaching machine.
- Computer Managed Instruction (CMI)- uses the computer for record keeping, calculating students grade, and organization of instruction.
- Computer Mediated Instruction (CMI)- describes computer applications that facilitate the delivery of instruction. Examples include electronic mail, fax, real time computer conferencing, and World Wide Web applications.

The Web can do many things. It does some things better than others do and things others cannot do. For example, one of the distribution media of the Web, i.e., the Internet can reach through the globe. Sure the television and telephone can do that, too. But unlike television, it supports two way communication, and unlike the telephone, it supports asynchronous exchange; as its transmission capacity increases the online medium can swiftly carry moving pictures and sounds (Naidoo & Schutte, -).

Advantages and disadvantages of Web/Internet are discussed as follows:

Advantages	Disadvantages
<ul style="list-style-type: none">• Time and place flexibility. It avoids time limitation (asynchronous) and distance limitation (can reach the globe).• Platform independent. There is not concern of the processor type and operating system.	<ul style="list-style-type: none">• Limited bandwidth. Since the capacity of transmission is low, sound, graphics and video are hampered (Naidoo & Schutte, -) . As a result the Internet can deliver

<ul style="list-style-type: none"> • Quick development time. We can quickly develop relative to other media (Hopkins, 1996) • Easy updating. In Web it is possible to update unlike print and as a result it lets accessing timely and updated information. • Multimedia. The Web can integrate graphics, text, sound and video. It also 	<p>video but not as fast as videotapes (McManus,-).</p> <ul style="list-style-type: none"> • Skill dependent. Learner success depends on technical skills in computer operation and Internet navigation (ERIC, 1996).
<p>supports animation.</p> <ul style="list-style-type: none"> • Resource. The Web serves as a library or it lets access resource of the world on the Internet. • Hypertext. Hypertext can be described as presenting the information in non-linear way. As the Web is a hypertext medium it is better than a book to structure and present large volume of data. At a result it allows users to follow different routes through the content, depending on their own learning styles and abilities (Naidoo & Schutte, -) • Distribution. The Web can be used to 	<ul style="list-style-type: none"> • Information overload. Information overload on the Internet also affects the students (ERIC, 1996). • Access. The individuals ability to access information is a problem (Hopkins, 1996). This is a problem to poor countries students. • Irrelevant materials. There is fear concerning materials that go against the locally prevailing political, religious or other cultural tenets. • The pace of change. The speed with

<p>distribute written materials, images, programs audio and visual resources. It can also be used to collect work from students.</p> <ul style="list-style-type: none"> • Web browsers. The Web has made the Internet to be used not only by technically privileged (Informix, 1997). This is so because a point and click, and ability to 	<p>which the Web technology changes is fast. This affects developers, trainers and users. For example, HTML is old enough, and this people are supposed to study XML and VRML (the Virtual Reality Modeling Language). This makes difficult to cope up with it.</p>
<p>display variety of information of Web browsers (Yeager & Mcarth, 1996). Web browsers and Web made the Internet user friendly. As a result beginners don't struggle a lot to use it.</p> <p>Discussion. The Web let the distant students to form a discussion group, which may include their instructor. If distance students form a group they develop a feeling that if there is a problem then there is help available.</p>	<ul style="list-style-type: none"> • Difficult. There are distance education activities that are impossible or difficult by Internet; for example, laboratory. • Body language. Instant feedback loss during instruction is a problem on the Web/Internet, especially in asynchronous exchange. • There are also other problems like copyright issues, and security.

TABLE 3 -ADVANTAGES AND DISADVANTAGES OF WEB/INTERNET

McManus generalizes the advantages of Web over other technologies that one it combines advantages of other media and second it can serve as a resource (library) which is the main headache of distance learning.

Moreover, some of the above problems have solution. For example, problem related to irrelevant materials can be avoided. There are two dominant strategies to lessen these concerns. Software may be installed locally to block access to potentially objectionable material, or students may be taught to recognize inappropriate resources and then held personally responsible for avoiding such sites (Naidoo & Schutte, -). Problems relating to inability of the Web/Internet to express body language can also be reduced by building a channel into a design (attaching e-mail in every page, for example). Moreover, others can also be solved as telecommunication infrastructure is changed, as private Internet Provider Services opens, and through training how to use the Internet.

Finally (Naidoo & Schutte, -) express the future of the Internet as follows:

The Internet has become such force in any modern information oriented society that it is not a question any more whether the Internet can be sued as a teaching tool. The Internet is becoming central to the concept of virtual teaching. It is interesting that all the different modern telecommunication technologies seem to be at a convergence on the Internet. And massive amounts of research and development funding are at present channeled into the Internet.

Therefore the above advantages, the possibility of solving (reducing) some of the problems and the future trend made the Web/Internet popular. It is used in distance education as a means to deliver course materials, assignments, getting/giving feedback;

for discussion of special topic; for online examination and automatic grading; to post interactive tutorials; for real time chatting, etc.

2.5 IT in DE in Developing Countries

Ethiopia has to share experience of how to use technology for distance education from other countries. The researcher believes that the experience of highly developed and least developed countries with no Internet connection is inappropriate because it is difficult to apply the experience of the former; and the experience of the later will be of less value. Therefore, experiences of African and/or advanced developing countries like South Africa, Morocco, Egypt, India, and Nigeria seem appropriate. Especially of South Africa will be beneficial because there are projects in South Africa, if successful, that could be replicated in other African countries (Naidoo & Schutte, -).

There are obstacles to use technology in distance education in both developing and developed nations as previously discussed. However, the problem faced by developing countries are of a very different magnitude, and often of a different nature, to those affecting the developed countries (Naidoo & Schutte, -). As we have discussed previously, these are lack of expertise, lack of information about the role of technology in education by higher officials, affordability (foreign exchange in developing is scarce, therefore, their affordability to use the modern technology is questionable), and skill to use the technology.

Moreover, developing countries lack even the most basic technological infrastructure like telephone, partially because in most countries there is no effective telecommunication competition; computers and networks are also regarded as a luxury (Byron & Gagliardi, 1998). Even if most African countries have Internet connection there is a wide disparities between urban and rural (even between capital cities and other towns) (Byron & Gagliardi, 1998; Naidoo & Schutte, -).

In addition to the above, in countries where there is Internet connectivity, access to the network is limited by the low frequency connection available because the old networks are inadequate for modern telecommunications requirements of bandwidth, stability, and continuous services (Byron & Gagliardi, 1998).

However, a growing concern is shown in many developing countries for building up the means of access to and use of these technologies in education (Byron & Gagliardi, 1998). There are signs that Africa as a whole has awakened to use technology in education. We can see the case of South Africa, Egypt, Morocco, Kenya, Zambia (Naidoo & Schutte, -).

2.5.1 IT in Distance Education in South Africa

South Africa is trying to practice the information technology in education and in distance education in particular. A good example is the university of South Africa and discussed as follows (Naidoo & Schutte, -).

University of South Africa with administrative seat at Pretoria and four branch campuses in other towns of South Africa provides distance education to 130,000 registered students. Its students are from all over South Africa, students in other African countries and even outside Africa. The students range from the poor rural, and non electrified areas, to the cities with necessary infrastructure and telecommunications. Student's fees are appreciably lower and the budget of the university is low.

The university didn't like to ignore students without even electricity and it cannot ignore its students who want to get the modern telecommunication advantages. Therefore, the university has moved towards the building of a Web-based virtual university, called students online (SOL) for those students with necessary infrastructure, teleconferencing and videoconferencing in the four branch campuses.

Students of the university are similar to students in Ethiopia, some of them here in Addis Ababa with better facility, the other in regions where dialup Internet connection is found, the others in zonal where some computers are found and still others in rural where there is no road, electricity and telephone. Moreover, Ethiopia is more similar to South Africa than highly advanced countries.

Therefore, even there are still differences between Internet connection (not equally distributed) between South Africa and Ethiopia. The similarity between university of South Africa and the Civil Service College allows the College to share the following experiences of the University of South Africa:

- A university that has students from areas with no electricity can use Web Based Education System to help students with necessary infrastructure while the others continue to use print and audio materials.
- The set up of videoconferencing in Wereda level, where there can be one student is not wise. However, as the college has branch campuses in regional towns it is possible.
- The use of Web/Internet is not without problems like in South Africa. The Problems experienced by University of South Africa are student's lack of Internet access, lack of support from management, problems of dividing students which is sensitive in south Africa, academic staff were fully committed to the printed mode of distance education .

2.5.2 Distance Education and IT (VC and Web) in Ethiopia

In Ethiopia there is some experience in distance education in schools. Such experiences in distance education uses print material, public radio and television. There are also experiences of distance education in AAU, Faculty of Education and Addis Ababa Commercial College.

However, there is no experience of using information technology like videoconferencing and Internet in distance education. A good start is being done by African Virtual University via Videoconferencing (two way audio and one way video) and the Ethiopian Civil Service College to give short term training for civil servants and instructors via videoconferencing (two way audio and video).

What can be mentioned in Ethiopia toward technology in general and Web in particular is that it is one of the eleven African countries that have local dial up Internet access nationwide (not at a capital city only unlike other African countries), on the top it is one of the top ten countries with most users (Naidoo & Schutte, -). What is more encouraging is there are more than 40 Web sites (EthioInternet, 2000), students at SISA are recommending and developing Web sites, at least one each year for the last three years and two last year.

CHAPTER THREE

3 Technology Support for ECSC Distance Education

3.1 The College

3.1.1 Overview of the College

The Ethiopian Civil Service College is one of the higher institutions in Ethiopia. The college, which is accountable to the Prime Minister office, first began in January 1995. Then, it was formally established as an autonomous higher education institution with its own legal status by the council of ministers regulation no. 3/1996 issued in Negarit Gazeta on February 15, 1996 (ECSC, 1997).

3.1.1.1 Mission and objectives

It was established specifically to meet the urgent trained manpower needs of the regional governments, which are now determine their own affairs because of decentralization of power from the center.

The college's objectives are as follows (ECSC, 1997; ECSC, 2000):

1. Providing short and long term training to civil servants in the regions and federal government, with special emphasis to women and backward regions.
2. Conducting researches and disseminates fruitful results.
3. Rendering consultancy services

3.1.1.2 Existing programs

Currently the ECSC offers residential programs in law (degree and diploma), economics (degree), accounting (degree and diploma), development administration (degree), urban planning (degree) and municipal engineering (diploma). The college functions the whole year, 3 terms of 14 weeks each with 2 weeks term breaks.

In addition to the long-term residential education, the college provides several certificate courses ranging from 4 weeks to 10 weeks. The courses include book keeping, budgeting, auditing, federal accounts, law and surveying. Moreover, there is evening diploma in accounting and law for the civil servants living in Addis Ababa and Oromia.

The college has also a good experience in using information technology for education. It has videoconferencing (two way audio and video) and 15 computers connected to the Internet. The college in collaboration with the World Bank delivers course relevant to its instructors and clients (, government agencies, ministers, NGOs, private sectors) at affordable price via the videoconferencing and Internet.

3.1.1.3 Near Future Directions

The college is preparing to start postgraduate programs and distance education. The post graduate program includes Human Resource Management (HRM), Public Finance (PF) and Law (LLM). For the time being, the distance education starts with diploma programs

in accounting, management and law and then it extends to include other fields in degree programs.

3.1.1.4 Assistance and Linkage

Half of the budget of the college is covered by government funds and internal revenue of the college. The other half is covered by donors like UNDP (major financial supporter), world Bank (second financial supporter); and others like the Netherlands governments, Austrian Development Cooperation, USIS, USAID, French government, British council are also helping the college (ECSC, 2000).

The college has a linkage with institutions in Nigeria, Canada, United Kingdom and France. There is also an interest to establish linkage with institutions in Uganda, Ghana, Kenya, Zambia, USA, China and India.

3.1.2 Organization of the College

The highest decision making body of the college is the board of governors. The board has seven members appointed by the Prime Minister. These are a Member of the House of People's Representatives, a Minister of Transport and Communications, Minister of Education, President of Addis Ababa University, the Minister of Agriculture, President of the College and the Academic Vice President of the College (Genanew, 2000).

The management committee, which has the president, academic and administrative vice presidents of the college as members, co-ordinates the implementation of the academic and administrative policies and procedures of the college (ECSC, 1997).

The senate (ECSC, 1997):

- Approves the academic programs and calendar of the college
- Formulates guidelines for examination and admission to the college
- Recommends academic promotions
- Confers degrees and diplomas
- Arbitrates and settles disciplinary matters

The administration and finance department, accountable to the Administrative Vice President, implements administrative regulations and policies, ensuring the smooth day to day running of the college.

3.1.3 Academic Division

3.1.3.1 The Faculties

The programs are underway in three faculties that are located at three campuses. These are the Faculty of Business and Economics, the Faculty of Technology; and the Faculty of Law.

The Faculty of Business and Economics comprises three departments. These are economics, accounting and development administration. This faculty is responsible for economics, accounting and development administration fields which are being offered in short term, long term, and evening programs. Its role will increase as postgraduate and distance education starts.

The Faculty of Technology has two departments. These are urban planning and municipal. This faculty is involved in long term and in short-term. The Faculty of Law is also involved in long term, short course, and evening. The responsibility of this also increases as distance education starts.

3.1.3.2 Admission

The admission criteria to the college degree and diploma programs is based on (ECSC, 1997; ECSC, 2000):

- Completion of 12th grade senior secondary school
- Pass the entrance examination of the college to be held in regional towns
- Recommendation from their respective employing regions/organizations.

However, there is a tendency to include ESLCE pass result as one criterion in the admission criteria for distance education.

