# ADDIS ABABA UNIVERSITY
# SCHOOL OF GRADUATE STUDIES

## AN ASSESSMENT OF THE UTILIZATION OF INFORMATION COMMUNICATION TECHNOLOGY IN SELECTED GOVERNMENT TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGES IN ADDIS ABABA


BY

ASHENAFI ABERA




MAY, 2011

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN MANAGEMENT OF VOCATIONAL EDUCATION

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# LIST OF ACRONYMS

| | |
|---|---|
| CAD | Computer Assisted Drafting |
| CAI | Computer Assisted Instruction |
| CBI | Computer-Based Instruction |
| CD-ROM | Compact Disc, Read-Only-Memory |
| CIM | Computer Integrated Manufacturing |
| CNC | Computerized Numerical Control |
| ETP | Educational Training Policy |
| FNG | Federal Negarit gazeta |
| ICT | Information Communication Technology |
| ILO | International Labor Organization |
| MOE | Ministry of Education |
| TBL | Technology-Based Learning |
| TVET | Technical Vocational Education and Training |
| UNESCO | United Nations, Educational, Scientific and Cultural Organization |

# Chapter One

# 1. The problem and its Approach

## 1.1 Background of the study

Present day society is entirely information dependent. Information is one of the most important resources, which is vital in nearly every aspect of our personal and for the day-to-day activities in our society. All sectors of the society and activities of individuals depend on the efficient handling of information. There is a rapidly growing demand for information by and ever widening range of users: educators, researchers, policy makers, managers, and the public at large for the effective and efficient performance of the many tasks and to contribute to the socio-economic and cultural development of the societies they live in (Rahel, 1992).

The bulk of available information, the need to process and disseminate accurate and timely information at high speed demand aid tools of such technologies as information communication technologies (ICTs). According to Hutchison and Sawyer (1998:6), the term information communication Technology (ICT) refers to "a set of activities, which facilitates the capturing, organizing, processing, transmitting, and displaying of information technology and communication technologies"

Information and Communication Technology (ICT) as one of the basic building blocks of modern society has become in use with in a very short time. Many countries now regard the understanding of ICT and the mastering of the basic skills including its concepts as a part of the core of education, alongside reading and writing (UNESCO, 2002).

Information and communication Technology (ICT), which includes radio and television, as well as the new digital technologies such as computers and the Internet have been touted as potentially powerful sector enabling tools for educational change and reform. When used

appropriately, ICT helps to expand its access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality, helping to make teaching and learning into an engaging, active process connected to real life (Victoria, 2002:11).

However, the experience of introducing different ICT in the classroom and other educational settings all over the world, over the past several decades suggests that full realization of the potential educational benefits of ICT is not automatic. The effective integration of ICT into the educational system is complex, has multifaceted process that involves not only just technology. Indeed, given enough initial capital, getting the technology is the easiest part; but also curriculum and pedagogy, institutional readiness, teacher competencies, and long term financial support, among others, are so vital (Victoria, 2002:6)

The rapid development of information and communication technologies (ICT) during the past two decades has impacts on education and trainings. The development of technology is placing new demands on expertise and the increased use of information communication technology (ICT) in instruction. Schools, TVET colleges and other educational institutions provide many sorts of facilities to facilitate the central mission of learning. In information communication technology, setting learning goals in education both by institutions and individuals are often complex and difficult. Throughout history, educators have suggested on the setting of goals and devised means to help people learn that all easier and faster than previous times. Some of the means are classified as technological, and are useful in applying scientific or other organized knowledge to the attainment of practical ends (Mesfin, 2007).

Mesfin also identified that, the new era has brought many changes and challenges to the theories and practices of educational technologies. New understanding regarding the process of human learning and of the nature of knowledge itself have challenged educators

to rethink basic concepts of underlying teaching methods in general and educational technology in particular. Advances in information communication technology (ICT) have altered and expanded the possibilities for facilitating learning in the classroom. According to Tissue (1997:5):

> *The common rational to incorporate information communication technology in education era are to improve learning effectiveness, greater access to information, graduates need ICT skills to be competitive in the job market, increase productivity, sharing resources of courseware, greater access to education via distance learning, and external forces' competition for students, pressure from parents, students, and public funding sources.*

According to the Ethiopian TVET strategy (2006:26) governments and other owners of public TVET providers are responsible for appropriately equipping institutions and making sure that TVET instructors are able to integrate ICT in TVET delivery and to encourage and guide trainees in the use of the new learning technologies. Non public TVET providers are encouraged to introduce e-learning and blended learning methodologies. To this end, the TVET authorities facilitate access to software and electronic teaching and learning materials need to be assessed.

Many studies related to ICT in education have been conducted in Ethiopia at different levels (eg. senior essay, MA Thesis and dissertation) and forms (articles, seminar paper and others) focusing mostly on television and radio, computers and plasma supported education. However, the researcher has observed research findings related with information communication technology, for instance, the research paper on "Information Technology Application in Institution of Higher Learning in Ethiopia: With Special Reference to Computer Application", mainly focused on computer application in higher institution. One of the findings of the study stated that the 28 institutions where she was doing the research

were having 71.7% computer facilities. (Rahel,1992:43). Even if this research is some what related with the research, her study did not specify the utilization of ICT and other ICT supporting equipment, which are the focus of my study .The other research carried out is on "Utilization of Information Communication Technology in Adama, Awassa and Kotebe College of Teacher Education". The major finding of the study is all about the extent of computer literacy in Adama, Awassa and Kotebe Teacher education colleges, which it did't add the issue raised on this paper.

Therefore, conducting a research on ICT utilization in TVET Colleges seems timely and appropriate.

## 1.2 Statement of the problem

The integration of information communication technology in technical and vocational education and training college curriculum is a new perspective. In the case of Ethiopia, efforts have been made to introduce information communication technology in technical and vocational education and training colleges. In doing so, students need to be equipped with an initial, basic understanding of information communication technology development in addition to their major education. Eventually, they could contribute to the economic development and social empowerment of the economy.

Introducing information communication technology (ICT) in TVET colleges' curriculum is assumed to minimize the information gap between developed and developing countries (UNESCO, 2003). In addition, first it is thought to bring about technological changes in the Ethiopian academia; second, it is believed that ICT bridges the information gap that exists between the information world and the Ethiopian setting; third, it is also considered that ICT plays a facilitative role in the management of the civil service sector. The government of Ethiopia invested large amount of financial and human resources to TVET college Information communication technology and it should serve its users to meet its objectives for which it is installed and teachers and students themselves should utilize the

vast information and other services available on the information communication technology. Since the information communication technology is new in TVET colleges, users of this information communication technology may face numerous problems while using the information communication technology. Hence, it is imperative to study its utilization and make viable recommendation.

Thus, the purpose of this study is, to assess the utilization of information communication technology in the selected government TVET colleges in Addis Ababa.

## 1.3 Objectives of the study

### 1.3.1 General objective

The general objective of this study is to assess the utilization of Information Communication ( ICT) in selected government TVET colleges in Addis Ababa

### 1.3.2 Specific Objectives

1. To assess teachers' awareness and attitudes towards information communication technology.
2. To assess students' attitudes toward information communication Technology
3. To identify the availability of technical equipment and infrastructure for the implementation of ICT in the TVET colleges.
4. To identify the major factors that impede the utilization of ICT in the TVET Colleges.
5. To assess the extent of ICT utilization in the management services of the TVET Colleges

## 1.4 Research Questions

To attain the objectives stated above, the study ought to answer the following research questions:

1. Are teachers sufficiently aware of ICT in TVET colleges?
2. To what extent are TVET college staffs utilize ICT?
3. What kind of attitude do TVET students have towards ICT?
4. What ICT resources are currently available in TVET colleges?
5. What are the major problems that affect the utilization of ICT in TVET colleges?
6. To what extent do TVET colleges utilize ICT for managerial services?

## 1.5 Significance of the study

The appropriate utilization of ICT has a crucial importance. It is true that information communication technology plays a key role in the socio-economic development of a country. Hence, the study appears to be useful in assessing the major problems in utilizing ICT in TVET Colleges in Addis Ababa more specifically. Thus, this study is significant for three reasons; Firstly, it provides valuable information to ICT decision makers and implementers about the major factors that hinder the utilization of ICT in TVET Colleges in Addis Ababa. Secondly, it helps all pertinent bodies to design a viable strategy, which in turn can promote the utilization of ICT in TVET Colleges. Thirdly, the results obtained from the research will also serve as a spring board for researchers who are interested in further ICT studies.

## 1.6 Delimitation of the study

The study focuses on the utilization of ICT in selected government TVET colleges in Addis Ababa. Even though, there are many TVET colleges in the country due to time and related constraints, the study is delimited to Addis Ababa government TVET Colleges. The study also focuses only on the practice of ICT in the selected TVET colleges. Practices other than ICT related activities are not the focus of the study.

## 1.7 Limitation of the study

In the process of conducting the survey, the researcher had a number of problems. The financial constraints are one major problem that has been an obstacle in conducting the research. The other major limitation is the shortage of time to collect available information from the surveyed colleges and other concerned bodies.

The writer experienced shortage of reference materials and spent considerable time to locate these materials.

However, by overcoming all the above limitations the writer has made a lot of effort to bring the paper to its complete form.

## 1.8 Definitions of key Terms:

**Computer:** is simply a tool for people to use; it is a machine that can solve problems by accepting data performing certain operations on that data and presenting the results of those operations (Szymanski, 1988).

**Information Technology (IT):-** is the application to information processing of current technologies from computing, telecommunications and microelectronics, where information processing refers to the organization, manipulation and distribution of information (Chambers, 1988).

**ICT (information communication Technology):-** defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. These technologies include computers, the Internet, broad-casting technologies (radio and television), and telephone (Victoria, 2002)

**Internet:** Global computer network; a network that links computer networks all over the world by satellite and telephone, connecting users with service networks such as e-mail and World Wide Web(WWW)

**World Wide Web (WWW):-** is a system that allows access to information sites all over the world using a standard, common interface to organize and search for information. The WWW simplifies the location and retrieval of various forms of information including text, audio and video files (UNESCO, 2002:235)

**ICT as an assisting tool**: ICT is used as a tool, for example while making assignments, collecting data and documentation, communicating and conducting research. Typically, ICT is used independently from the subject matter (pelgrum and Law, 2003:23)

**Training facilities:** articles such as furniture, up-to-date computers, printers, scanners, books, networking facilities, Internet connectivity etc. that are used without being consumed.

## 1.9 Organization of the study

The study is composed of five major parts organized into chapters. The first chapter deals with the background of the study, statement of the problem, significance of the study, delimitation, limitation of the study, definitions of terms and the research organization of the paper. The second chapter is concerned with the review of the related literature. The third chapter is regarding the research methodology and procedures of the study. The fourth chapter deals with analysis and interpretation the findings of the study. The last chapter brings the study so an end with conclusion and recommendations. Finally, bibliography and appendices were inserted and attached.

# Chapter Two

# 2. Literature Review

## 2.1 Historical Background of Vocational Education

### 2.1.1 Origin of Vocational Education

In the ancient time, the educational instructions were not formal. For this reason, the methods used earlier in teaching were based on observation and imitation. Thus, the history of vocational education was the history of man's efforts to learn to work. Concerning this idea, Struck (1958) states the following:

> *Vocational education of an informal nature dates back to earliest civilization. Fathers taught sons, mothers instructed daughters and the elders of the tribe trained eager youth in arts and crafts long before agriculture became established and before towns and villages were built (Struck, 1958:3)*

Hence, the first learning experience of vocational education came about as a result of some accidental discovery. This led to new ways of learning. Thus, the primitive man is believed to have lived and worked for many years by trial and error method of learning. This method was still in use but when time passes, new ways of teaching and new techniques of instruction came to replace the former one. In relation to this point, Robert (1965:5), writes, "The division of labor enabled man to improve the quality and quantity of the total product and at the same time necessitated the use of new methods of learning to work which involved the selection of youth of special abilities."

Therefore, the assigning of these youth to the vocations according to their abilities and inclination was the first educational placement system that man used in the earlier time. These selected of youth, spent some time as learners, and in the system of apprenticeship, which was the first form of organized learning.