3.1.3.3 Graduation

To graduate and obtain a degree a student must (ECSC, 1997; ECSC, 2000):

- Have a minimum CGPA of 2.00
- Remove all 'F' grades
- Take a minimum of 112 credit hours, and write a senior essay of 6 credit hours

To graduate and obtain a diploma a student must (ECSC, 1997; ECSC, 2000):

- Have a minimum CGPA of 1.75
- Remove all 'F' grades
- Take all required courses and prepare a final year project paper

3.2 Distance Education at the College

3.2.1 The Nucleus

In the "five year (1998/99-2002/3) plan of the college", there is a plan to start a distance education program to be run under the responsibility of distance education faculty (ECSC, 1998). Accordingly, a nucleus of the distance education has been set up. The number of this staff is four: two M.Sc, and one with B.Sc. and a secretary. Their duty is to prepare project proposal for the distance education and then implement.

3.1.3.3 Graduation

To graduate and obtain a degree a student must (ECSC, 1997; ECSC, 2000):

- Have a minimum CGPA of 2.00
- Remove all 'F' grades
- Take a minimum of 112 credit hours, and write a senior essay of 6 credit hours

To graduate and obtain a diploma a student must (ECSC, 1997; ECSC, 2000):

- Have a minimum CGPA of 1.75
- Remove all 'F' grades
- Take all required courses and prepare a final year project paper

3.2 Distance Education at the College

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Till now, the nucleus has finished the project proposal, and started to implement. For example it has started to hire people.

According to the nucleus, the distance education will include law, accounting, and management. Priority will be given to accounting that is to start in 2001. The reason given for this is that there are 8,000 employee working in areas of finance who need urgent training. Out of this 1,200 applicants in the selected regional and local centers will be registered at the first round. However, the distance education seems it cannot start in 2001 for a number of reasons (Gebre, 2000).

Furthermore, the nucleus has anticipated the following problems (Gebre, 2000):

- Shortage of fund because currently unnoticed components that can incur cost may emerge on the process of implementation
- Shortage of qualified material developers
- Lack of qualified tutors in the regional and local centers
- Delay in the training of course developers
- delay in material development
- Delay in the supply of necessary equipment and materials

3.2.2 The Proposed Distance Education

3.2.2.1 The Faculty

The distance education faculty is responsible for the following (ECSC, 1999; Gebre, 2000):

1. The faculty, which will operate under the leadership of the distance education dean assisted by five department, coordinate, organize, administer the distance education courses offered by different departments like accounting, law and management.
2. The distance education department council, whose members are the heads of the departments of the distance education, seeks solutions to problems and put working guidelines on issues such as budget, test and assignment, material development, manpower and student service. Moreover, it decides on issues such as admission standards, credit (course) transfer, tuition rate, tuition mechanisms and work load.
3. The distance education senate committee, whose members are the academic vice president, dean of distance education, deans of faculties that offer distance education courses like FBE & law and the registrar, generates ideas and coordinate the offering of distance education.

For the organizational structure of the faculty/institute see the following chart:

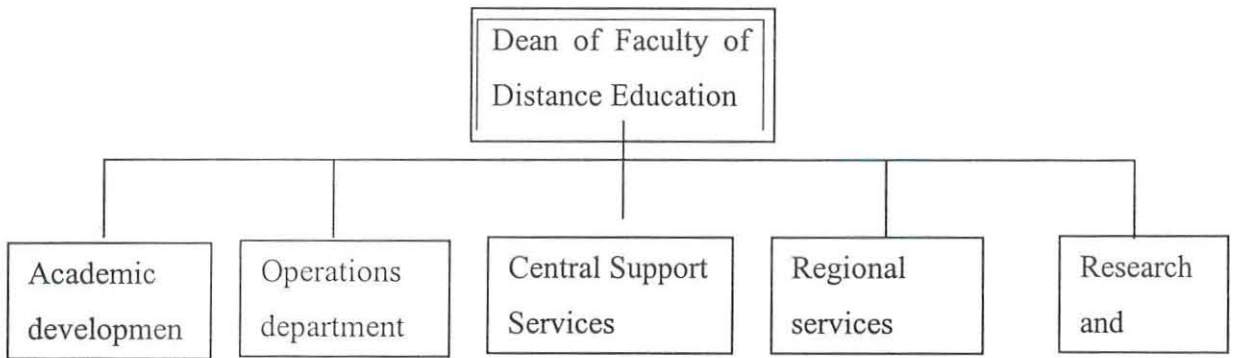


Figure1- Organization of the Distance Education Faculty

3.2.2.1.1 Academic Development Department

The responsibility of this department is:

- Organizing the content of materials produced by authors (instructors, etc)
- Editing and Converting and the material to appropriate format for distance education

3.2.2.1.2 Operational Department

The responsibility of the department is as follows:

- Printing materials for learners
- Distribution of all course materials to distance learners.

3.2.2.1.3 Central Support Service

This department will have **Student Record** section under it. The responsibility of this department is

- Ensuring that data of each distance learner is available in the learner's personnel file. This includes keeping each distance learner's results/grades and courses taken and preparing statistical data that show the number of dropouts
- Receiving distance learner's assignments and distribute them to the course coordinators and then returning the corrected examination and distribute them to distance learners through their addresses.

3.2.2.1.4 Research and Evaluation Department

The responsibility of the department is mainly conducting a research to identify the problems that affect the distance learners and recommend possible solutions. This includes Studying and evaluating the courses prepared, the tutorial services rendered, and devise mechanisms that help to improve the preparation of course by selecting appropriate media and tutorial services.

3.2.2.1.5 Regional Services

The responsibility of this department is:

- Serving as representative of remote centers

- Evaluating regional center coordinators
- Training regional coordinators and tutors
- Working out for efficient tutorial arrangements
- Creating efficient mechanism for the collection of students fees

3.2.2.2 Regional centers

To reduce direct interaction between the institute and the students, there will be 14 regional centers. These are Mekelle, Bahrdar, Debremarcos, Dessie, Jimma, Nazreth, Diredawa, Jijiga, Assossa, Awassa, Arbaminch, Dubti, Gambella and Addis Ababa. In each regional center, there will be two permanent employees (a coordinator and a typist). These regional centers are responsible for (Gebre, 2000; ECSC, 1999):

- Solving most administrative problems of students
- Course registering
- Dispatching materials to the local centers
- Supervising local centers and tutors
- Collecting fees.
- Screening students for admission
- Maintaining record of students
- Arranging examinations

3.2.2.3 Local Centers

Each regional center will have some local centers which will serve as end points (nodes) where students and tutors meet. The local centers are as follows (ECSC, 1999):

Regional centers	Local centers
Mekelle	Mekelle, Maichew, Adigrat, Axum
Bahrdar	BahirDar, Gondar, Injbara,
Debremarcos	Debremarcos
Dessie	Dessie, Kemissie, Kombolicha, Woldya
Jimma	Jjimma, Bedele, Bongo, Nekemit, Metu, Mizan Teferi
Nazreth	Nazareth, Goba, Assela, Ziway
Diredawa	Dire Dawa, Harar, Assebe Tefferei
Jijiga	Jijiga
Assossa	Assossa, gimbi
Awassa	Awassa, Negele, Dilla, Hossaena, Durame
Arbaminch	Arbaminch
Dubti	Dubti
Gambella	Gambella
Addis Ababa	Addis Ababa, Dbre Berhan, Ambo, Fiche, Debre Zeit, Wolkitie

TABLE 4 - LOCAL CENTERS

3.2.3 The Ethiopian Civil Service College Distance Education Proposal

The distance education will be at a diploma level. There will be two courses per semester. The students of the distance education will be adult employees. Moreover, the picture of the proposed distance education will be given as follows (Gebre, 2000; Mihretab, 2000):

Components	How
Admission procedures	Applicants apply to remote centers, recommend by regional states, take entrance examination to be held at regional towns and if passed they will get registered via remote centers.
Material distribution	Materials will be produced by authors and academic development department, distributed by operation department via regional services to regional centers and then to local centers/students
Teaching materials	It should allow students to study at a place and time of their choice for they should not be out of civil service.
Interaction with course coordinator/tutors.	Interaction with course coordinator is not available. Instead tutors will be available at local centers.
Periodic class session (tutoring)	Periodic class session is present with tutors. This will be per month. Tutors answer questions from students.

Assessment (examination and assignments)	Final Examination will be taken at regional centers that force student to come to regional centers. And it will be corrected at the college by course coordinators. Assignments and tests are corrected at remote centers by tutors and results transferred to the DE faculty.
Technology support	There is a tendency toward using technologies but still not decided to which technology to be used. Until it will be decided the distance education will use print and audio.
The relation with the rest of the college and regions	It works together with registrar, admission, faculties, regional states and regional institutions and instructor of the college.

TABLE 5 - PROPOSED DISTANCE EDUCATION

3.2.4 Technology Support Plan Conflict

The nucleus is in disagreement with what is proposed by consultants.

The nucleus proposes that a kit of distance learning material should comprise printed materials (nearly 97%), and audio materials (2%). However, the nucleus believes that the transfer of results of students form remote centers via manual is not recommendable. Therefore, a private network, and a system for storing and processing grades and related information are needed (ECSC, 1999; Gebre, 2000).

technology for distance education. These reasons can also be expressed differently by "to prioritize projects" or to justify the investment.

While we are comparing or evaluating, it is clear that some problems of evaluation are tolerated. The following are the most common problems (Ballantine et al, 1996; King et al, 1997):

- Quantification of costs- to quantify some costs is difficult for example the possible reduction of job satisfaction
- Quantification of benefits - to quantify some benefits is impossible, for example, increase of job satisfaction
- Not truly investigating risk.

3.3.1 Approaches

It seems that no single criteria are set to evaluate "technology for distance education". Therefore, many approaches are taken. These approaches are multidimensional approach, content requirement and user needs, and criteria put indirectly.

expressed in term of money or time saved by using specific information technology (information system). The non-measurable are benefits like satisfaction.

3.3.1.1.4 Second order effects

Second order effects are often appear as a surprise when they occur. While not all such effects can be predicted some of them can be predicted. For example, one of the second order effect of word processors is the increase of draft papers. However, in this paper I found to predict difficult, therefore excluded.

3.3.1.1.5 Flexibility (expandability)

The fifth one is the evaluation of flexibility. This evaluates whether the benefits can continue in the future or not. The success should not be measured based only on the benefits we can get during implementation but also about how it will continues to perform in the future.

3.3.1.1.6 Implementability

The main purpose of this step is to check whether the system is practical, whether the potential benefit will actually occur.

3.3.1.1.7 Risk

Risk is the possibility that the potential benefits will not be actual benefits and the possibility that benefit will not continue. When the gap is wide we say the risk is high.

3.3.1.2 Content Requirements and User Needs

However, information technology selected with out content requirements and user needs will have less value in distance education. For these reasons, information technology for distance education should be selected based on the content requirements, learner, educator, and nucleus, and support staff. Moreover, if particular technology is to be accepted, it should satisfy the needs of the college. For this reason, I found some criteria which a technology to be selected should fulfill. They are discussed in the following.

3.3.1.2.1 Content requirement

This deals whether the technology is appropriate for the proposed fields like law, accounting and management.

3.3.1.2.2 Skill and familiarity of students, educators

This step checks if the technology to be selected is familiar and users have skill to use it. It also sees if it is possible to train easily.

3.3.1.2.3 Acceptability by students, educators

This measures if it is acceptable.

3.3.1.2.4 Accessibility by the students

This is on the accessibility of the technology by students. This can be expressed as the distance between the students and the place where the technology is available, the space it can accommodate, and the transmission cost the students is to pay.

3.3.1.2.5 Nucleus needs

The technology should be able to satisfy the need of the nucleus which is to transfer grade related information from remote to the college.

3.3.1.2.6 Suitability to the planned distance education

It should be suitable to the planned distance education. Accordingly I have tried to coin one criteria by myself that the technology should let students to study at time and space of their own choice.

3.3.1.2.7 Capabilities of the technology

The ability of the technology to perform all or most of the activities of distance like admission, registration and material distribution.

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3.3.1.2.8 Affordability by the college

This is whether the cost of the technology can be covered by the college.

3.3.1.3 Criteria originated from the advantages and limitations of DE and IT

Although some of them are included in some of the above criteria, additional criteria can be coined from what we have seen in the previous chapter; that is, a technology to be selected, as far as possible, should

- not go against the advantages of distance education.
- solve the limitations of distance education.
- not go against the advantages of technology for distance education
- try to solve the limitations of the technologies as indicated in chapter two.
- solve the problems of developing countries to use technologies in education.

Therefore, these additional criteria are as follows.

3.3.1.3.1 Advantages of distance education

Advantages of distance education which are less cost, more access, reach students with distance and time limitations are covered under **cost, access, suitability for the planned DE.**

3.3.1.3.2 Limitations of distance education

Limitations of DE like inappropriateness for all fields and difficulty to understand body language are discussed under **content requirements**, **benefits** respectively. However, limitations like feeling of isolation of students are more or less reduced by the candidate technologies.

3.3.1.3.3 Advantages of information technology

Out of the advantages of information technology, **encouraging team problem solving**, **encouraging life long learning**, and **serving as a resource** are not covered, therefore will be added to the selection criteria.

3.3.1.3.4 Limitations of information technology

Out of the limitations of information technology, **technical expertise availability** and **culture colonization** seems uncovered.

3.3.1.3.5 Limitations of developing countries

Most of them covered above but infrastructure availability can be one criterion.

Therefore, in the next section the combination of the above: multidimensional approach, content and user need, the college's criteria and criteria forwarded indirectly will be used to evaluate the candidate technologies which are videoconferencing and Web.