### 2.1.2 Development of Vocational Education

Changes in every aspect of social life brought and led to the efficiency of work. Changes like the industrial revolution contributed to the development of human intellect. Thus, the expansion of production, business organization, scientific innovations and technological advancement required higher qualified workers. To achieve that objective, vocational schools were established and developed to produce the needed skilled manpower. Placement of trainees also had been seen in the development of vocational education with regard to the interests and inclination of trainees in order to place them into different appropriate fields of study.

In fact, the development of vocational education passed through complex stages. As Prosser and Quigley (1963), stated:

> *Individual initiative; unconscious absorption and initiation; conscious initiation in the home; organized training in the home; division between home and specialized occupation; conscious and organized training through apprenticeship; and pick-up learning under specialization and organized training trough such devices as apprenticeship, partially revived and modernized the foreman instructor and the public and private schools (Prosser and Quigley, 1963:10).*

Those steps of development in vocational education were changed gradually and brought the modern type of planned learning that we are using nowadays. In general, starting from early times, human beings taught the successive generations in skill and knowledge in the process of their developments. This is more true to vocational fields. Hence, with progress in the areas of industrialization human beings started formal training and placement of trainees according to their abilities and interests. As Nayak and Rao

(2004), pointed out vocational development is a mark of maturity. In a complex society such a development is in itself an achievement. Vocational planning preceded vocational experience, but competence in planning also required abilities and interests that came with maturity. Vocational choice was a process of growth reflecting other phases of developments. Thus, the placement of trainees into different fields of study should be seen strictly based on the abilities and interests of the students trained for the world of work.

### 2.1.3 Objectives of Technical and Vocational Education

The objective of technical and vocational education is mainly focused to that type of education which leads to particular occupation. Thus, as UNESCO (1995) puts it ,the purpose of technical and vocational education is reflections of schools that are concerned with the provision of subjects that have technical and vocational nature having responsibility of training people who would be able to work in the occupation available. In supporting the above idea Evans (1971:9) indicated that the objective of meeting the manpower needed to society was the "earliest and widely accepted". Thus, one of the primary purposes of technical and vocational education and training program is to meet the skilled manpower need of the specific area in which the schools have to operate.

Another objective of technical and vocational education according to Evans (1971) is that it increases options to students so that they could join any areas they want. The availability of vocational education as indicated by Evans gives students an opportunity of having more options in relation to the options that may be possible by attending general education.

In addition, the objective of technical and vocational education in Ethiopia is more or less similar with the purposes of the program mentioned above. The Educational

Training Policy (ETP) and its implementation (2002) states, the following as far as the purpose of technical and vocational education is concerned:

> *The aim in all these program is not only to train manpower for the development program that the country is in the process of implementing, but is also intended to encourage the trainees to create jobs themselves and contribute to the national development efforts.(ETP 2002)*

Generally, it is only when trainees are fairly selected and properly placed by utilizing the guidance service that the mentioned objectives can be realized.

### 2.1 .4 Development of Vocational Education in Ethiopia

Vocational education in Ethiopia is an outgrowth of the educational set up in the country over the years. Prior to the 20th century, the education system was predominantly religion oriented that used to serve the manpower needs of the church and the state. Available sources indicate that there was no significant sign of vocational education at that time (Yekunoamlak, 2000; Girma, 1990).

However, there were different occupational activities in the country that had been transmitted traditionally from family to children. Such as pottery, weaving, metal work, woodwork, leatherwork, etc. But in our society, especially in rural area, such manually skilled people were isolated and despised. Because, the jobs were viewed as inferior occupations (Wanna, 1998; Teklehyimanot, 2002).

Modern education, as opposed to traditional education, developed fast between the years 1908 and 1935. For the first time, handcraft education was given parallel to the academic education for students of grade one to six to plant the dignity of work in students mind (Yekunoamlak, 2001:90). Before that time, even though, there were about thirty modern schools in the country up to 1935, none of them included vocational education in their curriculum (Girma and other 1990:9-10).

With the objective of making the curriculum job - oriented and to produce middle level work force for the economy, the concept of comprehensive program was introduced in secondary school of Ethiopia in 1961. The first general secondary school to the converted comprehensive secondary school was Woizero Sihen School in Dessie (Getachew, 2004:18). In these comprehensive schools vocational courses were offered parallel to general education under the same administration.

Around the decline of comprehensive secondary schools, curriculum was observed (Yekunoamlak, 2000) and the schools lacked proper human and material resources. The quality of graduates was poor. The system was not able to absorb reasonable number of students. Later, the comprehensive schools failed to achieve mission, which was reducing unemployment. Then, to alleviate the problem attention was given to strengthen some selected comprehensive secondary schools and other technical/ vocational schools. Efforts were also made to improve the quality and to provide effective skills (Wanna, 1998). As a result, 10+3 technical/ vocational program was introduced.

The 1994 Education and Training Policy has brought fundamental change in the education sector in general and in TVET program in particular. Numbers of schools and enrollment have been considerably increased. Based on this, many TVET institutes have been opened in the country to cater training to those who completed grade 10. As a result, the number of TVET institutions was considerably increased. Up to 2010 there were 257 government, 523 private, 34 NGO TVET institutes in Ethiopia. (MoE, 2010). Accordingly, the provisions of training fields were also increased significantly. ICT was one of those areas, which was included in the curriculum.

## 2.2 Information Technology in Ethiopia

Information technology is playing a very important role for the development of different sectors of a country. Like any other African countries, the penetration of information technology to Ethiopia just began with the introduction of main frame computers in 1960. The initial stage of the introduction of the computers was characterized by inadequate literacy of the users. The application of computers, and there by the development and awareness of mechanization, was related to the introduction of computers into Ethiopia by foreign suppliers (Teferi, 1994).

The Government of Ethiopia by providing great attention to development of information technology established the Ethiopian Science and Technology Commission (ESTC), in 1975 by proclamation No. 62/1975. Later in 1987 the National Computer Center was established under the Ethiopian Science and Technology Commission with the following major objectives.

1) To conduct research and development activities in computer science and technology and to disseminate the results.
2) To promote the development of computer knowledge and service in Ethiopia.
3) To provide consultancy and maintenance services.
4) To provide training courses.

Home computing were later emerging in many places of the country, but different surveys showed growth did not match with usage (Lishan, 1999).

During the beginning time, Information Technology training had been restricted to a very few individuals selected for training. The forefront institutions that conducted computer courses were:

1. Addis Ababa University established a computer center for training in 1986 under mathematics department to offer courses for extension and regular students in Diploma and B.Sc. degree programmes respectively.
2. The Ethiopian Science and Technology

Later, the Federal Democratic Republic of Ethiopia established the Ethiopian Information and Communication Technology Development Authority to fulfill the following objectives:

1. to contribute its critical role for accelerated attainment of political, social and economic development;
2. to ascertain a national development cognizant of dynamism, peculiarities, extent and coverage;
3. to ascertain the development of nationally and globally competitive economic sector through coordinated measures (Federal Negarit Gazeta, 360/2003);

According to the Education and training policy of the country, the program launched to make students specialize in computer in vocational schools. This further reinforced the growth of knowledge in information technology. To achieve the objectives of TVET, like other fields of training, information technology courses were also included in all levels of training in TVET institutes (F.N.G, 2004).

## 2.3 ICTs in Education

Information and communication technologies are defined, for the purposes of this study, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information" these technologies include computers, the Internet, broadcasting technologies (Radio and Television ) and telephony (Blurton, 2002).

In recent years there has been a ground well of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings. But ICTs are more than just these technologies

older technologies such as the telephone, radio, and television, although now given less attention, have a longer and richer history as instructional tools (Cuban, 1986). For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominate delivery mechanism in both developed and developing countries. The use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access (Potashnik, 2002).

### 2.3.1 ICT and Its Importance to Education

Information and Communication Technology (ICT) one of the basic building blocks of modern society has become in use within a very short time. Many countries now regard the understanding of ICT and the mastering of the basic skills including its concepts as a part of the core of education, alongside reading and writing (UNESCO, 2002).

ICT which includes radio and television, as well as newer digital technologies such as computers and the Internet, have been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, ICT helps to expand its access to education, strengthen the relevance of education to the increasingly digital workplace and raise educational quality, helping make teaching and learning into an engaging active process connected to real life (Victoria 2002:11)

However the experience of introducing difference ICT in the classroom and other educational settings all over the world over the past several decades suggests that full realization of the potential educational benefits of ICT is not automatic. The effective integration of ICT into the educational system is complex, and has multifaceted process that involves not only just technology but also curriculum and pedagogy institutional readiness, teacher competencies and long term financing among others are so vital (Victoria, 2002:6)

According to UNESCO, (2003) the ICT revolution has been very much about spotting opportunities and inviting everybody to learn and make good use of it. Indeed the ICT is perhaps above all a revolution in learning. Individuals have seen the potential of the new tools and introduced them into their homes on a vast scale. Firms have applied them to an ever-widening range of activities bookkeeping, production control, management, communication, marketing and drug development etc. the experience of developed countries have situations that public authorities have incorporated them into all of their activities from vaccination programs to tracking criminals.

ICT has transformed the way learning institutions work .It also changed the way we think about organized education. ICT has become a medium in the original sense of the work something in the middle between the substance to be learned and the student who is to master it. First it liberates provision of education from the constraints of time and place, and many courses can be accessed from more or less anywhere at any time. Second, allows material to be adapted or customized to individual levels and tasks to be placed according to personal progress.

The pressing problem for educational planners is how to reach with a reasonable time and give due concern to the needs of the majority who are uneducated and poor, who live in rural areas and how to implement and maintain the educational part of ICT networks. Many countries adopt ICT policies for their education systems that cover not only hardware and infrastructure but also educational materials available on the internet where both domestic and foreign users can access them freely. In addition, many teachers and professional associations make their best work available free for anyone to use (Mesfin, 2007).

### 2.3.2 Educational Objectives of ICT

Planning for effective use of ICT in education necessitates understanding the potential of technology to meet different educational objectives and, consequently deciding which of these objectives to pursue. This decision affects the choice of technologies and modalities

of use. According to Gagarag, (2002:62-63) four objectives that enhanced by ICT are specified below:

- **Expanding access to all level of education**: In most developing countries, full time study within the time constraints of classrooms is only accessible to a few: for many who wish to study, learning will have to take place at a time and location of their choice, either synchronously or asynchronously, barriers such as time, distance and social and cultural constraints must be overcome. ICT in their many forms have been applied in a variety of contexts:
- **Improving the quality of education**: One of the most powerful reasons for considering using ICT in an educational system is that they put learning in the hands of the user. They facilitate individualizing curriculum, permit learners to dictate the pace of learning, and wider sources of information
- **Enhancing lifelong learning**: Lifelong learning is a necessity in a world that changes and renews itself rapidly.
- **Facilitating non-formal education**: ICT is being used to make information and knowledge available in non-formal contexts. The demand for enrichment learning is on the rise, particularly in countries experiencing an increase in aging populations and populations with more leisure time who wants to use it in intellectual pursuits. These are learners for pleasure, and for them, activities in a classroom are not ideal solutions. ICT offers a convenient solution, but only if the individual has the skills needed to use the appliances and navigate through the millions of web pages and is able to pay for the cost of the digital connection

### 2.3.3 The uses of ICTs in Education

Education policymakers and planners must first of all be clear about what educational outcomes are being targeted. These broad goals should guide the choice of technologies to

be used and their modalities of use .The potential of each technology vary according to how it is used. Haddad and Drexler identify at least five levels of technology use in education; presentation, demonstration drill and practice, interaction, and collaboration (Haddad and Drexler, 2002)

Each of the different ICTs –print, audio/ video cassettes, radio and TV broadcasts, computers or the Internet may be used for presentation and demonstration, the most basic of the five levels. Except for video technologies, drill and practice may likewise be performed using the whole range of technologies. On the other hand, networked computers and the internet are the ICT that enable interactive and collaborative learning best; their full potential as educational tools will remain unrealized if they are used merely for presentation or demonstration. Radio and television have been used widely as educational tools since the 1920s and the 1950s, respectively. There are three general approaches to the use of radio and TV broadcasting in education (Perraton and Creed, 2002).