3.3.2 Videoconferencing versus Web

Videoconferencing	Web
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<p>Cost/ Affordability</p> <ul style="list-style-type: none"> ➤ The fixed cost for videoconferencing includes the cost for audio equipment (microphone and speaker), video equipment (monitor and camera) and communication devices and furnished conference room. The already established videoconferencing in the civil service college costed \$312, 000 without the cost for furnished conference room. ➤ The setup cost includes the payment for the people who set up the videoconferencing. ➤ The operation cost includes transmission 	<p>Cost/ Affordability</p> <ul style="list-style-type: none"> ➤ The fixed cost includes mainly computers. According the plan, computer course will be given to the distant students. This implies that computers will be available at remote centers. Therefore, there is no need to purchase computers for this purpose. But, the college needs to buy server computer. ➤ The set up will not head ache of the college but the Internet Service Provider for less payment. ➤ The operation cost includes
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<p>cost (which is leased), the salary of the people who serve the videoconferencing, and the maintenance cost. The transmission cost is \$200/hr.</p> <ul style="list-style-type: none"> ➤ Moreover, there is cost for material development. ➤ Therefore, it will not be unrealistic to say the cost to establish not in places where 	<p>transmission cost (60birr/hr), and the salary of the people hired to serve the Web server.</p> <ul style="list-style-type: none"> ➤ Moreover, there is a cost for material development. This includes cost for Web Based Education System development. ➤ As it is obvious from the figures
<p>there are distance education, not in 42 local centers, not in 14 regional centers, only the addition of one videoconferencing is intolerable (unaffordable) in current situation of Ethiopia.</p>	<p>given the cost of Web/Internet is incomparable with that of videoconferencing, even one way video and two way audio (audioconferencing).</p>

TABLE 6 - COST/ AFFORDABILITY COMPARISON.

Infrastructure Support	Infrastructure Support
<p>VC demands electricity, without power fluctuation, which is common. Because Power fluctuation (including on and off) hurts videoconferencing very much. For example, the existing</p>	<p>In case of WBE, power at the place where there is web server should be constant. The other foundation is the availability of Internet and telephone.</p> <p>According the incomplete document found in EthioInternet, out of the local centers (42) at least</p>

<p>ECSC VC failed several times. As a result, the college has bought its own generator. Therefore in remote centers, it will not be affected provided their own generator is bought. However, this will make the cost of VC impossible to tolerate.</p>	<p>Nazareth, D/ziet, Jimma, DireDawa, Harar, Bahrdir, Awassa, Shashmenie, Mekelle, Dessie, Axum, kombolicha, Arbaminich, gondar are using the Internet. There is also a project "ETC-UNDP" (Ethiopian Telecommunication corporation- United Nations Development Program) to expand the Internet in regions with \$1.2 million (Tedla, 2000).</p>
<p>But VC doesn't demand the availability of telephone or Internet since it uses its own line.</p>	<p>Moreover, the remote centers seems have telephone connection for there is no complaints from the nucleus for lack of telephone communication.</p>

TABLE 7 - INFRASTRUCTURE SUPPORT COMPARISON.

Accessibility	Accessibility
<p>The college cannot make it available for not affordable and for not cost effective; and if made available in few areas the cost of transmission will affect the tuition fee of students and students will be forced for displacement, which is the main thing needed to be avoided. Moreover, the conference room doesn't</p>	<p>Internet can be made available easily than videoconferencing. The transmission cost is not as high as videoconferencing which is leased. Moreover, the Internet can reach the globe, that is, as far as there is distance education center unlike videoconferencing which is not cost effective to set up for few students.</p>

accommodate many students. For example, the existing conference room don't accommodate more than 15 people.	Moreover, space is also not a problem since they can be connected from home or office.
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TABLE 8 – ACCESSIBILITY COMPARISON

Suitability to The Planned DE	Suitability to The Planned DE
Students, according to the plan, are free to study at the time and place of their choosing. In this case videoconferencing which demands students, even in places where there is VC, to be at same location and time seems inappropriate to the plan.	Web fits the proposed distance education which lets students free to study at the time and place of their choosing. It goes according to the aim of the distance education of the college that is students are not to leave their job while they are at education.

TABLE 9 -SUITABILITY TO THE PLANNED DISTANCE EDUCATION COMPARISON

Benefits	Benefits
<ul style="list-style-type: none"> ➤ This technology reduces the distance barriers to face to face communication. Therefore, it is better to understand body language. ➤ It is appropriate for periodic class sessions. It can be used for connecting guest speakers. ➤ Students in conference room can also observe live experiments, which are being done in other 	<ul style="list-style-type: none"> ➤ The Web can be used in many ways: as informational (information about the class such as syllabus and notices); supplemental (provides links to resources that supplement, but are not required to class); dependent (major course components are placed) and fully Webbed (entire course

<p>sophisticated laboratories.</p> <p>➤ It also lets students to learn from primary sources than secondary sources like textbook.</p>	<p>content and activities are on the Web) (Washington, 1998).</p>
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TABLE 10 – BENEFITS COMPARISON

<p>Capabilities</p> <p>The proposed videoconference can best be used for lecture process. However most of the activities are not done by videoconferencing. For example, online admission, registration, and material distribution are not possible.</p>	<p>Capabilities</p> <p>The Web seems inferior in face to face lecturing even it can compensate it via posting lecture notes and using audio, and interaction. However, it can do most of the activities of distance education like online admission, registration and material distribution.</p>
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TABLE 11 – CAPABILITIES COMPARISON

<p>Nucleus Needs</p> <p>The nucleus needs to automate tasks like grade and related data processing and storage, and information exchange like results with the remote centers. In this case, videoconferencing proposed doesn't meet the need of this nucleus.</p>	<p>Nucleus Needs</p> <p>Web satisfies the needs of the nucleus to automate tasks like grade and related data processing and storage, and information exchange like results with the remote centers.</p>
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TABLE 12 - NUCLEUS NEEDS COMPARISON

Content Requirement	Content Requirement
<p>It is appropriate for instruction that needs a great deal of video (demonstration) and audio.</p>	<p>It is appropriate for law, accounting, and management. This is so because it lets students to study according their ability and learning styles. Moreover, students can revise these materials anytime. Content developers can also easily update the materials.</p> <p>However, it is not appropriate for courses it is not appropriate for instruction that needs a great deal of video (demonstration) and audio.</p>

TABLE 13 - CONTENT REQUIREMENT COMPARISON

Contribution to The College's objective	Contribution to The College's objective
<p>The objective of the college is to bring efficiency in the civil service. The VC, in addition to education, can be used for meeting of different civil servants in</p>	<p>The Web/Internet not only contributes to the objective of the college but it can also contribute to the strategy of the whole country. This is so because, there is a move toward giving information technology in education, in high schools, by the Ministry of Education. Therefore, the students who use the Internet for education will have good experience of Internet/computer after the education that is the objective of</p>

different regions.	the move. Moreover, to use Web/Internet for education encourages students who learn information technology in high schools.
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TABLE 14 - CONTRIBUTION TO THE COLLEGE'S OBJECTIVE COMPARISON

Skill and Familiarity	Skill and Familiarity
Since students are familiar with television and have an experience of watching television, it will not be difficult or unfamiliar to watch the monitor/TV screen. It is not skill dependent.	The Web requires learners, instructors, support staff to use the Web-based system. According to the data collected, about 90 % of instructors in the college are found to be familiar and have e-mail address. Only 4% of freshmen students are familiar. However, has observed that senior students at the college use the Web to do their paper.

TABLE 15 - SKILL AND FAMILIARITY OF STUDENTS & EDUCATORS COMPARISON

Acceptability	Acceptability
Byron and Gagliardi say that educators will not accept a technology if they are not familiar and have not necessary skill to use it. Therefore, once the DE is accepted, VC seems more acceptable.	Instructors may not accept it since it requires additional time and effort, initially. Students may not accept for they are not familiar. However, as they become familiar and more skillful, they will accept it since it provides them with good experiences.

TABLE 16 – ACCEPTABILITY COMPARISON

<p>Life Long Learning</p> <p>The proposed videoconferencing doesn't encourage life long learning as other technologies like Internet since it hasn't content.</p>	<p>Life Long Learning</p> <p>Web via Internet encourages life long learning. Because it is appropriate for learners to continue to use it after education, to learn by themselves.</p>
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TABLE 17 - LIFE LONG LEARNING COMPARISON

<p>Flexibility (expandability)</p> <p>In the future the increase of students may occur. In the case of increasing students but scattered videoconference seems not expandable. However, it is cost effective when the increase of students is in a given area (concentrated).</p>	<p>Flexibility(expandability)</p> <p>The Internet/Web can reach the whole globe. In this case, unlike videoconferencing, it can go to where there is a distance education students as far as there is electricity and direct telephone, irrespective whether the students are scattered over large area or not.</p>
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TABLE 18 - FLEXIBILITY (EXPANDABILITY) COMPARISON

<p>Implementability (practicality)</p> <p>Given fund, technical expertise all the benefits of the videoconferencing can be implemented.</p>	<p>Implementability (practicality)</p> <p>Even given fund, skill, in some cases it may not be as practical as needed. For</p>
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	example, video transmission is not wise for less transmission capacity.
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TABLE 19 - IMPLEMENTABILITY (PRACTICALITY) COMPARISON

Risk	Risk
<p>Since the service provider is the world bank, what if Ethiopia stops relation with the World Bank. There are also other cases that make the videoconference to function. For example, one time, the World Bank gave specification of a device to the college and the college bought the same device but using different specification and the World Bank stopped the service for some time. Moreover when there is failure, the videoconferencing will stop functions for a month on average until the world bank sends experts and maintain the system. Therefore, there is a high risk attached to the videoconferencing.</p>	<p>The risk attached to the Web is at least less than that of videoconferencing. This is so because, the Internet which is one distribution media of the Web is not owned by single body but thousands of universities, individuals, business organizations, and rather it gives benefit of access to these different individuals and groups. However, there may be some risks. Some of this is virus.</p>

TABLE 20 – RISK COMPARISON

Technical Expertise	Technical Expertise
There is rare expertise to maintain the videoconferencing. For example, the	The lack of expertise to maintain web server, to develop web based education

college wanted to hire and no one found.	system seems not a serious.
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TABLE 21 – TECHNICAL EXPERTISE COMPARISON

Cultural Colonization	Cultural Colonization
Cultural colonization is not serious for there is no content.	<p>Cultural colony, copyright and security are problems of Web. but can be reduced by</p> <ul style="list-style-type: none"> ➤ advising students to access inappropriate web sites, ➤ developing software that can protect inappropriate web sites, force copyright rules, and security ➤ And finally not to upload materials which demands security and copyright.

TABLE 22 – CULTURAL COLONIZATION COMPARISON

Serving as a resource	Serving as a resource
There is not such service	The students/instructors can obtain resources of any variety over the Internet that supports the teaching/learning process including course outlines, course descriptions, curriculum, teaching materials and programs of different universities. Journals and books are also available. They can use libraries of different universities

TABLE 23 – SERVING AS A RESOURCE COMPARISON

Team Problem solving	Team Problem solving
Even it lets interaction between students and instructor; and student to	It encourages team problem solving since it lets student to student discussion in real time and

students in class. There is not delayed discussion.	delayed time. They can discuss about the lecture, or about a specific topic or problem with each other or with instructors.
---	---

TABLE 24 – TEAM PROBLEM SOLVING COMPARISON

3.3.2.1 Others

As we discussed in the last chapter, non-interactive technologies are not recommended if there are possibilities to use interactive technologies that provides bi-directional flow of information, which is the base for education. However, the use of only interactive technologies seems not feasible. Therefore, Print, audiotape, CD ROM can be used as a support. But, videotapes is not recommended, this is so because this will discourage the exploitation of the existing computers in offices that are being used as word processors.

3.3.3 Decision

Even for familiarity, content requirements (in case of course that demands a great deal of demonstration like laboratory), and face to face communication videoconferencing is superior, it seems inferior to Web in the following:

- Cost and Affordability which is the issue in developing countries
- More access in term of transmission cost, reaching students, and space

- Letting students to study at their own appropriate time (on employment training) that is the aim of the proposed distance education and place.
 - Satisfying need of the nucleus
 - Gaining of technology experience which is critical for life after education
 - Serving as resource which is one of the problems of distance education
 - Encouraging life long learning,
 - Letting students to study according to their ability and learning styles, possibility to revise and update.
-
- Encouraging team problem solving.
 - Capability to perform most of the activities of distance education like admission, registration and material distribution.

Therefore, I recommend Web; and I suggest videoconferencing to wait until

- The college has a capacity to use it,
- Open branch campuses,
- Other colleges and civil services in regions be able to share,
- The relatively cheap technologies like Web to be tested and
- Course like engineering which demands a lot of laboratories to be started

Hence, in agreement or disagreement with the nucleus and or the consultant I have put my forward as follows.

- Web via Internet- in remote centers where there is Internet/telephone connection.
- Web via LAN (Intranet) to bring efficiency in the college

- Web via CD-ROM (Secondary Storage device) - for large files, video and for places where there is no telephone.
- Printed materials and audiotape -where there is no alternative.

CHAPTER FOUR

4 Web Based Technology

4.1 Web Based Education

There are different terms to express Web Based Education(WBE). Some of these are Web Based Instruction (WBI), Web Based Training (WBT), Internet Based Instruction (IBI), Internet Based Training (IBT) and Web Based Learning (WBL). However, there is no that much difference. For example Wild et al (1996) says WBL, IBI, WBI are the same. Moreover, McCormack and Jones (1998) say the use of computers and communication technologies in learning can be called Computer Mediated Communication (CMC), Computer Conferencing (CC), Online Learning (OL), and Internet Based Learning (IBL).

WBI is defined as follows by Khan (1997) as a hypermedia based instructional program which utilizes the attributes and resources of the Web to create a meaningful learning environment (Henke, 1997). WBT is also defined by Clark (1996) as Individualized instruction delivered over public or private networks and displayed by a Web browser (Henke, 1997). On the other hand Kilby (1997) differentiate WBT and IBT as WBT is training delivered using TCP/IP and HTTP; Internet Based Training (IBT) as training delved using TCP/IP, and not necessary HTTP.

CHAPTER FOUR

4 Web Based Technology

4.1 Web Based Education

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However, in this paper, Web Based Education is education (instruction, training, or learning) which utilizes the resources of Web and used to perform education-related tasks.

Web based education is not simply developing a Web page with links to other pages. It should consider motivating the learner, developed based on the what is required by learners, let interaction between student-students and student instructor, it should make the learner to actively involve, and it should guide and be able to give feedback (Ritchie, 1996; Wild, 1996).

4.2 Web

The Web/Internet is changing the business to e-business, and education to the Web based education (e-education). It is the hottest of all Internet services. No innovation in recent history has been received and widely implemented as the World Wide Web (Informix,1997).

4.2.1 What is Web?

The foundation blocks (characteristics) of Web are the three standards: Uniform Resource Locator (URL), HyperText Transfer Protocol (HTTP), and Hypertext Markup

Language (HTML) (Informix, 1997). These are used by browser to locate, transfer and display information, respectively.

4.2.1.1 Protocol

A protocol is a set of conventions or rules for how to communicate (Yeager & mcGarth, 1996). Every computer, browser, server should follow the protocol so that they can communicate with other computer browsers and servers. Several protocols are responsible for transmitting data across the Internet or Intranet. Of these the main are TCP/IP and HTTP.

TCP/IP which stands for Transmission control Protocol/Internet Protocol is composed of two protocols TCP and IP. IP takes care of (manages) the transfer of the data (packets). It transfers in pieces called packets. Each packet is encapsulated with an envelope of data describing where it came and where it wants to go. However, IP is not concerned with the order in which the packets will arrive at the destination, and doesn't guarantee the arrival of packets at the destination. This is the responsibility of TCP, that is, it manages the connection.

Moreover, application protocols like HTTP are required. HTTP is a set of rules that defines how Web browsers and servers communicate with each other over TCP/IP connection. The Web server programs and Web client programs must follow the rules of HTTP. Web browsers use HTTP as a primary communication protocol, however it can also understand other protocols (standards) like File Transfer Protocol (FTP).

4.2.1.2 HyperText Markup Language

Markup languages define areas of textual information by tagging them with specific format. Each browser interprets these tags. Although other markup languages like XML (Extended Markup Language) are coming, the HTML is the widely used and all browsers can interpret.

4.2.1.3 Unified Resource Locator

As e-mail has an address, the Web has an addressing mechanisms called URL. It uniquely identifies a document or a file regardless of the protocol. A single URL consists of three elements: the protocol to be used like HTTP, FTP; the server and Port to which it connects: and the file path. In short it will have this form "Protocol://Server_name[:port]/path", if no port is designated port 80 (Web service) is assumed (Informix, 1997).

Accordingly the Web browsers knows which protocol, from which server, and which file is to be dealt with by breaking the URL given into its components.

4.2.2 How the Web works?

4.2.2.1 Client

The term client sometimes refers to the Web browser, some times to the computer from a user side and to both. However, whether it is the software or the hardware, the duty of the client is to make request to the server.

4.2.2.2 Web Server

The term Web server sometimes refers to Web server software like Internet information server, sometimes the computer that serves the client, and sometimes both. The Web server receives a request sent from the client and sends a response back to the client. Additionally, it executes programs to dynamically access resources not in a Web server like databases.

4.2.2.3 Database Server

Many of the current applications on the Web are being served by flat file information systems. However, as the sophistication and complexity of the Web application increases, access to databases will be essential (Informix, 1997; Subrahmanian 1998).

4.2.3 Web Distribution Mechanisms

The Web can be distributed via Internet, Intranet and CD-ROMs.

4.2.3.1 Internet

Internet is defined by Dyson et al (1997) as a network of computer. They distinguish Internet from Web as Web can be taken as a movie and Internet as the hardware (and wires) that get the movie into your home or office.

Initially, before the introduction of Web in 1992, Internet was not convenient for use and popular since the content is put in different formats (Fuller & Pagan, 1997). Today the Internet has become convenient and widely in use and West (1997) states the popularity of the Internet saying, look in any news source today and you will find something about the Internet. Being the most rapidly growing of the Internet is the Web (Descy, 1995).

4.2.3.2 Intranet

To describe Intranet in term of Internet "Intranet is an Internet but in a company, in a specified area". It is a company wide Internet.

4.2.3.3 CD-ROM

We can access information from paper, CD-ROM or from online (a computer connected to telecommunication network). The advantage of online is that it can be updated rapidly. Moreover, CD-ROM distribution of information is less effective for the delivery of time critical information. However, CD-ROM is to the advantage for it can store much information in small size of media.

4.3 Web Based Education System Development approach

4.3.1 Introduction

For developing a Web based education system as an information system, any method, specially the popular ones like object Oriented Method, may be used but they are not proved to be best. For example, UML (Unified Modeling Language) which is a standard for Object Oriented approach is not proved whether it fits better than other methods.

In using Object oriented in general and UML in particular, there is no agreement whether a page should be taken as object? This is so because it arises questions like what will be the properties (fonts, tables, frames, text, control) and methods (can script be a method?) (Conallen, 1998). He continues and say, UML can be extended for Web development. However, he finally concludes by mentioning that the UML extensions for Web application are not developed.

However, in the development of Web based system, many methods specific to it are available. There are some commonalties like demanding the listing of goals/objectives before development of Web based. There are differences as well. For example, Sano's (1996) steps can be summarized as gathering background information, then identify goals/objectives, identify relevant information and activities, design structure and develop prototype. Buchanan et al (1997) put the steps as setting objectives, analyzing audiences, selecting appropriate content and choosing a promotional strategy. The steps

can also be put as design (determining the need to develop the system, analyze audience), development (creating content outline, review material, organize the content and develop the material) and evaluation and revision) (Idoha, -).

However, this paper used the method (steps) that has been proved by McCormack and Jones. This has been selected from the other specific methods for I strongly believed that it is appropriate for Web based system for education. For example, it recommends the analysis of components of distance education like college, subject, educator, student and technology before the development of the system.

4.3.2 Web Based Education System Development Steps

McCormack and Jones (1998) have provided the following steps for the Web-based development. These are analysis which focus on the analysis of critical components, planning which focus on the listing of objectives, and design of structures and content development. However, in this paper, it has been modified. It is detailed as follows.

4.3.2.1 Analysis

The analysis will provide much information needed to answer the questions that can be raised in the planing and designing. Hence, development begins by gathering information, without this the designer will not meet the needs (Sano, 1996). It is based on this information that a decision can be given to many values judgements. McCormack

and Jones focus on the analysis of the characteristics of critical components (college, educator, learner, field (subject), and technology) which highly affect the Web based education system. However, in this paper analysis means more than that includes identifying the problems of the existing system anticipated to be problems of the distance education, and identifying the activities, information need and problems in the distance education.

4.3.2.1.1 Anticipated Problems from The Existing On Campus Education

The distance education is not functional currently. However, the units like admission department and registrar, which are responsible for the on campus education, will be involved in the distance education as well, therefore, some of the problems of the existing system that are expected in the distance education are identified.

4.3.2.1.2 Analysis of activities, information needs and problems in the proposed DE

In this step, the activities in distance education, according to the proposal, are discussed and the possible problems are identified.

4.3.2.1.3 Analysis of Critical Components in DE

The characteristics of the critical components, that change the kind of the system, are important. This includes the characteristics of the college, the characteristics of educators in the college, the characteristics of the freshmen students who are more similar to the potential students, the fields (subjects) and the technologies in the college.

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4.3.2.2 Planning and Design

Planning and design, which are to be done after analysis, are used to identify a list of goals to be achieved, how to achieve them and designing the Web structures. Planning and design are not necessarily sequential. There may be a need to go back and forth as one becomes familiar with the use of a Web-based system (McCormick and Jones, 1998). Planning and design require a number of judgements based on the requirements and characteristics of the Web based system provided in the analysis step.

4.3.2.2.1 Planning

Planning helps to decide what is wanted to be done with the Web based system and how to be achieved. Good planning is essential to include the necessary requirements of user from the Web-based system. Designing a large-scale Web site requires thoughtful planning and refinement (Sano, 1996). McCormick and Jones (1998) forward three steps in planning. These are as follows:

- Develop a list of goals
- Identify how to achieve the goals
- Prioritize the list

4.3.2.2.1.1 List Goals

The first step in planning, according to the method selected, is listing the educational goals. Goals and objectives state the fundamental reasons for designing the system (Sano,

1996). He continues and say that clear objectives help to identify the relevant information and tasks.

While listing goals and objectives, McCormack and Jones advise to forget about the technology and practical considerations because it will help not to list only what is possible by Web. In developing a list one shouldn't try to complete the list in one sitting (coming back to process with a fresh mind can spark extra ideas), and one should not rely on the list created by himself but ask other people (McCormack and Jones, 1998).

4.3.2.2.1.2 Decide How to Perform

In this step, the move is from visionary to practical. This is the step in which we decide how to achieve the goals listed in the previous step. McCormack and Jones (1998) say that don't use the Web for every things.

4.3.2.2.1.3 Prioritize The List

It is always the case that there is no time or resources to implement all of the solutions the previous steps identified. Therefore, to rank or to prioritize the list helps to choose which should be implemented first. The list should make able to select the ones that are inexpensive in terms of time and resources and provide significant benefit to both staff and students (McCormack and Jones, 1998).

4.3.2.2.2 Design

Design of the Web based system helps to identify its structure. McCormack and Jones (1998) say that a good design provides the following:

- Attract visitors
- Continued use of the site
- Prevent the "lost in hyperspace" problem that is it helps uses (learners) know where they are and how to get to their desired destination.
- Facilitate expansion. (tend to grow with time)

Sano (1996) put it differently that an explicit structure (organizational framework) plays substantial role in the overall usability, efficiency, and usefulness of the Web site.

McCormack and Jones (1998) argue that if learners are required to perform the necessary tasks and access the information the information must be structured in logical and familiar manner. Moreover, Sano (1996) says that the Web designer is required to previsualize the Web site, organizing the information or activities into an obvious, navigable structures for the user.

McCormack and Jones (1998) say the Web site is combination of two structures:

1. **The presentation structure** which is the mental model of the Web based system formed by learner or visitors as they browse through the pages of the site. The

presentation becomes apparent to visitors as their Web browser and Web server translate the storage structure into presentation structure.

2. **The storage structure.** The storage structure is how the material (Web pages, files and so on) is actually stored on the disk.

4.3.2.2.2.1 Presentation Structure of The Web Based System

As indicated, the presentation structure defines how a visitor accesses and traverses the Web-based system. The presentation structure may be

- Hierarchical- structured in a way one element at a given level (not the end level) leads to other groups of elements as sub level
- Sequential- which makes possible to move through a number of pages one after the other, by the use of next and previous icons. Like a book
- Hypermedia- a structure which allows the visitors to follow links that may lead to multitude of pages. This structure is based on links.

These structures can be found in a single set of pages.

4.3.2.2.2.2 Storage Structure of The Web Based System

McCormack and Jones say that it is not necessary for the storage and presentation structures of a Web site to be similar. Moreover, they claim that grouping related elements and balancing breadth (which complicate navigation) and depth (which force

user to follow many links to get information) will reduce the effort required of visitors and people who maintain.

4.3.2.2.2.1 Database

Database is not necessarily required in a Web site. Therefore this step is optional in the development of Web site. However, a Web-based education demands the features of database. Therefore, although this step can be taken as a last part of storage structures, in this paper it will stand by itself.

4.3.2.3 Prototype Development

4.3.2.3.1 Design Page Layout (appearance)

With a good list of goal which helps in identifying the relevant information and tasks (which in turn determines the available links), and good structure of information and activities of the Web site, the needs of the visitors will not be met. This is so because there is still one thing which can make tasks difficult to perform. That one thing is the appearance of the interface. McCormack and Jones recommend that a well-designed interface makes navigation easier, motivates and attracts students.

In this step pages will be identified along with its functionality, content, controls and cross-links.

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4.3.2.3.2 How The Prototype Works

The designed or developed system is not final, therefore, it needs to be tested by actual users. For this purpose, at the end the prototype will be demonstrated to users for feedback.

4.3.3 Web Application Development Tools

The tools needed for static Web site is an HTML converter like Microsoft Front Pages, even Microsoft Word. In this paper the Microsoft Front Page is used as HTML converter or editor. However the need of the prototype is more than that, that is, more than static pages. It accesses databases from Microsoft Access.

The foundation of Web database integration is the Common Gateway Interface (CGI). However, to make life easier, several Web database integration products became available. One example is the Visual InterDev which supports scripting (client side and server side) in VBscript and Jscript. Therefore, Visual InterDev is used in the development.

Visual InterDev is used to build complex and intensive Web client/server applications. And it aims at Web database applications. It has enables to access a database from Microsoft access. It supports building server side applications using Active Server Pages (ASP, which are new features of MS IIS 3.0). ASP is used for developing a Web

interface to a database. ActiveX data objects enables linking of a database to an ASP Web pages to access and manipulate data.

The development tool runs on Windows 95 and Windows NT workstations. The project, while development, is stored on Microsoft personal Web server running on Windows 95.

4.3.4 Design Considerations

There are many things to be considered while we are designing or developing Web based system in general and Web based education system in particular.