- **Direct class teaching:-** were broadcast programming substitutes for teachers on a temporary basis;
- **school broadcasting:-** where broadcast programming provides complementary teaching and learning resources not otherwise available; and
- **general educational programming over community:-** national and international stations, which provide general and informal educational opportunities.

### 2.3.3.1 Teleconferencing and its educational uses

Teleconferencing refers to "interactive electronic communication among people located at two or more different places" (Rao, 2002). According to Rao,there are four types of teleconferencing based on the nature and extent of interactivity and the sophistication of the technology.

a) Audio conferencing involves the live (real-time) exchange of voice messages over a telephone network.

b) Audio-graphic conferencing when low bandwidth text and still images such as graphics, diagrams, or pictures can also be exchanged along with voice messages, then this type of conferencing is called Audio graphic. Nonmoving visuals are added using a computer keyboard or by drawing writing on a graphics tablet or white board.

c) Video conferencing allows the exchange not just of voice and graphics but also of moving images. Videoconferencing technology does not use telephone lines but either a satellite link or television network.

d) Web based conferencing as the name implies, involves the transmission of text, and graphic, audio and visual media via the Internet, it requires the use of a computer with a browser and communication can be both synchronous and asynchronous.

### 2.3.4 Use of ICTs helps improve the quality of education

Improving the quality of education and training is a critical issue, particularly at a time of educational expansion. ICTs can enhance the quality of education in several ways by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teaching training (Haddad and Jurich, 2002). ICTs are also transformational tools which, when used appropriately, can promote the shift to a learner-centered environment.

**Motivating to learn:** ICTs such as Videos, television and multimedia computer software that combine text, sound, and colorful, moving images can be used to provide challenging and authentic content that will engage the student in the learning process. Interactive radio likewise makes use of sound effects, songs, dramatizations, comic skits, and other performance conventions to compel the student to listen and become involved in the lessons being delivered more so than any other type of ICT, networked computers with internet

technologies, enable instruction to be received simultaneously by multiple and geographically dispersed learners (i.e.Synchronous learning).(UNESCO,2003).

- **Access to remote learning sources:** Teachers and learners no longer have to rely solely on Printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the internal and the world wide web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons-mentors, experts, researchers, professionals, business leaders, and peers-all over the world. (UNESCO,2003)

One of the most commonly cited reasons for using ICTs in the classroom has been to better prepare the current generation of students for a work place where ICTs, particularly computers, the Internet and related technologies, are becoming more and more ubiquitous. Technological literacy, or the ability to use ICTs effectively and efficiently, is thus seen as representing a competitive edge in an increasingly globalizing job market, (UNESCO,2003)

### 2.3.6 Uses of computer and Internet for teaching and Learning

According to (Richmond,2002),there are three general approaches to the instructional use of computers and the Internet, namely:

1) learning about computers and the Internet, in which technological literacy is the end goal;
2) learning with computers and the Internet, in which the technology facilitates learning across the curriculum; and
3) learning through computers and the Internet integrating technological skills development with curriculum application (Richmond, 2002)

Learning about computers and the Internet focuses on developing technological literacy. It typically includes:

- fundamentals: basic terms, concepts and operation;
- use of the keyboard and mouse;
- use of productivity tools such as word processing, spreadsheets, data base and graphics programs;
- use of research and collaboration tools such as search engines and email
- basic skills in using programming and authoring applications such as Logo or Hyper studio;
- developing an awareness of the social impact of technological change (Bosch, 2002)

Learning with the technology means focusing on how the technology can be the means to learning ends across the curriculum. It includes:

- presentation, demonstration, and the manipulation of data using productivity tools;
- use of curriculum-specific applications types such as educational games, drill and practice, simulations, tutorials, virtual laboratories, visualizations and graphical representations of abstract concepts, musical composition, and expert systems;
- use of information and resources on CD-Rom or online such as encyclopedia, interactive maps and atlases, electronic journals and other references (Bosch,2002)

## 2.4 The role of ICTs for Teaching and Learning in TVET

Information and communication Technologies (ICTs) are revolutionizing education by removing distance from education and making knowledge more accessible to all (Industry Canda,1997). Technology-enhanced learning will play a crucial role in the development of a lifelong learning culture and has the capacity to empower learners by providing them with multiple pathways that offer choices and channels to meet their education and training needs (Human Resources development Canada, 1997). It is not surprising therefore to see a

growing interest in Technology-based learning (TBL) across the world. Technology based learning (TBL) may be defined as the array of hardware and Software used in the teaching an learning systems that include computer-based training systems, multimedia systems, electronic performance support systems, telecommunications systems, as well as the Internet with world wide web systems. The rate of which the internet is being accessed keeps increasing at lightning speed. Technology based learning can enhance teaching and learning; it has the potential to become cost-effective as it offers greater flexibility regarding time and location of training delivery. Additionally, Technology based training may facilitate institutional policy regarding access and equity. Technology also provides greater flexibility to adapt teaching and learning to meet learners' cognitive and learning styles (Lafreniere, 1997)

The increased use of ICTs in TVET has resulted in a major paradigm shift, from a total dependence on the objectivist paradigm to a growing adherence to the cognitivist and constructivist paradigms. For example the use of ICTs in distance education has resulted in a pedagogy, which is constructivist, collaborative and distractive ( Wonacott, 2001)

There are different types of ICTs in common use for teaching and learning, namely: audiocassette tapes, radio, video tapes, CD-ROM, the Internet, wire line technology, wireless technology, web-based training, audio conferencing, audio graphics, interactive television, video conferencing, and open and distance learning.

Imel (1998) identified four different application of ICTs in adult education, namely technology as curriculum, technology as a delivery mechanism, technology as a complement to destruction, and technology as an instructional tool. Following is a brief description of each approach.

## Technology as curriculum

When using technology as curriculum the focus is on developing ICT literacy skills. There are two types of ICT literacy skill sets. The first is generic ICT literacy skills such as keyboarding, word-processing, using databases, using spreadsheet, desktop publishing and using the Internet for research and communication (Kasworm and Londoner,2000). In this network economy every graduate from TVET programmes needs to possess these essential and generic ICT literacy skills. The second ICT skill sets are the occupationally specific ICT literacy skills. Examples of these skills include the ability to use CNC equipment, work with CAD/CAM, and operate equipment with digital system controls.

## Technology as delivery mechanism

When technology is used as a delivery mechanism the focus is on packaging course content for digital delivery. Common approaches in current use include: computer-assisted instruction (CAI), computer-based instruction (CBI), and web-based or online instruction. Open and Distance Learning programmes make extensive use of technology as their delivery mechanism.

## Technology as a complement to instruction

When technology is used to complement instruction the emphasis is on providing opportunities to practice skills taught and extending learning by working with specific software application (Kassworm and Londoner, 2000). Simulators are often used in TVET to address safety concern during the initial phase of training and to offset cost in renting equipment for training crane operators truck drivers. In its simplest form, technology can be used for drill and practice to complement instruction.

### Technology as an instruction tool

Human learning is a very complex process. In spite of years of research in education, our understanding of how human learn is till limited. For this reason educators strive to use the little that is known about human learning whenever they engage in the act of teaching and learning. The learning process can be divided into two broad categories. The first relates to learning conditions that are internal to the learners. While this is the area where the potential to improve learning outcomes is the highest, it is undoubtedly the area that is most difficult to affect. The second condition of learning is external to the learners. People learn through the five senses and the contribution of each to the amount that we learn varies (Kupsh and Mason, 1985).

## 2.5 Using ICTs for Programme Support in TVET

TVET makes considerable use of ICTs for supporting its programmes. According to UNESCO, (2003) the use of ICTs for administrative purposes, career education and guidance, labor market information, placement of graduates, control of technical systems, information search and retrieval, communication purposes and programme design and development.

### 2.5.1 Using ICTs for Administrative purpose

The use of ICTs in education for administrative purposes has met with less resistance and has been more readily accepted and adopted. This is because educational administration embraces more the management rather than the education paradigm; and ICTs are perceived as empowering rather than threatening, as is sometimes the case in the teaching profession. ICTs are currently being using for administrative purposes even in institutions where it is not being used formally for teaching and learning -ICTs have been very effectively and effectively used in TVET for the following administrative purposes: accounting, advertising, staff administrative services, student administrative services, support services, research and evaluation, physical plants and fund raising (UNESCO,2003).

### 2.5. 2 Using ICTs for Career Education and Guidance in TVET

According to Stern (1997),there are currently too many school leavers that "spend several years floundering in the labour market before they find steady, long-time jobs" .TVET practitioners and career guidance counselors should work in close collaboration to monitor labour market conditions and requirements in order to provide optimal services to students. Since a large proportion of secondary school leavers will not attend universities, all stakeholders need to work together to improve the image of TVET so that parents and students can appreciate the relevance and importance of vocational training. (stern, 1997,P.4).

The European community recognized that the individual is the most important agent responsible for constructing the qualifications by upgrading, combining and using acquiring knowledge, skills, and training to make teaching and learning employable and adaptable in the changing world. However, in the present environment where choosing and preparing for career is like attempting to shoot at a moving target, proper career guidance and counseling are of critical importance to ensure seamless learning throughout life. The purpose of vocational guidance and counseling is to assist students to:"Understand and appropriate their talents; relate effectively to others; explore career alternatives, develop appreciate their talents; relate effectively to others; explore career alternatives; develop appropriate educational and vocational training plans; implement and complete their plans; implements and complete their plans; and integrate successfully in society and the labour market" (Conger, 1998, 1)

### 2.5.3 Using ICTs to Provide labour market information in TVET

In an economy where human capital has become a critical element in the production of goods and services, easily accessible and up-to-date labour market information (LMI) must be available to students as part of the career education and Guidance services. ICTs are increasingly being used for disseminating labour market information. (UNESCO, 2003).

### 2.5.4 Using ICTs for Placement of TVET Graduates

To a large extent, the effectiveness of TVET programmes are measured by the success TVET graduates to obtain jobs in their occupational preparation. Service providers and funding agencies usually conduct follow-up of TVET graduates to assess placement rate after graduation.

ICTs are revolutionizing employee recruitment and job search. Many countries, including Australia, Canada, and United States, have created online national job bank where employers can post vacancies and job seekers can search for jobs by occupational categories, average earnings, and geographical location. These free services have considerably reduced the time needed for matching employers and employees (UNESCO,2003).

### 2.5.5 Using ICTs for the Control of Technical Systems

The globalization of the economic systems has had major impacts on the use of ICTs in the production of goods and services. In summarizing the impact of new technologies on production, Sapountzoglou (1998:85) noted:

> *The internalization of the economic activity favours the development of new technologies, and simultaneously, new technologies favour the internationalization of economic activity. This two-way phenomenon is relative to the continuous evolution and change of production and consumption patterns in contemporary societies.*

Business and industries have experienced dramatic transformations as a result of the exponential growth of ICTs. For example, transportation industry has seen massive computer integration into their operating systems. Some vehicles use three or more computers to control different on board systems. Separate computers are being used to control the engine, transmission/transaxle, instrumentation and climate control, suspension system, and antilock bracks. Today's automotive technology but must not only update

themselves with changes in automotive technology but must also keep up with new equipment and procedures. In modern alternative repair shops, workers must use computerized diagnostic tools to diagnose problems and make repairs. Other information technology systems provide access to technical service bulletin, manufacturers' service information, and inventory databases (Erjavee and Scharff, 1996)

The design, the manufacturing, and the printing sectors have also been transformed in major ways. Many machines that were traditionally manually or mechanically operated and controlled are now controlled by information technology. In the machining trades, computerized numerical control (CNC) has replaced traditional setups and processes. Computer - Assisted Drafting (CAD) has replaced much of traditional hand drawing. In the printing trades, computers are replacing light tables and artists' knives (Lewis, 1996 P.47)

The manufacturing sector has also been dramatically altered by ICTs. Many technology based processes have been implemented in manufacturing such as computer-Numerical Control (CNC), computer-Aided Manufacturing (CAM), computer-Aided Design (CAD)and Computer-Integrated manufacturing (CIM) (Lynch, 1998)

### 2.5.6 Using ICTs for Information Search and Retrieval

In workplaces where employees' performances depend heavily on information, computerized manuals are replacing printed information. Manuals are conveniently stored on various CD-ROM so that they are readily accessible (Kirk, 2002). In this information age the ability to retrieve and use information in form of electronic text, sound, graphics and video is fast becoming an essential skill. BECTA (no date,b) identified these critical skills related to information retrieval;

- ability to conduct Internet search skills;
- ability to restructure information;
- ability to assess the quality of information;

- ability to assess the validity and authenticity of materials;
- ability to assess the quality of information;
- ability to select the most appropriate sources of information;
- ability to download and save information;

### 2.5.7 Using ICTs Communication Purposes

The advent of the Internet has dramatically opened new avenues to communicating. Although older technology such as the telegraph, telephone, radio, and postal service are still useful, the Internet is becoming a dominant form of communication. It is convenient, cheap (typically there is no cost for communicating via the Internet once the actual Internet connection is paid for) and allows for learners around the world to share and exchange ideas instantly. Communication techniques can be divided into two categories:

#### 2.5.7.1 Asynchronous Communication

Asynchronous Communication refers to communication between individuals is independent of time and location. The individuals do not receive messages instantaneously they receive messages only when they have the imitative to retrieve or view them (Illinois, 2001). Examples of asynchronous communication are e-mail, listserv, bulletin boards, discussion boards, and newsgroups (Karahalios,2000)

**E-mail**

As implied by the name, e-mail (electronic mail) is essentially an electronic letter. It is a text based form of communication where a message can be sent to one person or a ground of people in different location (Karahailos, 2000). E-mail can be managed by programmes. Such as Emacs, Microsoft outlook, netscape Mail, and pine. Web-based e-mail (such as hotmail and Yahoo) can be accessed through an Internet browser, without any special e-mail

programmed. Objects such as documents, images, etc.Can be attached to an e-mail. Assignments can be handed in and documents can be exchanged through e-mail.