- A Web site has to be consistent. Wild variations in size, shape, color and positioning of essential elements within the same level disrupts users ability to perceive logical relationships within the structure. (Sano, 1996; Descy, 1997).
- Sites that are easy to navigate, and support a range of activities (chat, forums, etc.) will be used more than those that are not. However, an attempt to provide more functionality than is needed (and unrelated to the task compromises usability (Sano, 1996). Similarly, overusing links inhibit usability by requiring the user to traverse too many levels for needed information (Sano, 1996).
- Content should be broken into smaller units of related content so that it can facilitate rapid scanability, with access to greater detail if required; and users should be informed if they encounter a problem, how to remedy the situation (Sano, 1996, Nielsen, 1999). Nielsen (1999) says more than 90% of users used not to scroll

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navigation pages by simply pick form the visible options. Similarly, Horton (1997) suggest that make the page free standing unlike book pages, and avoid dead pages (with no links). Gregory & Brown (1997) also advise that Home pages should contain only information common to all/almost all users. Assign a meaningful title to home pages and links.

- Preparing content for distribution on the Web involves issues such as access control, charging for information, and copyright infringement (Sano, 1996). Therefore, it is not wise to publish any material if the author is not willing to distribute (Michigan, 1996). On the other hand Descy advises that put copyright notice on the Web pages.
- West (1997) say that the Webs site should have good appearance (contrasting color, fancy fonts, etc). Visual learners needs lots of graphics illustrations (Tim, 1997). However, Internet transmission capacity is not to the extent needed, especially connection with modem below 14.4 is nearly useless, therefore much care should be taken in using graphics, images and reduce colors in graphics (Sano, 1996). Gregory & Brown (1997) advise to keep graphics small.
- Some operations are processed at the client computer, therefore it is important to test Web pages on a less powerful computers (Sano, 1996). For example, the monitor can alter the visual appearance of Web pages and different browsers offer dramatic differences in page presentation (Sano, 1996).
- Test your designs on real users (Tim, 1997).

Therefore care must be taken to reduce or solve the above problems.

CHAPTER FIVE

5 Analysis of ECSC Distance Education

5.1 Introduction

In this chapter the problems of the existing system will be discussed first followed by the activities/information need in the distance education. And finally, the characteristics of the critical components of distance education will be discussed.

5.2 Problems From The Existing On Campus Education

The existing system has many problems. Listing all is difficult. However some attempt has been done to identify problems which can be expected to be problems in distance education unless some proper system is implemented. Specially, in areas like admission and registration, the departments are to be involved in the distance education, therefore, their problems will increase as the number of students increase because of distance education.

5.2.1 Admission Department

- Filling of paper form has resulted in incomplete information, unclear information, the filling of forms in languages other than English,

- Late arrival of application form resulted in rejection of students from sitting for the entrance examination.
- The entrance examination is costly, for at least three instructors goes to the regions for administrating the examination and students come to regional towns.
- Manual correction makes timely selection of applicants difficult
- The manual selection of the applicants by regions and admission department is not proved to be out of bias.
- Reporting the applicants to the college, and reporting the selected students by the college to regions/students take much time.
- Movement of examination was not free of risk like missing, illegal acts

5.2.2 Regional Centers

- The regions sometimes couldn't get the information about the applicant on time. Therefore regions will be forced to select from the available applicants who don't qualify the criteria of the college.
- The regional centers don't get complete information from applicants (for it is paper and don't force the application to complete the information), as a result the selection will not always be correct.
- The screen out by regional government takes time and much effort, and it is difficult to prove it is free of bias.
- It was difficult for regions to match the field of study with their need which result from not having time for this process.

- From the experience, all recommended students will not sit for the entrance examination which is partly because of communication problem.
- Applicants of some regions don't have orientation that how they should get prepared for the examination. As a result, the result of applicants of specific regions will be high and of the others low.
- Regions want to give another examination which help them select the appropriate students to sit for the entrance examination, however, they could not do it as it is difficult and time taking to handle. Some regions like regions 3 (Amhara) has tried it, and they found it difficult.

5.2.3 Registrar Department

- It is not unusual to get incomplete and unclear registration form. There are also cases that students don't arrive on time.
- The registrar is performing actions like registration for courses, status change of students, grade computation, add/drop courses, dismissal, withdrawals, graduation process manually. As a result, it is late to produce statistical reports, transcripts, diplomas, letters of recommendations, grade reports, producing list of graduates and decisions.
- Moreover, mistakes in grade computation, graduation, add/drop courses are understood. Taking course without taking prerequisite course is also common problem

- Retrieving specific information from the traditional file system is difficult. This will increase as the distance education begins.
- The registrar is investing much effort than needed had a computerized system existed.

5.2.4 Nucleus Problems/ Anticipated Problems

- The nucleus has anticipated almost all the problems of the admission and registration
- The same problems could be expected in its student record department
- Employees has not information about the distance education like when it will be started as a result they will not get ready.

And the following section has tried to discuss more on this.

5.3 Activities, Information Needs & Problems in the DE

The following activities/information need in the Ethiopian Civil Service College distance education proposal have been found through document analysis of the nucleus, discussion with the members of the nucleus, registrar, admission people, management and my experience.

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5.3.1 Admission and Registration

5.3.1.1 Application

1. Students fill application forms which includes name, zone, organization, address, field of study, experience in work. Along with the applicants are required to submit photos, high school transcript.
2. The complete application form will be submitted to the regional center
3. Region center submit the applications forms to the region that is responsible for screening.

5.3.1.2 First Screening

1. The region (responsible body) select students based according the quota given to each region. However, the criteria used by regions are not clear and standard.
2. The regional centers receive the list of students recommended by the region and check the applicants for academic criteria of the college like grade 12 complete.
3. The Admission department gives an ID-card which is to be used to take the entrance examination.

5.3.1.3 Entrance Examination

1. Admission department sends instructors to administer the entrance examination to each region for the students who fulfill the regional requirements, and regional center requirements.

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2. The examination then will be brought to the admission department for correction and admission department with the help of instructors correct examination.
3. The applicants along with their exams will be listed in order of their result for the second screed out based on the result of the applicant.

5.3.1.4 Second Screening

1. The admission then screen out based on the result of the examination.
2. The admission department reports the list to registrar department of the college so that the registrar knows who are going to be registered.
3. Similarly, the admitted students know if they are admitted distance education-regional services-remote centers so that they can register.

5.3.1.5 First Registration

1. Students fill registration form in the regional centers. And regional centers send the filled information to registrar for approval.
2. And finally the registrar provides the list to the student record.

5.3.1.6 Course Registration

1. Students process course registration in the regional centers. The form includes the course they are taking, the credit hours, and a signature.
2. Regional centers report to the registrar/student record of distance education via the regional services.

Comment / Problem

1. Applicants/learners are required to come to the regional center at least to take examination and at most to apply, and for registration. This will take much of their time, they will be displaced from their organization/offices which contradicts the purpose of distance education. It is costly for students/applicants to come to the region. Applicants/learners may send the application form and registration form, and slip to the region but there may be delay which leads to the rejection of the student.
2. The manual screen out (selection) by the regional governments, regional centers, and admission departments leads to bias, mistake and delay, and takes much effort.
3. Filling application form, registration form, slip on paper may result in incomplete and unclear information.
4. The cost transportation and other costs of investigators and students, cost for paper examination, manual correction and manual reporting of results is costly, takes much time, and mistake. Moreover the accumulation of exam paper may lead next applicants to practice the examination that study other materials. The paper examination may be missed. It may be difficult to handle as the number of applicants increases.
5. Communication between regional centers and registrar, regional centers and admission, and regional centers the distance education faculty takes time.

5.3.2 Material Distribution

To distribute materials from the warehouse of the distance education faculty to students at remote locations.

How

1. The operations department provides the material to the regional services department of the distance education faculty.
2. The regional services of the distance education faculty take the material to regional centers.
3. And the material will be distributed to the students via the remote centers.

Comment/ Problem

1. No other distribution media like Internet, CD-ROM, etc are considered.
2. To know whether the material is reached will be delayed.
3. Material distribution will be late.
4. Since add/drop is high in distance education, the number of students changes from time to time, therefore the need to know the exact number of students every time is important. However, via postage this will be difficult. As a result, material misallocation is expected.
5. Distribution of outdated materials

5.3.3 Core activities

5.3.3.1 Interaction with Course Coordinators

It has not considered interaction between instructor and the student. Other possibilities are not as well be considered like slides and audio combinations.

5.3.3.2 Tutoring

Helping students in case they need help

How

1. Regional centers hire tutors with the required qualification
2. Tutors and students meet at the local centers (per month) for questions and answering purpose

Comment

1. The tutors with the required qualification may not be found
2. The tutors may not go according to the instructor who prepared the material, the examination,
3. And it is costly.

Comment / Problem

1. The assessment is limited to three assignments and one final examination to be held at the regional centers. However, the number of examination is decreased due to fear of manual handling of the assessment.
2. Like in the case of entrance examination, the examination is expected to be costly, takes much time, and mistake, accumulation of exam paper may lead next applicants to practice the examination that study other materials, the exam may be missed and difficult to handle as the number of students increases.
3. The assignment is prepared by instructor and corrected by different tutors. Which leads to unfair grades correction differs form tutor to tutor. Moreover the transfer of results of assignment is manual, therefore, takes time.
4. Students will be forced to come to the regional centers to take examinations.

5.3.5 Grade point Average (GPA) processing

To process the GPA of students

How

1. Results of assignment from regions and the result of the examination will be added and graded.
2. The GPA will be sent to the registrar for future storage and so that the registrar take action based on the rules and regulations of the college like warning, dismissal. It will also be stored in regional centers.

Comment / Problem

1. Grades will be stored in three places: in the registrar, in the regional centers, and in the student record of the distance education. This may be good for cross check but takes much space.
2. If wrong grade (which may happen for manual processing) is given to the student, to change the grade which probably initiated by the distance student takes time.

5.3.6 Outing

5.3.6.1 Dismissal

1. The Registrar checks the CGPAs of students for 1.5 at the end of the semester and a minimum of 2.00 at the end of a year
 2. Move the file of the student to dead file
 3. Send a report to the student record/regional center
-

5.3.6.2 Withdrawal

1. Students apply to the regional centers
2. Regional services report to the registrar
3. Registrar takes action and send a report to the regional center/student.

5.3.6.3 Graduation

1. Registrar screen out prospective graduates
2. Report to the senate for approval
3. Process transcript, diplomas and transfer the file to dead file

Comment / problem

As we can learn from the existing on campus education.

1. Action will be late. For example graduation may be postponed, students may be late to get information like warning.
2. May be wrong. For example a student may be graduated without necessary course completion, number of credit hours
3. Much effort is needed

5.3.7 Others

However, in the case of the following, there are clear procedures. Therefore I could not found enough information.

- Readmission (regional service, or registrar or distance education's student record)
- Course add/drop (regional service, or registrar or distance education's student record)
- Financial processing (in and out)
- Information provision (through public relation of the college or the DE)

5.4 Analysis of the Critical Components

5.4.1 College

⇒ Future Direction

As per of discussion with management, the future direction of the college is to bring the balanced development in regions. Since this paper contributes to this I strongly believe the college will support the implementation of the Web based education system.

⇒ Infrastructure and Funding

The college has 15 computer connected to the Internet. Moreover, according to the proposal of the nucleus, it has been allocated .5 million Birr for computer purchase. Moreover, donors like World Bank which set up the videoconferencing in the college likely to donate for computer purchase.

⇒ Workload

The on campus method for calculating staff workload of the college will not adapt to the Web-based education system. For example education task change from that of a verbal information distribution mechanisms (give lectures) to that of using personal communication to urge and guide the students to understanding. If the college is to continue to calculate in term of numbers of lectures and tutors the instructors will be disadvantaged. And the distance education will not be successful. However, the management of the college expressed that it is possible to change the workload

calculation so that to include the instructors time spend in interaction with each distance student.

⇒ Administration Policies and Procedures

The administrative policies and procedures don't fit the Web-based education system. The student fees of the college is 50% of their salary, however, in the new system should be based on the Internet use, etc.

⇒ Internet Access Policies

The college don't have Internet access policy that clearly specifies who can access the Internet (for the time being academics, what about students on campus and distant), what they can access, and who pays for the service.

5.4.2 Subject

The fields to be given are law, accounting and management. What seems difficult via WBE is laboratory.

⇒ Laboratory

Computer and English need laboratory. The distance education haven't decided how it is going to be done. English lab can be done since there are audio materials in the distance education kit. The problem here is the availability of audio player. It is estimated that since these people are all salaried the problem will not be worse. The problem is with

computer laboratory. It cannot be done without computers at site. It seems for this purpose that computers are to be purchased. Once computers are available there, decision is required whether instructors can go there, or partimers can be hired or facilitators can teach the computer which include how to use the Internet, Web based education system, which is to be given as a prerequisite.

5.4.3 Educators/ Instructor

⇒ Instructors/tutors/facilitators

According to the proposal there is a plan to hire tutors in every local centers. The proposal also indicates that there will not be qualified tutor in local centers.

This paper proposes that the facilitators with information technology specially with Internet knowledge should be hired instead of administrative personnel in the local centers, and not to hire tutors in local centers where there is Internet connectivity because the students can interact with the instructor at the college who is qualified, with experience, who developed the material, who prepare the examination, and who is to evaluate them.

Although there may some resistance by instructors for it needs additional time, effort and training, the opposition may be lower since almost all academic staff is familiar (using the Internet). But it needs further training so that the academic can appreciate and don't

commit themselves to print materials more and be skillful. In August there will be computer training for the instructors as planned by the computer department which can be taken as part of this.

⇒ Experience

Most of the instructors have experience in teaching the proposed courses at a degree level and in preparing teaching materials for the newly started development administration. Therefore, if they get training in how to prepare materials for the Web based education format, it is clear that it will not be difficult for them to prepare. The distance education has also one division "converters" which help instructors how to prepare, or they themselves will convert the material in a way which is appropriate for Web based education format.

⇒ Ability

The Web-based education emphasizes on interaction. Therefore, it is impossible to hide a lack of knowledge in a subject area. However, the instructors of accounting, management, and law have experience in teaching these fields at a degree level, therefore it is not expected that they will have knowledge gap to teach at a lower level, that is at a diploma level. Moreover, they are qualified with M.A or M.Sc, with few B.Sc or B.A. holders. For further information see appendix 1.

⇒ Time of Teaching Staff

Much time is not required once the instructors have thought the courses in traditional education. The instructors that teach 12 hrs /week (the maximum load) is rare. As a result, the instructors of the college teach in different institutions like Addis Ababa University (AAU) and Addis Ababa Commercial College (AACC) as parttimers. Therefore, if enough incentive is given to them time is not a problem.

5.4.4 Student

⇒ Skill

The prospective students are civil servants, hence they are old with experience with the traditional education system. It is believed that older students take longer time to adapt to a new technology. Although there is some belief that they may have some computer experience at their office, it is not common to all. Therefore skill of the students to use the Web-based education is really a problem.

However, if the computer course is given as a prerequisite to the program, and facilitator with enough knowledge is there, the problem will reduced as time goes.

⇒ Language

The first languages of the students is different form the language of instruction. This will remain to be a problem.

⇒ Physical Disabilities

There is no figure which indicate that there are some people with physical disabilities like color bindness. But if there are they will use the print or audio.

5.4.5 Technologies

⇒ Client Software and Hardware

As indicated previously, there are 15 computers connected to the Internet. The client computers don't have CD-ROM but they can be upgraded because the distribution through only Internet is not wise for price and speed. The memory, CPU, harddisk, graphics resolution, available colors are proved to be enough.

The operating system at the college is Windows 3.11, windows 95, windows NT. In the college Internet explorer, Netscape navigator, Microsoft office are highly dominant.

While there are printers, there are no scanners, video cameras, CD-writers.

⇒ The server

There is no Web server in the college. However, Web server that provides mailing lists, Web pages, and authentication is required.

⇒ Time of Teaching Staff

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CHAPTER SIX

6 Planning and Design

6.1 Planning

6.1.1 Listing Goal and Objectives

Objectives arise from problems (Michigan, 1996). Accordingly my objective to design the Web-based system is to solve the problems indicated previously and possibility to enhance the distance education process. Therefore, this objective can be detailed in many specific objectives as found in the analysis:

1. To provide information about the distance education which may be needed by students, applicants, remote centers, the college management and the distance education itself, instructors of the college.
2. To reduce the problems that arises from filling paper application form, registration form, and slip like incomplete information, unclear information, and to force students use the one language to fill these forms. As a result, to reduce the problems of manual checking and wrong decision based on unsatisfactory information.

3. To reduce rejection of some applicants who are late to send their application form to regional centers / admission department and to reduce the problem of late registration or rejection.

4. The entrance examination is costly for at least three instructors goes to the regions for administrating the examination and students comes to the regional towns. Therefore, to decrease the cost of the entrance examination like cost for the paper examination, transportation for invigilators and students, manual correction.
Moreover, to avoid the risk attached like missing examination papers and to reduce the delay and effort needed.

5. To make the selection of applicants out of bias; and to reduce the time, cost, and effort needed in selection.

6. To help students get ready for entrance examination. And at the same time, to avoid the over accumulation of examination papers.

7. To avoid the coming of students to regional towns to take entrance examination that is costly and hurts their job.

8. To make regions prepare their own pre-entrance examination before selecting applicants to sit for entrance examination of the college.

9. To solve the problem which is anticipated by the nucleus like lack of qualified tutors. To allow students interact with course coordinators. To let student to student and student to instructor interaction. Hence, avoid the feeling of isolation.
10. To avoid the delay in distribution, to make the distance education faculty know exactly the number of materials to be sent, and avoid material misallocation.
11. To make students get updated materials.
12. To let self directed learning. To make students study at their own preferred time and place.
13. To reduce problems related to assessment like limiting assessment to three assignments and one examination for fear of manual handling. To reducing the effort and cost needed in assessment and the risk. To avoid delay in assessment (examination, test, assignment).
14. To provide students test their understanding. To avoid unfair grades which can come as a result of correction by different tutors.
15. To make results reach the college on time and to automate grade processing. Grade related information will be stored in three places, therefore, to reduce the space needed to store the grade related information of the students.

16. To reduce the effort needed to perform activities in the registrar department, and other departments that will be involved in the distance education.
17. To reduce late decision and services (graduation, withdrawal, and dismissal, readmission, preparation of statistical data, and course add/drop) in the registrar department, and other departments that will be involved in the distance education.
18. To reduce mistakes like taking a course without taking a prerequisite, wrong GPA, wrong actions like graduation with out taking the necessary course.
19. To make able the transfer of time critical information between/among students/applicants, distance education faculty, registrar, admission, and management.
20. Reuse material that is already created like past assignments/exams, and teaching materials development by other.
21. To reduce the difference between on campus and distance students. To search the best method for resource (library), laboratory, etc.
22. To bring overall performance efficiency in the college which also help enhance the on campus education.

6.1.2 Decide How to Perform

It is important to match the solutions with the objectives (Michigan, 1996). The following are, therefore, an attempt to achieve the above objectives.

6.1.2.1 Developing Internet Based System

The system will do the following by:

1. Posting **Information page** which leads to pages which contains information about
 - the distance education which may be needed by bodies concerned with the distance education, this may include academic calendar, the programs given in the distance education, the plan of the distance education, the available departments in the distance education and their duties and e-mail address,
 - the registrar, procedures for withdrawal, graduation, e-mail address for the registrar,
 - the admission, procedures for admission, e-mail address for the admission department, and
 - the college at large.
 - the course like in which term the course is given.
 - the course coordinators like backgrounds
2. Posting **Applicants page** for the applicants which leads to get apply, to take entrance examination, to check if he/she is admitted, to get register, and to fill slip.

3. Posting **Application form** on the Web/Internet for applicants. Attaching the necessary database (application) to store information about applicants to be used by regional government and regional center for validation and recommendation; for the admission department to know the exact number students to sit for the exam in each region, to give password, and later to put results of the entrance examination, and select the appropriate students.
4. Posting an interface to the admission department (**Admission page**) so the department can enter password for the checked/recommended applicants, enter the result of entrance examination of the applicants, and select some applicants from the applicants according to their results (from application database).
5. Putting the **Entrance Examination** with necessary database for applicants with password from the admission department.
6. Posting the **Registration Form** and **Registration Slip** on the Web/Internet for the students. Attaching the necessary database which is to be used by the registrar department, remote centers and the student record section of the distance education to know the students who are registered.
7. Posting an interface for the remote centers (**Remote page**) so that it can enter the results of assessment (not online).

8. Posting an interface for the student record (**Student Record page**) which will be used to enter results and the necessary database which contains the results of students to be used for grading.
9. Posting an interface for students (**Student-in-class page**) which leads the students to Assessment (past examinations, assignments, self check quizzes), Frequently Asked Questions, Resources, and course online (audio and lecture notes) and Interaction.
10. Delivering all material on the Web (**Resource page**). Materials can be placed online via the Web, to make materials reach on time. To put resources (references) on the Web and to link students to other sources until the time comes to put the books in the Internet (the college's library on Internet).
11. To design the course online (**Course Online page**), that is to put lecture notes on line with audio.
12. To post an **Interaction page** on the Web so that students can interact with their instructors and other students which lets students ask questions to the course coordinator (instructor) and other students. This lets the instructor know the performance of students. In this case Instructors may be busy.

13. Putting **Assessment pages** which leads to Web based examination/quizzes /assignments. Self-check exams ,which help students to know where they are, will be posted. And putting past examinations and assignments (but controlled) so that students can know what is required in specific course will be essential.
14. Developing frequently asked questions (FAQs) (**FAQ page**) to avoid students asking of the same question repeatedly. This will save instructors form being asked the same question twice or more.

15. Posting an interface for students (**Student out class page**) which leads to withdrawal form, readmission form, course registration form, add/drop form and show me result.
16. Finally Posting **Server Units Page**, through which the following goes to their pages: the admission department goes to **Admission page**, the Registrar goes to the **Registrar page** with which it can get list of admitted students and registered students, the distance education (student record) goes to its page, the Remote Centers goes to **Remote Page**, Regional government goes to **Region page** with which they recommend a student, and Instructor goes to **Instructor page** where he/she creates examination.

6.1.2.2 Developing Intranet Based System

17. The above uses Web via Internet. However, the Intranet system is also required as a support for the services given via Internet. For example, automating the registrar

activities: graduation process (check the students for completing the required course, credit hours, no F grade), producing statistical data (Students graduated, dismissed, withdrawn), withdrawal process (the system checks for rules of the college and decides), readmission process (to check for course given in the next term so that the student can be readmitted), and Course add/drop process (the system decides based the course given in the term, etc).

In short, the system will incorporate system of each department in the college and lets each department to communicate one another internally.

6.1.2.3 Preparing CD-ROM

18. The large files, video cannot be transmitted to the distance education via the Internet, moreover, it is not difficult to say there are students with no Internet access, therefore, CD-ROM is going to be used for those with computer access.