**Listserv**

A list server (listserv) is a programme that automatically sends e-mail to the members on a mailing list. Users can subscribe to a particular mailing list by sending an e-mail to a special mailing list address and listserv automatically adds the e-mail address to the mailing list. Listserv conveniently manage mailing lists by allowing announcements and information to be easily distributed to the required individuals (listserv,2001)

**Discussion Boards and Newsgroups**

Tools such as discussion boards and newsgroups allow individuals to post questions, answers, comments, and relevant information to people subscribed to that group. The posted information is available for all the authorized individual to view and to respond to . Discussion boards and newsgroups can be private, such as the one's provided in web-based courses. There are also public forums called usenets that anyone can join. There are over 17,000 use net groups spread across the nine high level categories: biz (business related topic),Comp (computer related topics (including software), misc (discussions that don't fit into any one category), news (discussions on usenet itself), rec(hobbies, games, and recreational related topics), sci (sciences other than research biology), Soc (Social groups, Often ethnically related), talk (politics and related topics), alt (alternative or contro verseial related topics) (Karahalios,2000).

### 2.5.7.2 Synchronous Communication

Synchronous communication refers to communication that occurs in real time, that is, instantly. Responses to messages can be received right away where the interaction mimics a telephone conversation. Synchronous communication tools can be text-, audio, or video-based, or a combination of any of the three. Examples of Synchronous communication

methods include chat and instant messaging programs, Internet telephony, audio conferencing, videoconferencing, and audio graphics.

### Chat and Instant messaging programmes

Chat and messaging programmes allows individuals to have a real time, that is, undelayed conversation through text messages. Individual can type and send messages to each other and they can respond immediately. There is an area where users can type their messages and another area where users can view the messages that have been sent from remote users.

**Audio conferencing, Videoconferencing, and Audio graphics**

Audio conferencing and audio graphics allow real-time voice exchange. Audio graphics can also have real-time transfer of graphics and images if interactive white boards, are used. Videoconferencing allows individuals to see and hear other individuals in emote areas.

## 2.6 The use of ICT for TVET programme Design and Development

Good vocational education programmes are designed using a system approach. This approach includes various systematic processes, such as job analysis, task analysis, curriculum design and development, and instructional system design and development (UNESCO,2003)

### 2.6.1 Online Occupational Analysis and Essential Skills Profile

There is a strong demand on TVET for imparting, retooling and enhancing job related skills. If the purpose of a TVET programme is to improve the job performance, it is the important to use the job requirements as a basis for programme design and development. Job analysis is a strategy developed to breakdown a job into parts and components. Any job can be divided into duties tasks, and subtasks. Duties are the major work activities performed by workers. Tasks are specific work activities, while subtasks are the steps that must be completed in the accomplishment of a task lack of front-end analysis is the single most common error in programme planning. Analysis is a very important phase of the

programme planning process. It influences all the under pinning assumptions used in the decision-making process and provides the basic foundation for programme design and development. The process and product of the analysis also provide an audit trail for validating the programme planning activities as well as programme outcomes after its implementation. Additionally, job or occupational analysis is the only valid source of information for making programme-planning decision(UNESCO,2003)

### 2.6.2 Automated Instructional System Design and Development

Past surveys have determined that over 200 development hours are required to produce one hour of online learning (Kemske, 1997 as cited in Chapman, no date). For highly interactive lesions, the number of hours can jump to 800, even 1000 hours (chapman, no date). This significant time commitment to programme design and development warrants the use of instructional design tools to increase efficiency and productivity. The whole instructional development process can be separated into two major phases: design and development (authoring).

Automated instructional design (AID) tools assist professional especially people with limited instructional design expertise, to create instructional products. Abby (1998:2) classified these tools into four categories:

1. Expert systems: Expert system facilitates decision making and instructional analysis process using a built-in knowledge base.
2. Advisory systems: These tools assist or coach the designers in the instructional design process.
3. Instructional Design Environment: This tool supports and instructional design methodology for teaching the use of software in real-life problem solving context.
4. Electronic performance systems: These are self-instructional electronic environments that provide just-in-time information, guidance, data, tools and assessment to support instructional design tasks.

## 2.7 Factors affecting the Integration of ICT in TVET

While technology - enhanced education holds great promise, its wide spread implementation also poses some immediate challenges with respect to: capital outlays in hardware and soft ware, equal access to eliminate technological "haves and " have - nots" ,appropriate strategies for integrating technology across curricula, copy right issue, and availability of pedagogically sound materials. Teacher development is a major challenge for the implementation of technology- enhanced learning since for most teachers' information technologies are both exhilarating in their possibilities and daunting in the uncertainty created by the speed of change (Council of Ministers of Education, 1997)

The conference board of Canada (2000) has identified nine of the most common challenges faced by employers who have attempted to use ICTs for workplace learning. There are : lack of time, money and support; technological and systemic limitations difficulty of using ICTs; no evaluation of outcomes; resistance to change; lack of planning; lack of communication; lack f leadership; and learner resistance. The discussion that follows will focus on two critical barriers the digital divide and the cognitive divide. Stevens (2001) also identified five barriers related to the implementation of ICT-mediated learning in TVET, namely: Content and curriculum, appropriateness and efficacy of technologies, quality and branding of programmers, stakeholders resistance to innovations, and the digital divide. Details follow below.

### 2.7.1 Curriculum related factors

While much attention is being given to the development technologies that drive ICT-mediated learning, one of the most critical issues remains the curriculum content. As Stevens (2001:52) noted "A current impediment to the further growth and diffusion of more advanced systems in all parts of the world is the unavailability of relevant, well designed instructional content. This is particularly true in the technical/vocational training area"

### 2.7.2 Appropriateness and Efficacy

There is a perception that distance education is not an appropriate method for delivering vocational and technical skills. However "..... For many occupations within the emerging 'knowledge economics' the cognitive and affective learning domains are becoming more substantial relative to psychomotor skills" (Stevens, 2001: 52). Providing distance education in these two domains is much less challenging than teaching manual skills at a distance.

The efficiency for distance learning in vocational education will keep improving with the upgrading improvement of learning technology, instructional design, adaptive learning modules, simulation of work place environment, learners support systems, access to e-learning, and the development of intelligent tutoring. Greater emphasis on a self-directed style of learning and an increase in computer literacy among stockholders will further enhanced the efficiency of distance learning in TVET (Steven, 2001: 54)

### 2.7.3 Stakeholder's Interest

The shift to technology based learning may represent a threat to job lost for some stakeholders, thus resulting in resistance to embrace the innovation. Adopting ICTs for teaching and learning will not result in job lost, however there will be a change in the instructor's rule, moving from teaching to facilitating and guiding the learning experience (Stevens, 2001: 54). Brennan, Mc Fadden and Law(2001:7) noted that "There is a potential lost of work if the scenario of teacher less classrooms comes anywhere near reality secondly, technology by its very existence and its degree of present and predicted permeation of education and training, throws all existing methods up to scrutiny. Practitioners are forced to examine and justify their existences". The case studies of online learning conducted by Curtin (2002) also confirmed this problem: "Where the institutional constraints are not addressed, the case studies suggest that online delivery is likely to remain an island of innovation in a sea of resistance.

### 2.7.4 Institutional Factors

Institutional barriers associated with ICT-mediated learning have been well documented in the literature.

Following are some of the barriers:-

- Lack of equipment and support
- Difficulties in scheduling
- Lack of adequate resources
- High cost of programmed development
- Instructional difficulties
- Difficulties in recruiting qualified instructors
- Difficulties in maintaining reliable technical assistance and support (Zirkle, 2001)

### 2.7.5 Student related factors

There are many barriers experienced by distance education learners. These include:-

- Cost of equipment and access to technology
- Motivation
- Lack of immediate feedback from instructors
- Lack of adequate support and services
- Alienation and isolation
- Lack of ICT literacy skills
- Lack of skills in managing data and time (Zirkle, 2002)

### 2.7.6 Software- related factors

The development of ICT mediated learning materials for TVET has been slow as compared to rate for the general education sector. This trend can be explained:-

- Comparatively law enrolment in TVET; and

- The need for a wide variety of occupational specific software in TVET. "Specifically, technology applications used in various occupational fields are not available to educators" (Allen, Walker and Morehead 1999: 6)

Vocational educational does benefit from manufacturers developed software and hardware dealing with specific products or services. On the other hand many of the products are not comprehensive enough to cover all aspects of a programme's curriculum Herschbach, (1984: 8) notes:

> *"The market for vocational education is relatively small, compared to the potential market for general education subjects in the elementary and secondary levels. On the other hand vocational education benefits from products of all kind developed for business and industrial applications in general, although there are few instructional areas where comprehensive converge may be expected"*

## 2.8 Experience of Some Countries on Utilization of ICTs in TVET

The rapid development of information and communication technology (ICT) during the past two decades has had many points of contact with education and training. The development of technology is placing new demands on expertise, and it is also leading to the increased use of information technology (IT) in instruction and learning. Andre Lewis (2001: 1), noted that traditional training approaches of TVET " are under threat and new ways of thinking about, organizing and ensuring adequate skills formation that is usable in enterprises are required " all UNESCO member states are attempting to reform their TVET systems to make them more responsive to this new reality many countries are trying to harness the power of ICT mediated learning as part of a comprehensive strategy to reform the TVET systems.

**Australia**

Australia is a recognized as a trendsetter in the area of TVET. The country has also established itself as a world leader for its initiatives in research , innovation and reform in TVET (Tapsall and Ryan, 1999;147). At the national level, all states and territories have agreed to an Australian flexible framework for vocational education and training 2000-2004.The purpose of the agreement is to:

- Build a critical man of TVET staff who are able to use flexible learning approaches
- Achieve a national TVET system, which facilitates affordable access by all communities learners and employers to online services
- Develop world class online content , applications and services and
- Remove unnecessary regulatory barriers to online learning (keating and Thompson, 2001)

Australia has developed a strategic plan for achieving its flexible learning vision in vocational education and training. This plan is outlined in the Australia flexible learning framework for the national vocational education and training system 2000-2005. This plan address five area of strategic importance:

1. **Creative, capable people**: to build a critical mass of TVET staff that can apply flexible learning
2. **supportive technological infrastructure**: to ensure the availability of ICTs and necessary connectivity to achieve a national TVET, which is accessible to all
3. **world- class online content development application and services**: to assist the Australian TVET system to maintain and expand its share of the training market within Australia and internationally
4. **Enabling policies**: to ensure that policies and protocols facilitate uptake and usage of flexible learning in TVET

Many training packages with strong emphasis on ICT-mediated (Computer –based training, online learning, Video conferencing) learning have been developed for the TVET sector. The college network in Adelaide makes extensive use of video conferencing to eliminate unnecessary travel across campuses. Videoconferencing is also used in Queensland to train personnel for the hospitality industry. Australia is experimenting with the use of Asia Space, a point-to-point satellite service for online learning. This system has the capacity to deliver data to fixed and mobile locations without phone (Tapsall and Ryan, 1999). The state of Victoria is planning to launch technical and further education (TAFE) online, which will be a web-based campus representing 30 technical and further education colleges. All states are implementing coordinated and centralized networked online system for information and student administration. Several states have also implemented learning centers to encourage the use of multimedia and Video conferencing. The types of formal delivery include:

- A mixture of online and face- to- face
- A mixture of online and print-based distance education materials, and
- Total online delivery (Brennan, Mc Fadden and Law)

The onkaparinga Institute of technical and further education in south Australia uses CD-ROMs in many of their courses, in fields ranging from community services and health, to horticulture and agriculture, to transport engineering. Both the practical and theoretical components of the course material were provided on the CD-ROMs. The materials are presented using text, audios, graphics and video and are geared to students who prefer less text, and more user-friendly and interactive presentations including diagrams, photographs and video.