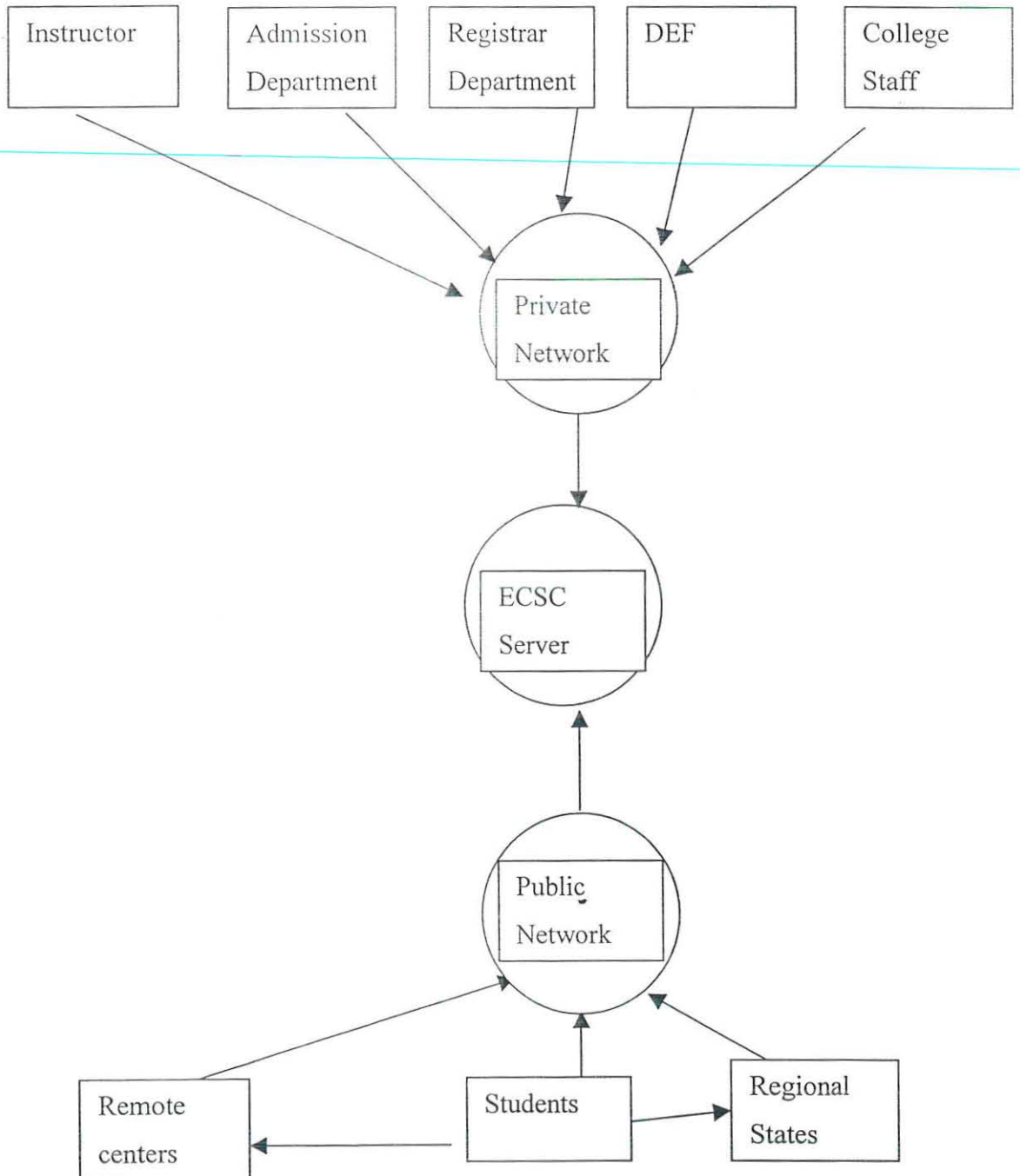
6.1.2.4 Face to Face

19. All the three could not do things like laboratory, therefore, face to face communication is also in need.

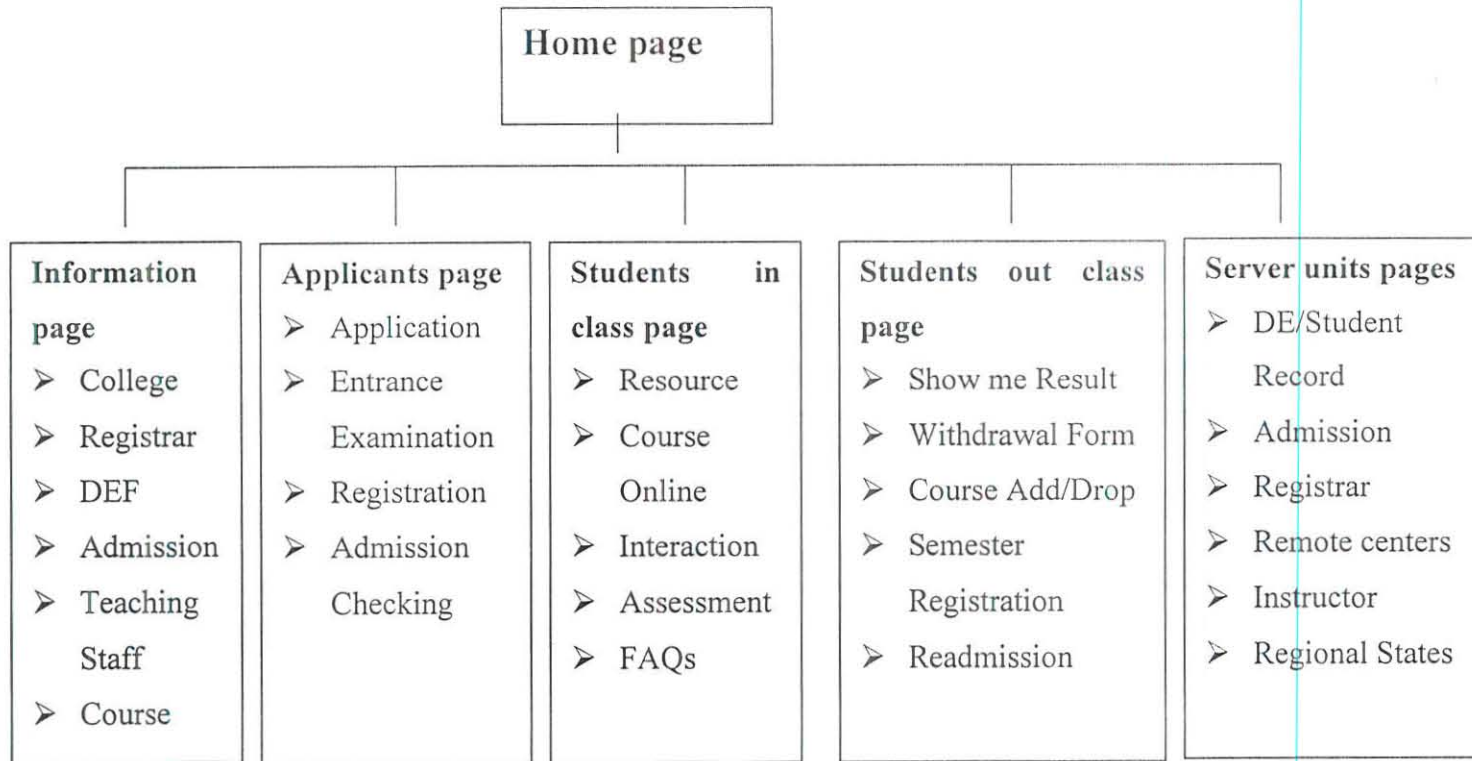
6.2 Design

6.2.1 Diagrammatical Overview of The System

Figure 2 – Diagrammatical overview of the system.



6.2.2 Design of Presentation Structure



6.2.3 Deign of Storage Structure

6.2.3.1 Files and databases required

The required files and databases are as follows:

First Level	Second Level	Files	Database (table/view)
	Information Page	Information.htm, College.htm, registrar info.htm, The distance Education.htm, Amission info.htm, The Teaching taff.htm	-
	Applicants page	Applicants.htm,application.asp, Ent_Exams.htm, English_Ent.asp, law_ent.asp, math_ent.asp, man_ent.asp, registration.asp.	Application Ent_Exam Registration Regionalview Admissionview Admittedview Registeredview
Home Page	Students In Class page	Studentsinclass.htm,CoursesList1.htm, CoursesList2.htm,CoursesList3.htm, CoursesList4.htm, CoursesList5.htm, course online.htm, lecturenotes.htm, Audio.htm,	Examination

		slide1.htm,slide1.htm, slide2.htm,Slide3.htm, slide4.htm,slide5.htm,Slide6.htm,Resource.htm,Frame1.htm,Frame1.htm,book1.htm, hapter1.htm, subsectionioin.htm, chapter-book1, subsection2.htm,section-amharic.htm, Exam.asp, Interaction.htm, Assessment.htm, FAQs.htm,	
	Students Out	Students out class.htm, semi-registration.asp,	Semi-
	Class Page	course-add-drop.asp, result.asp, withdrawal.asp, readmission.asp.	registration, course-add-drop, record-result, withdrawal, readmission.
	Server Unit Page	Server units.htm, admissiond.htm, registrarD.htm, DEF.htm, Instructor.htm, region.htm, remote.htm,	Application Ent_Exam Registration Student Result Examination

TABLE 25– FILES AND DATABASES REQUIRED FOR THE WEB BASED EDUCATION SYSTEM

The databases are detailed as follows:

		slide1.htm,slide1.htm, slide2.htm,Slide3.htm, slide4.htm,slide5.htm,Slide6.htm,Resource.htm,Frame1.htm,Frame1.htm,book1.htm, hapter1.htm, subsectionoin.htm, chapter-book1, subsection2.htm,section-amharic.htm, Exam.asp, Interaction.htm, Assessment.htm, FAQs.htm,	
	Students Out	Students out class.htm, semi-registration.asp,	Semi-
	Class Page	course-add-drop.asp, result.asp, withdrawal.asp, readmission.asp.	registration, course-add-drop, record-result, withdrawal, readmission.
	Server Unit Page	Server units.htm, admissiond.htm, registrarD.htm, DEF.htm, Instructor.htm, region.htm, remote.htm,	Application Ent_Exam Registration Student Result Examination

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Students Out	Students out class.htm, semi-registration.asp,	Semi-
Class Page	course-add-drop.asp, result.asp, withdrawal.asp, readmission.asp.	registration, course-add-drop, record-result, withdrawal, readmission.
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Students Out	Students out class.htm, semi-registration.asp,	Semi-
Class Page	course-add-drop.asp, result.asp, withdrawal.asp, readmission.asp.	registration, course-add-drop, record-result, withdrawal, readmission.
Server Unit Page	Server units.htm, admissiond.htm, registrarD.htm, DEF.htm, Instructor.htm, region.htm, remote.htm,	Application Ent_Exam Registration Student Result Examination

TABLE 25– FILES AND DATABASES REQUIRED FOR THE WEB BASED EDUCATION SYSTEM

The databases are detailed as follows:

Application

Name	Age	Sex	Grade	F_Study
Region	Zone	Wereda	Organization	Telephone
Exam_ID	Passed	Password	Checked	recommended

Registration

Name	Age	Sex	F_Study	Mar_Status	Nationality
Disability	Region	Zone	Organization	Telephone	E_mail
Student_ID	Password				

Examination

Questions	Choices	Chosen Answer	Right Answer
-----------	---------	---------------	--------------

Semi Registration

ID_num	Course#	Credit hrs	Term	Password
--------	---------	------------	------	----------

Result-record

Course#	Result	Outof	Id_num
---------	--------	-------	--------

Withdrawal

Name	Student_id	Reason for	Year	F_study	decision
------	------------	------------	------	---------	----------

Readmission

Name	Student_id	Year	F_study	Decision
------	------------	------	---------	----------

Course-Add-Drop

Name	Student_id	Year	F_study	CourseAdded	CourseDropped	Decision
------	------------	------	---------	-------------	---------------	----------

6.2.3.2 Structure of the storage database

The storage structure of the system is similar to the presentation structure. However, the storage structure includes some databases, sound files and image files that are to be put in three directories: data, sound and image.

CHAPTER SEVEN

7 Development of Prototype

7.1 Introduction

The prototype is mainly based on what is common to all learners (that learners via Internet). These are

- Providing Information and Letting students Apply, take entrance examination and registered;
- Providing services that a student expects in class like online lecturing, resources, Assessment, and Frequently asked questions
- Out class services that includes course add/drop, semester registration, filling withdrawal form, readmission, display result; and
- Providing services for servers like instructor, Distance Education (Student Record), Admission department, registrar department, regional states and remote centers.