Some of the modules are developed on the CD-ROMs are being used in the actual workplace where the computers are located at the end of workbench and provide step-by – step instruction for specific tasks.

Australia has also some exemplary online training initiatives in the private sector. For example, Quantas Colleges online was established to service 30,000 employees who are unable to attend face to face training because of their shift work and travel. The rapid growth ICT- Mediated learning in Australia has been fuelled by the reluctance of employers to release trainees during working hours (Tapsall and Ryan, 1999).

# Chapter Three

# 3. Research Design and Methodology

## 3.1 Research Method

The purpose of this study was to assess the utilization of information communication technology in the selected government TVET colleges in Addis Ababa. Descriptive survey method was employed to explore the issue since the approach enables the researcher to identify the current status and the prevailing constraints that need to be alleviated and to enhance the utilization of information communication technology in the selected TVET colleges in Addis Ababa. Thus, in describing the existing level of utilization of ICT in TVET colleges, the method was found to be relevant and convenient.

## 3.2 Sources of Data

The data for the study were obtained from both primary and secondary sources. The primary data sources were deans, department heads, teachers and students. These sources helped the researcher acquire first hand information and to draw valid inferences. The data from deans and assistant deans were collected through interview. TVET college teachers were selected because of their direct involvement in the utilization of ICT and, students were selected for the reason that they were mainly the target groups of the program. Secondary sources of data were documents, such as educational and training policy of Ethiopia, TVET strategy, classroom procedures, and Teachers' teaching materials.

## 3.3 Sample Size and Sampling Techniques

In Addis Ababa, six government technical and vocational and training (TVET) colleges are located in different sub-cities. The sources of the data were representative of the six TVET colleges. Out of the six TVET colleges, three colleges were selected using purposive sampling technique. This study deals with three senior government's Technical and Vocational Training Colleges in Addis Ababa because these senior TVET colleges are assumed to have had better experiences in the application of ICT.

Sampling is a procedure in selecting a part of a population on which research can be conducted, which ensures that conclusions from the study can be generalized to the entire population (Cohen,2005 ). For varieties of data sources the researcher is obliged to employ purposive, stratified and simple random sampling technique to select samples from selected government TVET colleges.

As it is mentioned above, in Addis Ababa there are six TVET government Colleges. Out of which three colleges were selected using purposive sampling technique. Stratified sampling was employed to select students by their respective field of studies, while purposive sampling was employed to select deans. Regarding the student respondents, level 2, level 3, level 4 students were considered in the study, as level 1 except IT students are not made to take ICT course because of the revised TVET education policy. In order to ascertain reasonable representation, Cohen and et al (2005) suggest, 10% of male teachers and students, and 10% female students and teachers were taken for the study.

From the selected colleges all the deans and assistant deans were taken using purposive sampling technique to participate in the study.

**Table 1: List of TVET Colleges with total number of students' and teachers' population and sample size**

| No | Name of TVET College | Number of Students | | | Sample Size | | | Number of Teachers | | | Sample Size | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | F | Total | M | F | Total | M | F | Total | M | F | Total |
| 1 | Entoto TVET College | **1094** | **952** | **2046** | **109** | **95** | **204** | **142** | **41** | **183** | **14** | **4** | **18** |
| 2 | General Wingate TVET College | **942** | **491** | **1433** | **94** | **49** | **143** | **138** | **25** | **163** | **13** | **3** | **16** |
| 3 | Tegbared TVET College | **1250** | **769** | **2019** | **125** | **77** | **202** | **100** | **23** | **123** | **10** | **2** | **12** |
| | Total | **3286** | **2212** | **5498** | **328** | **221** | **549** | **380** | **89** | **469** | **37** | **9** | **46** |

## 3.4 Instruments of Data Collection

In order to get the broader picture of ICT utilization an in-depth study is required. So, understanding the existing system was the first step to achieve the pre-stated objectives. Thus, to gather data from different sources, the researcher used questionnaire, interview and personal observation.

### 3.4.1 Questionnaire

Questionnaires were developed after intensive review of relevant literatures for the research topic. The questionnaires were designed to address to meet the objectives of the study. Two types of questionnaires were used for data collection from teacher and students. This is to get different views from different perspectives of respondents about the utilization of information communication technology. The questionnaires included mainly closed-ended questions and a few open-ended item. In the open ended questions, the participants were required to respond in writing, where as, closed-ended questions had options, which were determined by the researcher.

### 3.4.2. Interview

Beside the questionnaire, interview was employed to investigate the utilization of information communication technology in the selected government TVET colleges in Addis Ababa. The interviewees were deans and assistant deans of the colleges. The interviews were conducted by speaking to each interviewee face to face. The interview guide questions were seven open-ended items designed for the purpose. The interviews were administered in "Amharic" language in order to communicate better. Then, the researcher translated the responses in to English.

### 3.4.3 Observation

In order to assess the actual utilization of information communication technology in the three selected government TVET colleges, laboratories, teachers' qualifications, availability of the technologies were observed using an observation checklist. The observation was done to get factual information about institutional facilities that were in use for utilization of information communication technology.

## 3.5 Method of Data Analysis

After collecting data from respondents, descriptive statistics tools were employed for presenting and analyzing the data in the study. Data from students and teachers questionnaires and observation were tallied, organized and analyzed using frequency counts and percentage. Percentage was used mainly to make the figure easily understandable. Descriptive analysis was conducted for each case and reported. The data drawn from interview were analyzed qualitatively and used to supplement the quantitative data.

# Chapter four

## Presentation and Analysis of the data

The questionnaires were prepared for students and teachers of TVET Colleges were distributed to 549 students (Entoto 204, General Wingate 143 and Tegbared 202) and out of which, 535(97%) (Entoto 199, General Wingate 141, Tegbared 195) were filled and returned. On the other hand, 46 questionnaires (Entoto 18, General Wingate 16 and Tegbared 12) were distributed to the teachers of the TVET Colleges and 46(100%) have been filled and returned.

For the ease of understanding of the analysis of the results are used tables and statistical tools that are helpful to analyze and interpret the collected data.

### 4.1 Characteristics of Respondents

Based on the response obtained from the participants of the study, background characteristics like Sex, Age, Service year and Educational levels of the participant of the study were asked the following table shows the demographic characteristics of the teachers.

**Table 2**: Demographic Characteristics of teachers participated in the research

| No | Items | | No of teachers | Percentage |
|---|---|---|---|---|
| 1 | Sex | Male | 37 | 80.4 |
| | | Female | 9 | 19.6 |
| | | **Total** | **46** | **100** |
| 2 | Age | 30 or below | 24 | 52.2 |
| | | 31-50 | 15 | 32.6 |
| | | Above 50 | 7 | 15.2 |
| | | **Total** | **46** | **100** |
| 3 | Service year | 1 – 5 | 22 | 47.8 |
| | | 6 – 10 | 6 | 13.1 |
| | | 11 – 15 | 7 | 15.2 |
| | | 16 and above | 11 | 23.9 |
| | | **Total** | **46** | **100** |
| 4 | Educational level | Diploma | 1 | 2.2 |
| | | BA./B.SC/BED | 39 | 84.8 |
| | | MA/MSC/MED | 6 | 13.0 |
| | | **Total** | **46** | **100** |

As indicated in table 2 a total of 46 (100%) teachers were involved in the study. Out of which 37 (80.4%) were male and 9(19.6%) were female though the number of females is low, the data was collected from both male and female teachers.

Regarding teachers Age, 24 (52.2%) was found in the Age category of 30 or below and 15(32.6%) of teachers age were between 31-50 years, while the remaining Age 7(15.2%) of teachers above 50. The data showed that more of respondent teachers age were below 30. This could enable the teacher to carry out their tasks with eager and assume responsibility to solve problems.

When we see the service years of the teacher respondents, 22(47.8%) of them have served between 1 to 5 years, 6(13.1%) of them have served between 6 and 10, 7(15.2%) of them have served between 11 and 15 years, while the remaining 11(23.9%) of them have served above 16 years in the teaching profession. Teaching experience is helpful in managing the class room atmosphere, how to plan the training from beginning to end the way how to evaluated students' activities. The training staffs with in TVET institutes need to be well qualified in both their area of specialty and pedagogical skill and have sufficient relevant experience (UNESCO, 1997). With reference to service year/experiences, 47.8% and 23.9 of the teachers have served 1-5 and 16 and above respectively. The different age spectrum could help the younger staff members to share experiences from the old.

With regard to the teacher respondents' educational level, qualification i.e. 39(84.8%) were first degree holders, 6(13.0%) were second degree holders and one (2.2%) with diploma. This conditions are fulfill the educational requirements as per ministry of education's standard (MOE, 2004: 43), which state instructors ought to have a minimum of first degree to teach in the middle level technical and vocational training center. The suggestion is given base on UNESCO's (1976:21) recommendation for the teaching staff of TVET program, which is stated follows:

> *The teaching staff for the TVET should possess either a degree or a high vocational education qualification in an appropriate field and should have*

*industrial or construction or comparable experiences in their particular discipline"*

**Table 3**: Demographic Characteristics of students' participated in the study

| No | Item | Alternative | No of Respondent Students | |
|---|---|---|---|---|
| | | | No | Percentage |
| 1 | Sex | Male | 312 | 58.3 |
| | | Female | 223 | 41.7 |
| | | **Total** | **535** | **100** |
| 2 | Age | 20 or below | 420 | 78.5 |
| | | 21 – 25 | 96 | 17.9 |
| | | 26 – 30 | 10 | 1.9 |
| | | 31 or above | 9 | 1.7 |
| | | **Total** | **535** | **100** |
| 3 | Major field of training | Office Administration and Secretarial science | 54 | 10.1 |
| | | Accounting | 67 | 12.5 |
| | | Information Technology Support and System Assistance | 179 | 33.5 |
| | | Human Resource | 25 | 4.7 |
| | | Purchasing and Supply Management | 6 | 1.1 |
| | | Drafting | 10 | 1.9 |
| | | Hotel Management | 7 | 1.3 |
| | | Surveying | 5 | 0.9 |
| | | Web and Multimedia Technology | 115 | 21.5 |
| | | Marketing | 4 | 0.7 |
| | | Art and Music | 3 | 0.6 |
| | | Aesthetics | 2 | 0.4 |
| | | Hard ware and networking technology | 58 | 10.8 |
| | | **Total** | **535** | **100** |
| 4 | Level of Learning | Level one | 8 | 1.5 |
| | | Level two | 49 | 9.2 |
| | | Level three | 128 | 23.9 |
| | | Level four | 350 | 65.4 |
| | | **Total** | **535** | **100** |

As shown in Table 3, a total of 535 students were involved in the study. Out of which 312(58.3%) were males and 223(41.7%) were females. The data reveal the existence of discrepancy between males and females students in number from the sample population to participate in the study.

Regarding students' age, 420(78.5%) was found in the age category of 20 or below. The data showed that almost all of the respondents were found to be in the appropriate age to fit the respective educational level.