7.2 The Pages in The Web Site

7.2.1 The Home Page

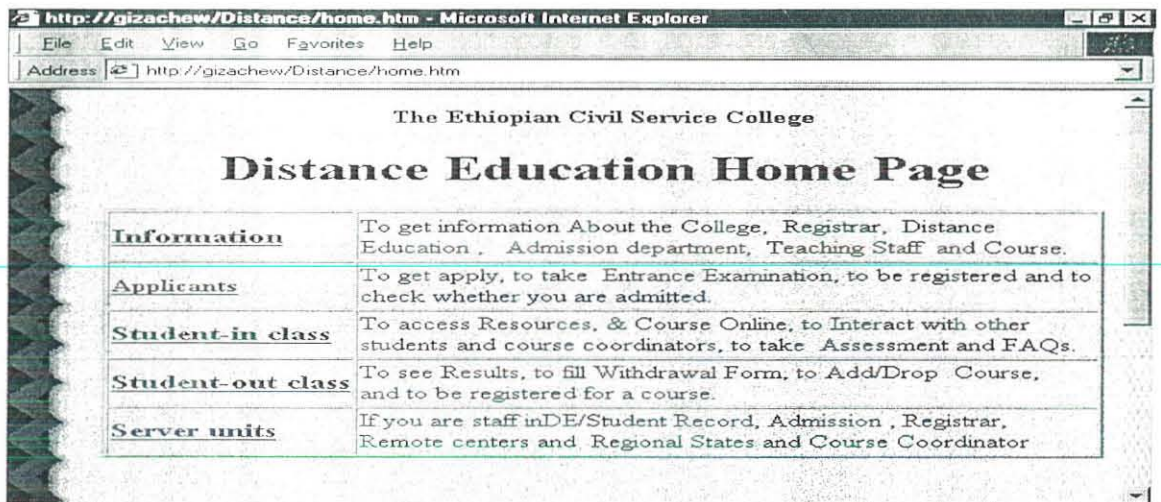


Figure 4 – Home page

7.2.2 Information page

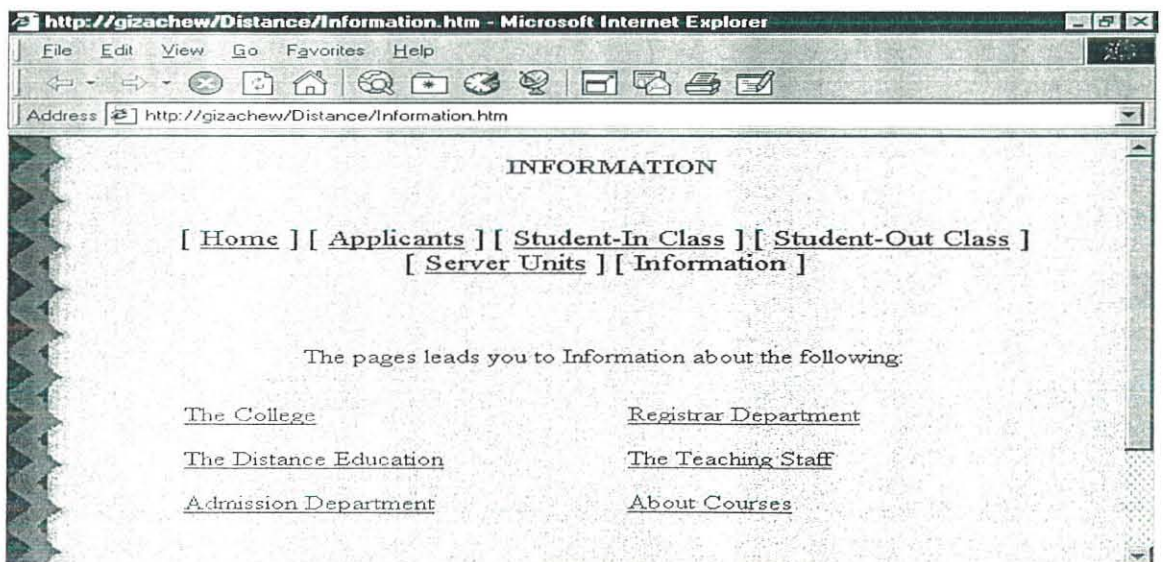


Figure 5 – Information page

7.2.3 Applicants page

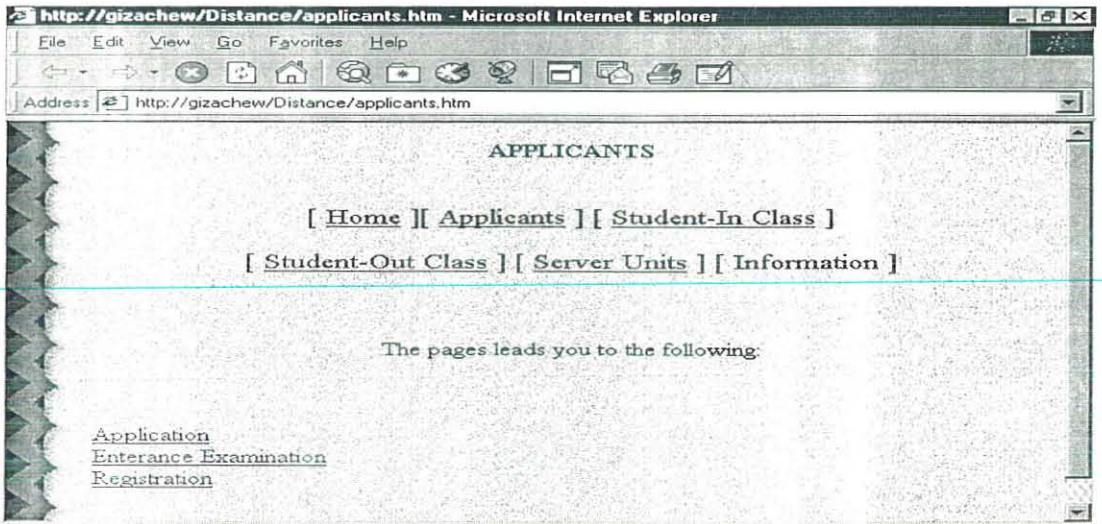


Figure 6 – Applicants page

7.2.4 Student In Class page

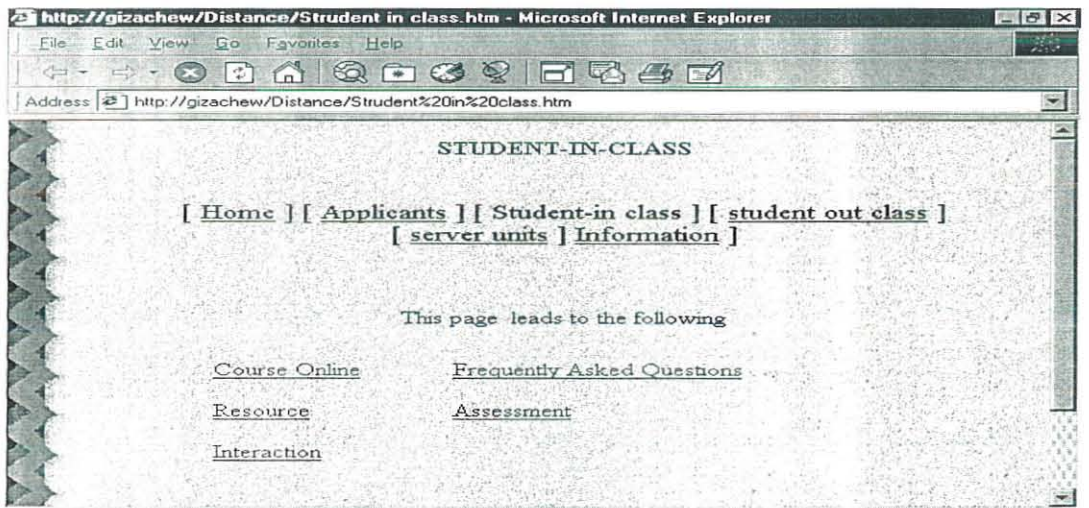


Figure 7 – Student in class page

7.2.5 Student Out Class Page

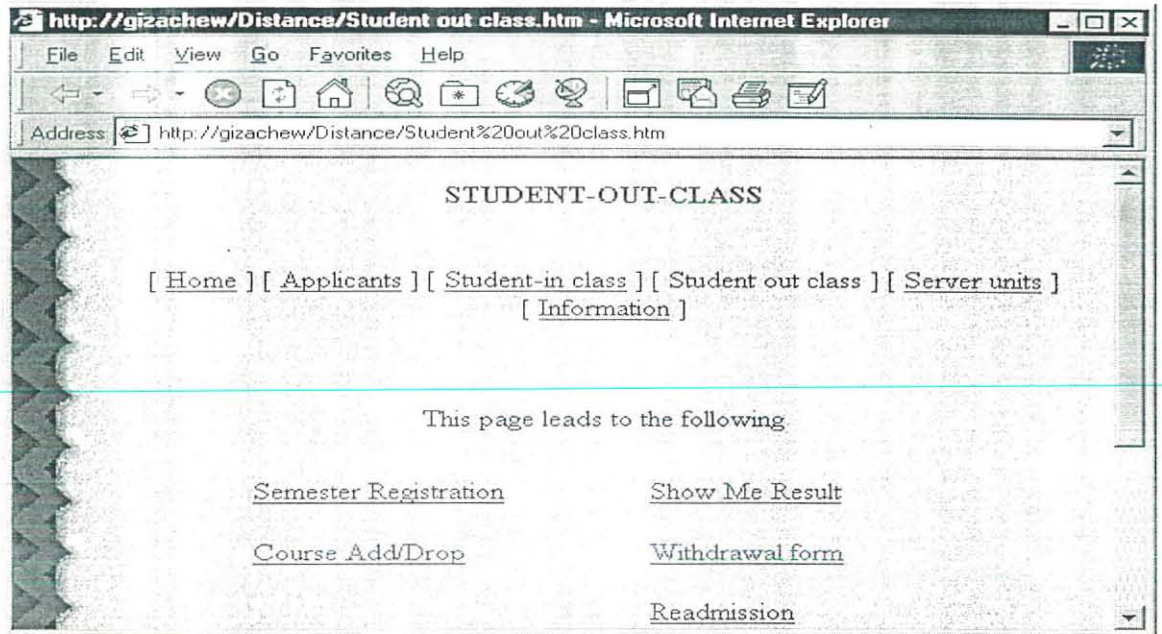


Figure 7 – Student out class page

7.2.6 Server Units page

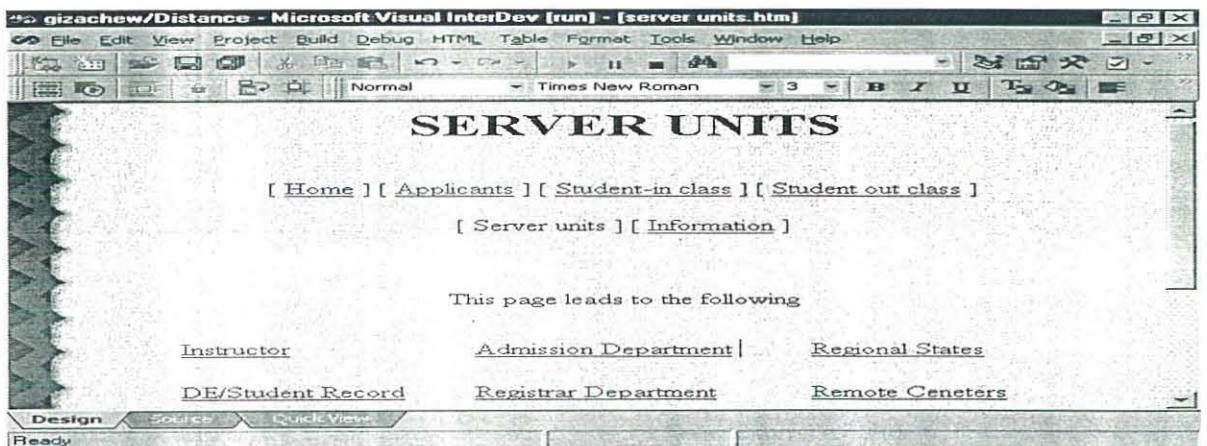


Figure 8 – Server Units page

7.3 Demonstrating the prototype

7.3.1 To Access Information

We can access information about the college, the distance education, the admission department, the registrar department, the teaching staff, the courses.

➤ To access information about the college

1. Click on **Information** from the Home page
2. Click on **The College** from the Information page

7.3.2 Application, Entrance Examination, and Registration

The students can apply, take entrance examination, and be registered.

➤ To Get Apply

1. Click **applicants** from home page
2. Click on **application** from applicants page
3. Click on Add button
4. Fill in the Application form
5. Click on Update

➤ To Take Entrance Examination

1. Click on **Applicants** from home page
2. Click on **Entrance Examination** from applicants page

3. Select the type of Entrance Examination

➤ **To Get Registered**

1. Click **applications** from home page
2. Click on **Registration** from applicants page
3. Select your name from the name list (if you are admitted your name will be there)
4. Click on Add
5. Fill the information
6. Click on Update

7.3.3 Course Online, Resource, Interaction, Assessment, FAQs

➤ **To Read Lecture Notes**

1. Click on **Students-in-class** from the home page
2. Click on **Course online** from students-in-class page
3. Select the course you want
4. Select **lecture notes**
5. Move from page to other using Next

➤ **To Listen Lecture**

1. Click on **Students-in-class** from the home page
2. Click on **Course online** from students-in-class page
3. Select the course you want

4. Select audio

➤ **To Access Resources**

1. Click on **Students-in-class** from the home page
2. Select Resource from students-in-class page
3. Select the course/subject you want

➤ **To Take Examination, Test/quiz, Assignment, Past exams**

1. Click on **students-in-class** from home page
2. Click on **assessment** form students-in-class page
3. Select the course you want
4. Select the assessment type (mid exam, final exam, test1, etc.)
5. Select answers
6. Click on finish

7.3.4 Semester Registration, Withdrawal, Course Add/Drop, Readmission, Show Me Result.

1. Click on **students-out-class** from home page
2. Select semester registration, or withdrawal, or course add/drop or readmission
3. Click on Add
4. Fill the form
5. Click on Update

7.3.5 Server

There are many activities to be done by servers like DEF, support departments and instructors. For example, the instructor can create examination online.

➤ **To create Examination**

1. Click Server page of the home page
2. Click on instructor from the server page
3. Click on create examination from the instructor page
4. Enter the question and choices
5. Click on finish.

CHAPTER EIGHT

8 Summary, Conclusion and Recommendations

8.1 Summary and Conclusion

The main objective of the study is to select an appropriate technology for the distance education at the college and to propose a framework for developing a system that solves some the problems of it. To achieve these two main objectives, many attempts have been done. Some of these are justifying the need of distance education, information technology and identifying the available technologies.

The available technologies for distance education can be classified into two: Interactive and Non Interactive. The non interactive includes printed materials, audiotape, videotapes, radio and television. Interactive technologies, which are candidates for selection, also include audioconferencing, videoconferencing, and Web. In fact Web can also be non-interactive or offline.

According to the plan of the college, there are two directions. The first one is mainly towards using videoconferencing (audioconferencing plus one way video) giving a minor consideration to web technology and the other one is towards using print material, audio and Network for grade transfer.

However, the paper reduces the interactive technologies to include only the proposed videoconferencing (audioconferencing and one way video) and web technology, and compares these technologies themselves (**interactive technologies**) and proposed Web as an appropriate technology. Therefore the Plan should be modified, that is, it should give high attention to Web.

The selection of the technology demanded the proposal of appropriate system. Therefore, an appropriate system is proposed based on the requirements of the users. Moreover, a prototype which focuses on information provision, application, registration, course online, resources, assessment, and other services like semester registration is developed.

The prototype will be used to collect feedback so that the full system can be developed.

8.2 Recommendations

- The prototype requires the development of course content, therefore, the development of the course content should be in a way it is suitable to be put on the Web.
- It is clear that the focus of this paper have been on Web via Internet. This is so because it is difficult to come up with complete system for non-operational distance education, time and resource. The problems in registrar and distance education in particular and the college in general could not be solved with out Web via LAN (Intranet). Therefore, further study is required which could cover activities related to

such aspects as intranet is believed to increase information distributions in the college and helps all staff to have internet access through it.

- Even the nucleus is ok with the prototype, A step by step test by actual users (distant students) should be made to collect feedback so that the full system can be developed. In the development of the full system, specialized software like quizzing programs should be considered. after the full system is developed, instead of hiring tutors, students should interact with their instructors.
- Computer training to all instructors is to start in August, as the plan of computer center. This should be compatible with the use of Web for distance education.
- Computer course is in the curriculum. However, the paper highly demands making it pre requisite for the whole program.
- Server is required in the college (cost) to serve the Web based system. Computers with CD-ROM that is to be used as client to the Web based system and to train the students should be bought.
- The addition of the remote centers in the future should take the availability of basic infrastructure of information technologies as one criterion.
- While the college hires facilitators that works in remote centers, computer skill of this people should be considered.
- Additional Internet service providers are required for it helps in increasing the Internet connection of remote areas. The Ethiopian telecommunication that is the only ISP should upgrade its telecommunication infrastructure so that the transmission capacity of the Internet can increase.

- As indicated previously, the establishment of videoconferencing should be considered along with the opening of branch campuses, the demand of other colleges in regions, the beginning of fields not suitable for Web for example like engineering, and the dissatisfaction of cost effective technologies like Web Based Education (the full system). And based on the reason for the establishment, the kind of videoconferencing should be determined. Some of these are desktop videoconferencing (computer based VC), two way audio and video, two way audio and one way video or the its extension, that is, only two way audio (audioconferencing).

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Appendix

Appendix 1 (academic staff profile)

Faculty	Qualification	Number
Law	Ph. D.	1
	LL. M.	9
	LL. B.	19
FBE	PH. D.	7
	MA/M.Sc	13
	BA. /B.SC	1
Technology	PH. D.	6
	MA/M.Sc	7
	BA. /B.SC	1
	Adv. Dip	2
English department	PH. D.	12
	MA/M.Sc	
	BA. /B.SC	
Computer center	PH. D.	1
	MA/M.Sc	
	BA. /B.SC	
Dis. Edu.	PH. D.	2
	MA/M.Sc	
	BA. /B.SC	

TABLE 26- ACADEMIC STAFF PROFILE

Appendix 2 (student enrollment by year and subject and tutors needed)

Field of study	2001	2002	2003	2004	2005
Accounting	1,200	2,400	3,900	5,400	5,700
Management	0	1,200	2,400	3,600	4,800
Law	0	0	1,200	3,200	5,200
Total	1200	3,600	7,500	12,200	15,700
Tutor	60	180	375	550	565

TABLE 27- STUDENT ENROLLMENT PROGRESS

DECLARATION

The thesis is my original work, has not been presented for a degree in any other university and that all sources of materials used for the thesis has been acknowledged.



By Gizachew Kebede

May 2000