With regard to the major field of training, Information technology support and system assistance, web and multimedia technology, Accounting and hard ware and networking technology 179(33.5%), 115(21.5%), 67(12.5%) and 58(10.8%) fields of training respondent students respectively were considered. Finally, regarding level of learning, 350(65.4%) of the respondent were level four students, 128(23.9%) of the respondents were level 3 students 49(9.2%) and 8(1.5%) of the respondents indicated that they were level two and level one students respectively.

## 4.2 Utilization of ICT Resources

In the survey questionnaire participants of the study were asked to point out utilization of ICT resources to facilitate their teaching learning activities. The respondents were asked their utilization of computer and duration of ICT utilization for teaching purpose. The following table shows the utilization of ICT resources

**Table 4:** The Utilization of ICT Resources

| No | Items | Alternative | Teachers | % |
|---|---|---|---|---|
| 1 | Do you use computer as a teaching tool? | Yes | 45 | 97.8 |
| | | No | 1 | 2.2 |
| | | **Total** | **46** | **100** |
| 2 | How long have you been using computer? | Less than one year | 4 | 8.7 |
| | | 1 – 3 years | 10 | 21.7 |
| | | 4 – 6 years | 14 | 30.4 |
| | | More than 6 years | 18 | 39.2 |
| | | | **46** | **100** |

As indicated in item one of table 4 above, (97.8%) of the respondents replied that they used computer as a teaching tools and (2.2%) of the respondent were not using computer as a teaching tools. This shows that almost all teachers use computer as teaching tools for the respective courses they offer.

Regarding item 2 of Table 4, (8.7%) of the respondents replied that they utilized computer less than one year, 10(21.7%) of the respondents indicated that they utilized computer 1 to 3 years. (30.4%) and (39.2%) of the respondents indicated that they used computer 4 to 6 years and more than 6 years respectively. This shows that majority of the teachers of the colleges under study had utilized computer for a long period of time or the majority of teachers of the TVET Colleges utilized ICT resources as a teaching tool for a long period of time. This indicated that the utilization of modern information communication technology (ICT) resourses to TVET Colleges and testing their TVET delivery was an important tool for enhancing access and quality in TVET education and for developing their teaching opportunities and through utilization of ICT resources, teaching and learning as well as testing different technical and vocational materials at a lower cost.

### 4.3 Teachers ICT Skills.

Participants of the study were asked to point out their level of ICT skill. Table 5 summarizes the result of the survey.

**Table 5:** Teachers' ICT skills

| ICT Skills | Excellent | | V. good | | Good | | Fair | | No capability | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | No | % | No | % |
| Word processing | 31 | 67.4 | 11 | 23.9 | 4 | 8.7 | - | - | - | - |
| Spread sheets | 22 | 47.8 | 6 | 13.0 | 7 | 15.2 | 7 | 15.2 | 2 | 4.3 |
| Presentation Tools (power point) | 29 | 63.0 | 8 | 17.4 | 2 | 4.3 | 3 | 6.5 | 3 | 6.5 |
| Internet browsing | 24 | 52.0 | 15 | 32.6 | 4 | 8.7 | 3 | 6.5 | - | - |
| Audio Conferencing | 9 | 19.6 | 2 | 4.3 | 11 | 23.9 | 9 | 19.6 | 14 | 30.4 |
| Audio Graphics | 7 | 15.2 | 1 | 2.2 | 5 | 10.9 | 10 | 21.7 | 13 | 28.4 |
| Video Conferencing | 6 | 13.0 | 3 | 6.5 | 8 | 17.4 | 16 | 34.8 | 12 | 26.1 |
| Web based Design | 8 | 17.4 | 10 | 21.7 | 9 | 19.61 | 6 | 13.0 | 10 | 21.7 |
| Data base Management | 12 | 26.1 | 8 | 17.4 | 11 | 23.9 | 7 | 15.2 | 8 | 17.4 |
| Programming | 10 | 21.7 | 7 | 15.2 | 14 | 30.4 | 3 | 6.5 | 11 | 23.9 |

As indicate in Table 5, the skills of teachers in ICT shows that, word processing, , Internet browsing, presentation tools (power point) and spread sheets skills rated 91.3%, 84.6%, 80.4%, 60.8% respectively with excellent and very good skills. The findings from the survey of information communication technology skills, reveal that almost all teachers have excellent and competent skill in basic word-processing, Internet browsing, presentation tools (power point) and spread sheets. Whereas, they have the less competency in video conferencing, Audio graphics, Web based design, Audio conferencing, Programming and Data base management. As indicated in the table, teachers had the least competency in Video conferencing.

### 4.4 Students ICT Skills

Participants of the study were asked to indicate their level or extent of ICT skills. The following table summarizes the result of the survey

**Table 6:** Students ICT skills

| ICT Skills | Excellent | | V. good | | Good | | Fair | | No capability | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | No | % | No | % |
| Word processing | 142 | 26.5 | 123 | 23 | 166 | 31 | 51 | 9.5 | 25 | 4.7 |
| Spread sheet | 73 | 13.6 | 72 | 13.5 | 161 | 30 | 74 | 13.8 | 89 | 16.6 |
| Presentation(Power point) | 107 | 20 | 111 | 20.7 | 157 | 29.3 | 67 | 12.5 | 53 | 9.9 |
| Internet browsing | 82 | 15.3 | 100 | 18.7 | 120 | 22.4 | 78 | 14.6 | 104 | 19.4 |
| Webpage design | 53 | 9.9 | 72 | 13.5 | 122 | 22.8 | 76 | 14.2 | 157 | 29.3 |
| Data base Management | 49 | 9.2 | 75 | 14 | 136 | 25.4 | 78 | 14.6 | 151 | 28.2 |

As indicated in table 6, word processing, Presentation (power point), Internet browsing and working on spreadsheet; the majority of the students under study reported that they were skilled better. i.e. 142(26.5%), 107(20%), 82(15.3%) and 73(13.6%) respectively. Whereas, students were not well skilled on webpage design and data base management. From these findings one can say that the students did not get sufficient training in some areas of information communication technology. The deans and assistant deans were asked and the interview result as well as the observation made indicated that the number of ICT equipment and space available in the Colleges' ICT services were not equal to the number of TVET students. So that, they spent more time while waiting for their turn for the ICT services. Internet traffic problems, slow processing speed that makes the gap between the request and response time is very wide and time consuming. The researcher observed students' ICT skills of the actual class room by using a checklist (see appendix 4). Therefore, students couldn't get sufficient training time in some areas of information communication technology services.

### 4.5 Reasons for using ICT skills by teachers

Concerning the purposes of the use of ICT skills in TVET Colleges under study the response obtained from respondents presented in Table 7 below.

**Table 7:** Reasons for the use of ICT skills by teachers

| Purposes of ICT skills For | Response | |
|---|---|---|
| | No | Rank |
| teaching specific lesson in various Subject | 37 | 4 |
| making presentation and lecture | 39 | 2 |
| preparing lesson | 37 | 4 |
| communication with student and teachers | 19 | 6 |
| preparing paper and teaching materials | 38 | 3 |
| administrative purposes | 14 | 8 |
| collecting handout and reference materials | 33 | 5 |
| down loading document from internet | 42 | 1 |
| e- learning | 14 | 9 |
| browsing journals | 17 | 7 |

As indicated in the above table, the reasons for using ICT skills is for down loading documents from internet, for making presentation and lecture, for preparing paper and teaching materials, for preparing lesson, for teaching specific lesson in various subjects, and for collecting handout and reference material were ranked in order the highest to the least having the teachers response number 42, 39, 38, 37, 37,and 33 respectively. From these findings, the purposes of the use of teachers ICT skills under study were sufficiently utilized in more areas of ICT skills. Whereas, teachers did not sufficiently utilize some areas of ICT skills in the selected government TVET Colleges. i.e. teachers of TVET Colleges were not ready to use some areas of ICT skills

## 4.6 Availability and Accessibility ICT Infrastructure in the TVET Colleges

Concerning the availability and accessibility ICT infrastructure for the utilization of the ICT in the selected TVET College under study the response obtained from respondents is presented Table 8 below.

**Table 8:** Availability and Accessibility of ICT Infrastructure

| No | Item | Available | | Not Available | |
|---|---|---|---|---|---|
| | | No of Respondent | % | No of Respondent | % |
| 1. | Over head projector | 294 | 55 | 203 | 37.9 |
| 2. | TV | 151 | 28.2 | 353 | 66 |
| 3. | VCD | 190 | 35.5 | 317 | 59.3 |
| 4. | VHS | 113 | 21.1 | 397 | 70.8 |
| 5. | DVD | 165 | 30.8 | 316 | 59.1 |
| 6. | Multimedia Projector | 177 | 33.1 | 299 | 55.9 |
| 7. | LCD Projector | 264 | 49.3 | 216 | 40.4 |
| 8. | Computer | 494 | 92.3 | 26 | 4.9 |
| 9. | Printer | 212 | 39.6 | 288 | 53.8 |

Keys: TV= Television, VCD= Video Compact Disk, VHS= Video Home System,
DVD= Digital Versatile Disk

As shown in Table 8, the majority of the respondents indicated that there were inadequacy of infrastructures, like TV, VCD, VHS, DVD, Multimedia projector and printer in the selected TVET Colleges under study. Whereas, in the same table most of the respondents

indicated that adequacy the availability of facilities like computer and the barely adequate availability of facility like over head projector. Thus, the findings
indicate that the appropriate ICT infrastructure were in limited supply, access to all students were low. In addition, interviews conducted with deans and assistant deans of TVET Colleges about infrastructure and its accessibility indicated that ICT infrastructure and accessibility are not equal to the number of students in different colleges and fields of
training. Some of the available ICT equipment were not maintained and even some of the existing ones do not work properly. Moreover, the observation also supported the questionnaires and interview findings results. Observation was conducted on the availability and accessibility of ICT infrastructure particularly in the class rooms and laboratory utilization. Therefore, in all sample TVET colleges, the buildings were not attractive to handle the ICT equipment in computer laboratory, workshop etc. There is lack of extensive retrofitting to ensure proper electrical wiring, in proper network cable line, lack of cooling and ventilation and also lack of safety and security. In addition, few telephone line, few fax machines, no wireless telephone technology, poor telecommunication infrastructure, lack of technical support specialist who were used in installation, operation, and maintenance of ICT, lack of technical equipment including software and network administrator are the major problems. However, in the colleges there were different training workshop, which had few recent type desk top computer, few VCD players, few educational video dec, inadequate laptop computer, few printers, few scanners, few UPS in computer room and library and workshops. The colleges that were working with different stack holders are Entoto TVET college with Korea Embassy and Tegbared and General wingate with Italian cooperation; and they donated computers, ICT equipment funds and technical support for ICT infrastructure.

## 4.7 Frequency of Utilization of ICT Tools

Participants of the study were asked to point out how the frequency of using ICT tools for different purposes. Table 9 shows the survey result.

**Table 9:** Frequency of use of ICT tools by the respective colleges

| No | Item | Every day | | Twice a week | | Once a week | | Never | |
|---|---|---|---|---|---|---|---|---|---|
| | | No | % | No | % | No | % | No | % |
| 1. | Teaching/Learning specific subject | 17 | 37.0 | 15 | 32.6 | 8 | 17.4 | 6 | 13 |
| 2. | Teaching computer skills | 13 | 28.3 | 14 | 30.4 | 10 | 21.8 | 9 | 19.6 |
| 3. | Making presentation lecture class and work shop | 12 | 26.1 | 17 | 37 | 9 | 19.4 | 8 | 17.4 |
| 4. | Preparing lesson | 24 | 52.2 | 13 | 28.3 | 6 | 13 | 3 | 6.5 |
| 5. | Communicating with other teachers | 10 | 21.7 | 12 | 26.1 | 12 | 26.1 | 12 | 26.1 |
| 6. | Communicating with students | 5 | 10.9 | 12 | 26.1 | 9 | 19.6 | 20 | 43.5 |
| 7. | Preparing administrative reports | 7 | 15.2 | 4 | 8.7 | 16 | 34.8 | 19 | 41.3 |

As shown in the above table the frequency of utilization of ICT tools, 52.2% of the participant of the study utilize ICT tools for preparation of their lessons every day, 32.6% of participants of the study use ICT tools for making presentation lecture class and work shop twice a week, 34.8% of participant indicated that they use ICT tools for their preparation of administrative report once a week, 43.5% of the participants point out that they never used ICT tools for communicating with their students.

The frequency of use of ICT tools or to use its resources by its respective users to asserted that the frequency of use of ICT tools, the above data show that they carry

out every day. Majority of teachers were using ICT tools for preparing lesson and teaching/learning specific subject. Whereas, more number of teachers never use ICT tools for communicating with students. On the other hand, more number of respondents confirms that they were using ICT tools for making presentation in lecture in class and workshop. Generally, from this finding TVET teachers were able to integrate ICT in TVET delivery and to encourage and guide students in the use of the new learning technologies frequently.

### 4.8Teachers' and Students' Internet Access

**Table 10:** Teachers and students Internet access in the college

| No | Item | Alternative | Number of Respondents | | | |
|---|---|---|---|---|---|---|
| | | | Student | | Teachers | |
| | | | No | % | No | % |
| 1 | Internet Access | Yes | 172 | 32.1 | 39 | 84.8 |
| | | No | 363 | 67.9 | 7 | 15.2 |
| | | **Total** | **535** | **100** | **46** | **100** |
| 2 | How often use internet | Once a month | 32 | 6 | 3 | 6.5 |
| | | Every day | 35 | 6.5 | 20 | 43.5 |
| | | Once a week | 24 | 4.5 | 3 | 6.5 |
| | | Several time a week | 42 | 7.9 | 19 | 41.3 |
| | | Never | 402 | 75.1 | 1 | 2.2 |
| | | **Total** | **535** | **100** | **46** | **100** |

As observed in Table 10 item 1 of the table, teachers and students Internet access in TVET Colleges, the respondents reported differently. The majority of the students i.e. 363(67.9%) reported inadequacy of the Internet access. On the other hand, the majority of teachers 39(84.8%) reported the existence of adequate access to use Internet in their colleges.

Regarding item 2 of the same table, respondents were asked to indicate the frequency in which 35(6.5%) of student respondents and 20(43.5%) of teacher respondents replied that

they utilize internet every day, 42(7.9%) of student respondents and 19(41.3%) of teacher respondents indicate that they utilized several time a week, 32(6%) of student respondents and 3(6.5%) of teachers respondents and 24(4.5%) of students respondents and 3(6.5%) of teacher respondents indicated that they use Internet once a month and once in a week respectively. Whereas, 402(75.1%) of student respondents and 1(2.2%) of teacher respondents indicated that they never utilize Internet. This indicates the Internet access in the TVET Colleges, the majority of student respondent reported the inadequacy of internet access and from the open-ended questionnaire of students; the researcher noted that there was lack of sufficient Internet access. This problem is one of their major draw backs to adequately exploit information. On the other hand, the majority of teacher respondents reported the existence of adequate access to use Internet in their colleges.

## 4.9 ICT Training

ICT training enables users to effectively use information communication technology. Participants of the study were asked whether they have taken ICT training or not. The result of the survey is summarized below.

**Table 11:** Teachers focused training on ICT and the main reasons for attending ICT training

| No | Item | Alternative | Number of despondent | % |
|---|---|---|---|---|
| 1 | Have you taken training on ICT? | Yes | 29 | 63 |
| | | No | 17 | 37 |
| | | **Total** | **46** | **100** |
| 2 | If yes, what is the main Reason for attending ICT training? | Career education | 11 | 37.93 |
| | | Financial | 7 | 24.14 |
| | | Training required | 11 | 37.93 |
| | | **Total** | **29** | **100** |

As it can be observed from item 1 of table 11, 29(63%) of respondent said that they took ICT training. Whereas, 17(37%) of the respondents said that they didn't take any training of ICT.

Regarding item 2 of Table 11, those respondents who attended ICT training were requested the reason for attending ICT training. Their response were presented in Table 11 and about 11(37.93%) of the respondents indicated that the main reason they attending ICT training for training required in their colleges. Those who attended ICT training for career education were 11(37.93%), 7(24.14%) of the respondents reported that the main reason they attending ICT training for financial purpose. From these findings one can say that the majority of the respondents were took ICT training. From this, it is possible to say that most teachers have taken training regarding utilization of latest information communication technology. Moreover, from the interview of the colleges Deans and assistant Deans the researcher noted that there were ICT trainings that to filling the skill gap and on the competence of the teachers.

## 4.10 Factors influencing the use of ICT in TVET Colleges

There are different factors that can hinder the utilization of ICT in TVET colleges. To assess the common factors which were expected to have influence on the utilization of ICT, opinions and responses were gathered from different participants of the study.

**Table 12:** Factors as barriers to the increased use of ICT

| No | Variables Factors | Strong Agree "5" | | Agree "4" | | Undecided "3" | | Disagree "2" | | Strongly Disagree "1" | | Average Mean | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No | % | No | % | No | % | No | % | No | % | | |
| 1 | Cost of purchase of hard ware | 12 | 26.1 | 18 | 39.1 | 4 | 8.7 | 4 | 8.7 | 6 | 13 | 3.59 | 2 |
| 2 | Cost of technical support for training of teachers | 16 | 34.8 | 15 | 32.6 | 2 | 4.3 | 4 | 8.7 | 6 | 13 | 3.72 | 1 |
| 3 | Poor telecommunication infrastructure | 9 | 19.6 | 15 | 32.6 | 6 | 13 | 8 | 17.4 | 5 | 10.9 | 3.35 | 3 |
| 4 | Lack of text book that integrate the use of ICT | 7 | 15.2 | 8 | 17.4 | 6 | 13 | 10 | 21.7 | 12 | 26.1 | 2.72 | 8 |
| 5 | Lack of training of teachers on how to use of ICT | 9 | 19.6 | 18 | 39.1 | 3 | 6.5 | 6 | 13 | 7 | 15.2 | 3.37 | 4 |
| 6 | High internet service charge | 15 | 32.6 | 3 | 6.5 | 7 | 15.2 | 8 | 17.4 | 10 | 21.7 | 3.12 | 6 |
| 7 | Breakdown of ICT equipment | 6 | 13 | 10 | 21.7 | 8 | 17.4 | 9 | 19.6 | 7 | 15.2 | 2.98 | 7 |
| 8 | Absence of ICT plan | 11 | 23.9 | 7 | 15.2 | 14 | 30.4 | 5 | 10.9 | 5 | 10.9 | 3.33 | 5 |
| | | | | | | | | | | | | Grand Mean 3.27 | |

As indicated in Table 12 cost of technical support for training of teachers, cost of purchase of hard ware, poor telecommunication infrastructure, lack of training of teacher's use of ICT, absence of ICT plan, and high internet service charge were ranked high from first to sixth level having average mean of 3.72, 3.59, 3.35, 3.37, 3.33 and 3.12 respectively.

These are the major factors that affect the utilization of information communication technology in the selected TVET Colleges in Addis Ababa. According to the students the inadequacy of time to practice in computer lab, poor supply of facilities such as computer rooms etc. shortage of software, problem with Internet access, inadequacy of financial support to ICT, large number of students in computer laboratory, and students poor background information communication technology are the major factors.

In addition to this, the interview with the colleges Deans from the open ended questionnaires of teachers and students and personal observation; there were many factors that act as barriers to increase the utilization of ICT in the selected TVET Colleges. Some of the major problems faced in the utilization of ICT teachers were indicated, there was lack of broad band Internet access, maintenance problems, there were insufficient trainings for teachers, lack of Internet access for students, lack of technical support for all administrative and teaching staff, insufficient time to practice ICT and large class size. The deans and assistant deans have also indicated the problems that they faced in the utilization of ICT in the TVET Colleges which include, budget scarcity shortage of ICT equipment, shortage of ICT training, inadequate ICT infrastructure facilities, i.e. the number of ICT equipment, space available in the Colleges, Internet traffic problems, lack of sufficient Internet training, Power failure shortage of modern and latest computers, shortage of Internal training (short term) are the colleges society members on ICT programs.

# Chapter Five

## Summary, Conclusions and Recommendations

The chapter presents the summary, conclusions and the recommendations part of the study. It first attempts to summarize the most important points of the study, including major findings as well as the conclusions drawn from the major findings. Finally, it presents the recommendations forwarded by the researcher as possible solutions for the problems identified through the study with reference to the basic research questions raised in the first chapter.

### 5.1 Summary

The study was carried out to explore the utilization of information and communication technology (ICT) in the selected government TVET colleges in Addis Ababa. Namely, Entoto, Tegbared and General Wingate TVET colleges. The following basic research questions were formulated for investigation.

- Are teachers sufficiently aware of ICT in TVET colleges?
- To what extent are TVET college staffs utilize ICT?
- What kind of attitude do TVET students have towards ICT?
- What ICT resources are currently available in TVET Colleges?
- What are the major problems that affect the utilization of ICT in TVET colleges?
- To what extent do TVET Colleges Utilize ICT for managerial services?

Descriptive survey method was employed where questionnaires, interviews and observation were used as data gathering instruments.

Quantitative descriptive survey design was used and it was conducted in selected government TVET colleges in Addis Ababa. To this end, a sample 549 students and 46 teachers were selected using stratified, purposive and simple random sampling techniques respectively. The researcher used questionnaire, interview and observation checklist to

materials, preparing lessons, making presentation and lecture and teaching specific lesson in various subjects. Whereas, some of the teachers' responses showed that they were not using ICT skills for administrative purpose, e-learning and browsing journals.

8. The majority of the student respondents indicated that there were inadequacy of the availability of infrastructure, ICT equipment and facilities like TV, VCD, VHS, DVD, multimedia projector and printer. Whereas, most of the respondents indicated that the adequately available are ICT facilities such as computer and over head projector. Thus, the finding indicates that the appropriate ICT facilities and equipment were in limited supply and access to all students was low in computer laboratory, workshops and libraries.
9. Most of the teacher respondents indicated that they were using ICT tools for preparation of their lessons every day. About 37% of participants of the study make use of ICT tools for presentation of lecture classes and workshop twice a week, 34.8% of the participants indicated that they use ICT tools for the preparation of administrative report once a week.
10. Teachers' and students' Internet access in the selected government TVET colleges, were reported differently. The majority of the student respondents (67.9%) reported inadequacy of Internet access. On the other hand, the majority of teacher respondents (84.8%) reported the existence of adequate access to use Internet in their colleges.
11. The majority of teachers (63%) had taken training program regarding the utilization of information communication technology and the main reason for they attending ICT training was to fill the skill gap that was observed on the competence between them.
12. Cost of the technical support training of teachers, cost of purchase of the hard ware, poor telecommunication infrastructure, absence of ICT plan, Internet service charge, students' shortage of time to practice in computer laboratory, poor supply of ICT facilities and equipment, shortage of education software in different fields of training in their workshop, students' Internet access problem, inadequacy of financial support to ICT,

Internet traffic, maintenance problem were found out to be the major factors affecting utilization of information communication technology in the selected government TVET colleges in Addis Ababa.

## 5.2 Conclusions

The study has attempted to assess the utilization of information communication technology in selected governments TVET colleges of Addis Ababa. Based on the findings of the study, the following conclusions are made:

1. Almost all of the teachers of the selected colleges were using computer as a teaching tool. This shows that almost all the teachers were using computer as a teaching tool for the course they offer.
2. Most of the teachers of the selected government TVET colleges have been utilizing computer for more than 6 years. Hence, the majority of the TVET teachers had relatively adequate experience in the application of ICT.
3. Almost all teachers and students in the selected government TVET colleges have excellent skills in computer and were competent in some areas of information communication technology skill like word processing, presentation (power point) and working on spread sheet. From this, it can be concluded that the utilization of ICT among teachers and students was adequate.
4. ICT training time, available space and computer are not enough when compared to the number of the students in the selected government TVET colleges. This implies that shortage of computers hinder students from using ICT frequently.
5. Most teachers of the selected government TVET colleges focused on using ICT skills for downloading documents from Internet, for making presentation and lecture, preparing paper and teaching materials and collecting handout reference materials. From this, it can be concluded that teachers ICT skills were sufficiently utilized in more areas of ICT.

6. There are available information communication technology infrastructures in all the three government TVET colleges. But, the availability and accessibility of infrastructure to TVET educational facilities, and student Internet access seem to be inadequate.
7. The major factors that have affected the utilization of ICT are : inadequate financial support from government and donors, inadequacy of TVET ICT educational facilities and poor telecommunication infrastructure, inadequacy of time for students' utilization of ICT in laboratory and workshop, maintenance problem, students' Internet access problem and shortage of software.

## 5.3 Recommendations

On the bases of the findings obtained and conclusions drawn, the following suggestions are forwarded so as to promote the utilization of information communication technology in the selected government TVET colleges in Addis Ababa.

1. The Ethiopian Government, different donors and stakeholders should closely work together and allocate sufficient budget to TVET colleges' information communication technology infrastructure and ICT training facilities.
2. The TVET colleges' administrators should facilitate in-service training for teachers and create awareness concerning the potential and services of ICT.
3. The city government should develop and improve the existing ICT infrastructure, computing facilities through the acquisition of more powerful personal computers with higher storage capacity, high speed and memory size and related accessories, upgrade the server processors speed in order to overcome the Internet access problem and should allocate enough time to students' practice in laboratory and workshop in the colleges.
4. TVET Colleges' information communication materials and facilities have their own great role in facilitating the utilization of ICT. To use these materials and facilities properly, the concerned body of the colleges need to know the nature of each

department. Thus, the donors and stakeholders need to assign ICT technicians for each college. This helps to control and maintain different ICT equipment and material not to fail frequently.

5. As this study is very limited to come up with all problems being featured in the current utilization of ICT, furthermore, in depth study should be carried out on the same area to identify or provide possible answers to other problems uncovered in this study.

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# Appendices

## Appendix -A

**Addis Ababa University School of Graduate Studies**

**College of Education and Behavioral Studies**

**Department of Business Education**

**A questionnaire to be filled in by teachers of Technical and Vocational Education and Training (TVET) Colleges.**

Dear Respondent,

The purpose of this questionnaire is to collect data for a research entitled "Utilization of Information Communication Technology (ICT) in the Selected Government Technical and Vocational Education and Training (TVET) Colleges of Addis Ababa". Your cooperation in providing relevant and candid information is highly important for the success of the study. Please be frank and respond to each item as accurate as you can.

Instruction:-

- No need of writing your name. The data will be kept confidential.
- Where alternative answers are given put "✓" mark in the box to indicate your answer. Please, make it short and clear in responding to the open ended question.

Thank you in advance for your cooperation

## Part I Background Information

1. Name of the TVET College _____
2. Sex Male ☐ Female ☐
3. Age A) 30 or below ☐ B) 31 – 50 ☐ C) above 50 ☐
4. Total number of services in years _____
5. Education level

   A. Diploma ☐ C) MA/MSC/MED ☐

   B. BA/BSC/BED ☐ D) PHD ☐

   E) Other ☐

## Part II General Questions

6. What is the average number of students in your class(s)?

   ☐ 20-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ above 60

7. Which stream do you teach?

   ☐ Computer/Information science stream

   ☐ Vocational stream

   ☐ Technical Stream

   ☐ Natural /Social sciences

   ☐ Aesthetics

   ☐ Music and Arts

   If any, please specify_____

8. Do you use computer as a teaching tool?

   ☐ Yes ☐ No

If your answer is "No" give reason _____

9. If your answer is "yes" in item number 8, for which subject do you use computer as a teaching tool? You can have more than one choice.

   ☐ Computer/Information science ☐ Aesthetics

   ☐ Vocational Education ☐ Natural Science

   ☐ Technical Education ☐ Social Science

   ☐ Music and Arts Other (Please specify) _____

10. Please mention the software that you use in your computer_____

11. For how long have you been using computer?

☐ Less than one year ☐ 4 – 6 years

☐ 1– 3 years ☐ More than 6 years

12. Have you taken any training on ICT?

☐ Yes ☐ NO

12.1 If "yes", please indicate it below

| Title of Training | Total Number of Hours | Level of Course | | |
|---|---|---|---|---|
| | | Basic | Intermediate | Advance |
| | | | | |
| | | | | |
| | | | | |

12.2 What is the main reason for attending ICT training?

☐ Career Enhancement ☐ Training Required

☐ Financial ☐ Other, specify_____

13. Please rate your ICT skills mentioned in the following table:

| ICT Skills | Excellent | Very Good | Good | Fair | No Capability |
|---|---|---|---|---|---|
| Word Processing | | | | | |
| Spread Sheets | | | | | |
| Presentation Tools(Power Point) | | | | | |
| Internet Browsing | | | | | |
| Audio Conferencing | | | | | |
| Audio Graphics | | | | | |
| Video Conferencing | | | | | |
| Web based design & conferencing | | | | | |
| Data base Management | | | | | |
| Programming | | | | | |

14. Please state for what purpose do you use the above mentioned ICT skills?

- ☐ For teaching specific lessons in various subject
- ☐ For making presentation and lecture
- ☐ For preparing lesson
- ☐ For communicating with students and teachers
- ☐ For preparing paper and teaching materials
- ☐ For administrative purposes
- ☐ For collecting handout and reference materials
- ☐ For down loading document from the Internet
- ☐ For e-learning
- ☐ For browsing Journals
- ☐ Other (please specify) _____

15. How often do you use ICT tools for the following purposes?

| | **Every day** | **Towice a week** | **Once a week** | **Never** |
|---|---|---|---|---|
| Teaching/ Learning specific subject | | | | |
| Teaching computer skills | | | | |
| Making presentation/lectures/class and work shop | | | | |
| Preparing lessons | | | | |
| Communicating with other teachers | | | | |
| Communicating with students | | | | |
| Preparing administrative reports | | | | |
| Other | | | | |

16. Where do you have the access to computer in your College?

☐ In my office ☐ In Library

☐ In Computer lab If any, please specify_____

☐ In Administrative office

17. For how many hours per week is computer accessible to you in your college?

☐ Less than two hours ☐ 6 – 10 hours

☐ 2 – 3 hours ☐ More than

☐ 3 – 6 hours

18. Do you use computer outside the school hours?

☐ Yes ☐ No

19. Do you have access to the Internet in the college?

☐ Yes ☐ No

20. How often do you use the Internet in the college?

☐ Once a month ☐ every day ☐ Several times a week

☐ Once a week ☐ Never

21. What type of ICT training and support are available in your college? Circle "yes" or "No" to indicate whether training is available. If used ,rate how effective you think.

| Type of training and support | How effective was it | | | | |
|---|---|---|---|---|---|
| | Used yes or no | Not effective | Somewhat effective | Very effective | Not sure |
| Informal, self though | Yes/No | | | | |
| Formal, workshop/seminar | Yes/No | | | | |
| Technical support | Yes/No | | | | |

22. Do you agree to the following factors as barriers to the increased use of ICT in your College?

Use "**5**" Strongly agree "**3**" Undecided "**1**" Strongly disagree

"**4**" Agree "**2**" Disagree

| Factors | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| Cost of purchase of hardware | | | | | |
| Cost of technical support for training of teachers | | | | | |
| Poor telecommunication infrastructure | | | | | |
| Lack of text book that integrate the use of ICT | | | | | |
| Lack of training of teacher's use of ICT | | | | | |
| High internet service charge | | | | | |
| Breakdown of ICT equipment | | | | | |
| Absence of ICT plan | | | | | |

23. What has been the most noticeable change in academic achievement in Your College that may be related to ICT use?

_____

_____

_____

_____

24. What do you think should have been done to reverse the existing problems of your college in relation to ICT use?

_____

_____

_____

_____

_____

**Appendix-B**

**Addis Ababa University School of Graduate Studies**

**College of Education and Behavioral Studies**

**Department of Business Education**

**A questionnaire is to be filled in by Students of Technical and Vocational Education and Training (TVET) Colleges.**

The purpose of this questionnaire is to collect the basic data for a research entitled "Utilization of Information Communication Technology (ICT) in the Selected Government Technical and Vocational Education and Training (TVET) Colleges of Addis Ababa". Your cooperation in providing relevant and candid information is highly important for the success of the study. please be frank and respond to each item as accurate as possible.

Instruction:

- No need of writing your name .The data will be kept confidential.
- Where alternative answers are given put "✓" mark in the box to indicate your answer. Please make it short and clear in responding to the open-ended question.

Thank you in advance for your cooperation

## Part I Background information

1. Gender

   ☐ Male ☐ Female

2. Age ☐ 20or below ☐ 21-25 ☐ 26-30 ☐ 31or above

3. Field of training_____

4. Currently,what is your level of learning?

   ☐ Level one ☐ Level three

   ☐ Level two ☐ Level four

## Part II General Questions

5. For how many years have you been using ICT?

   ☐ Less than one year ☐ 4 – 6 Years

   ☐ 1 – 2 Years ☐ More than 6 years

   ☐ 2 – 4 Years

6. Tick your choice by (✓) mark If you have/ If you have no access /,Or/If you use / ;If you don't use the following in your college work

| Items | Available | Not available |
|---|---|---|
| Over head projector | | |
| Television | | |
| Video Compact Disk(VCD) | | |
| Video Home System(VHS) | | |
| Digital Versatile Disk(DVD) | | |
| Multimedia Projector | | |
| LCD projector | | |
| Computers | | |
| Printers | | |

7. What are the subjects and classes you use computers and ICTs ?

☐ ICT subjects ☐ Technical subjects

☐ Vocational Subjects ☐ Social/natural Science subjects

☐ Art and M usic subjects ☐ Aesthetics Subject

If any, please specify_____

8. Indicate your level of skill in the use of the following :

| **Computer application** | **Excellent** | **Very Good** | **Good** | **Fair** | **No capability** |
|---|---|---|---|---|---|
| Word processing | | | | | |
| Spread sheet | | | | | |
| Presentation (power point) | | | | | |
| Internet browsing | | | | | |
| Web page design | | | | | |
| Data base management | | | | | |

9. Where do you use ICT in the college?

☐ In a computer lab ☐ I do not use ICT in college

☐ In the library other (Please specify) _____

☐ At home

10. If you use computer and related ICT, how many hours a week on an average are you using them for studies?

☐ Below one hour ☐ One hour ☐ Two hours ☐ Three hours

☐ Four hours and above

11. Do you have access to the Internet in the college?

☐ Yes ☐ No

## Appendix - D

### Addis Ababa University School of Graduate Studies

### College of Education and Behavioral Studies

### Department of Business Education

**Observation checklist to supervise the selected Government TVET colleges**

Name of the College _____

| No | Availability of ICT Equipment | Yes | No |
|---|---|---|---|
| 1 | Telephone | | |
| 2 | Fax Machine | | |
| 3 | VCD Player | | |
| 4 | Video Deck | | |
| 5 | Desktop Computer | | |
| 6 | Laptop Computer | | |
| 7 | Printer | | |
| 8 | Scanner | | |
| 9 | Network | | |
| 10 | Internet/E-mail | | |
| 11 | Internet/World Wide Web | | |
| 12 | Teleconferencing | | |
| 13 | Soft ware's available | | |
| 14 | Availability of UPS to computer rooms | | |

## Appendix - C

**Addis Ababa University School of Graduate Studies**

**College of Education and Behavioral Studies**

**Department of Business Education**

# Interview Guide

**Interview questions during survey of TVET Colleges**

1. What facilities are available to support ICT plan?
2. Does the facility have necessary infrastructure to support a significant increase in personal computer and servers?
3. Do the buildings have necessary air conditioning and room security?
4. Who is the major stake holder in teacher training programme?
5. What is their interest (political, personal, academic and economic) in the program?
6. What makes your college different from other sister colleges?
7. How will the level of technology and proficiency gained by students, teachers and staff be assessed?

12. How often do you use the Internet for surfing websites in college?

- ☐ Never
- ☐ Once a month
- ☐ Several times a week
- ☐ Daily
- ☐ Once a week

13. Please use the space below for your general comment regarding ICT use in your college.

_____

_____

_____

_____

14. What is to be done to solve the problems related ICT use in your college?

_____

_____

_____

_____

## DECLARATION

I, the undersigned, declare that this thesis is my work and that all sources of materials used for the thesis have been fully acknowledged.

Name: Ashenafi Abera

Signature: _____

Date: 18/04/11

This thesis has been submitted for examination with my approval as University advisor.

Name: Lemma Setegn

Signature: _____

Date: 18/04/11