



**The Role of Private Higher Education Institutions towards Strengthening ICT
in Ethiopia**

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Abstract

Development in Information and Communication Technology (ICT) has become a critical success factor for economic, political and social development. Those who have access to information at the right time with high level of accuracy could cope up with the underlying changes in market demands, new products and new technologies. Due to this, information has turned out to be the key resource. Information and Communication Technology has become the key technology. In spite of this fact, like many of the less developed countries, the development of ICT in Ethiopia is at its infant stage. One of the challenges in ICT development in Ethiopia is lack of human resource, which in turn is the result of lack of academic institutions in this area.

Unlike other training programs, this program presupposes substantial investment in ICT infrastructure for which public institution couldn't solely afford. Hence, although some of the public institutions like Addis Ababa University have shown significant developments in this regard, the demand for ICT training programs has persisted and has drawn the attention of PHEIs. As a result, a number of private colleges have launched training programs in this area. Therefore, this paper strives to pinpoint the role of PHEIs in promoting ICT development in Ethiopia. It attempted to assess the ICT training programs offered by some selected PHEIs together with their intake capacities. To achieve the stated objectives, the study utilized secondary and primary data from selected higher education institutions and analyzed the data through descriptive statistics.

In line with this objective, results of this study have shown that there is a high demand for ICT training programs although there is limited space for applicants in public institutions. For instance, out of the total 3,858 applicants for the 2004/2005 SIST (School of Information Science and Technology) program of the Addis Ababa University, only 10.4% of the total number of applicants have secured admission in both Computer Science and Information Science programs in the day as well as evening programs. Thus, the need for other alternative institutions seems a necessity. To this end, PHEIs are offering options and hence playing vital roles through filling the gap between the demand and provision of these training programs. The outcome of this study has also indicated that the growth of PHEIs is in favor of ICT training programs. This is confirmed through a consistent growth in the percentage share of enrolments in ICT training programs in the last four years in all the PHEIs covered in this study. Hence, it is plausible to conclude that PHEIs are playing a vital role in the struggle to transform the nation to the Information Society.

1. Background

1.1 Introduction

Human development proceeds in three stages; namely: agrarian, industrial and information society in their respective order. So, just as industrial society replaced agrarian society, the information society is replacing industrial society. In information society, which is today's modern society, the main activity is to produce information via research and development, to process information through studying and teaching, and finally to distribute information using communication technologies. As a result, information has become the key resource, and Information and Communication Technology (ICT) the key technology.

The development of information and communications technologies (ICT) in developed countries has brought an extra-ordinary growth of information. This information boom enables multinational companies to compete with changes in market demands, new products and new technologies, which in turn can boost the economy of a country, increase its efficiency and win global dominance.

The third world countries have difficulties to seek, to receive, to process and to produce information due to their limited capacity to manage information. The lack of appropriate information at the right time will result in low productivity, low quality research works, and waste of time to pursue information and even to do research, which actually had been done by others or, in other countries.

Ethiopia, as a developing country should have a great concern on this deficiency and efforts have to be made so that the digital divide could be reduced or there will be an economic recovery. In fact, it is a matter of survival. To this end, Ethiopia seems aware of the seriousness of the information technology gap, which could be confirmed by the fact that a number of measures are being taken that enables to launch and accelerate information production, transmission, management and handling of information.

ICT human resource development is one of the key factors that could significantly contribute to the development of communications and information technologies. Among other things, lack of skilled manpower in ICT is one of the factors that have hindered the development of ICT in Ethiopia.

Although computers are deployed in many of the public and private organizations, in most cases due to lack of skilled manpower, computers are being used for basic computing works like word-processing. This is to say that, in spite of the tremendous power of computers to process

information, many of these organizations are not utilizing their computer systems for high-end value-added applications like information systems (MIS, DSS), databases, personnel management systems, accounting and budgeting and so on. In this respect, results of a survey conducted have revealed that as much as 83% of the capacity of a PC is often underutilized (Lishan Adem 1999).

To meet this demand, public universities like Addis Ababa University are offering ICT training programs at diploma, degree and Masters levels. Moreover, apart from a number of private computer training centers mainly involved in the basic level training and a number of business organizations like the banks providing in-house and out-house computer training to their staff, the private sector involvement in this area is growing significantly. This could be witnessed by the fact that private colleges that provide ICT training programs are mushrooming and even the existing institutions are strengthening their ICT programs in intake capacity as well as a variety of programs.

1.2. Research Objectives

The purpose of this study is to assess the extent to which Private Higher Education Institutions are contributing towards strengthening ICT with particular emphasis on the ICT human resource development. Accordingly, the roles that have been played and will be expected from those institutions in this area will be thoroughly examined. It also strives to include reference to what works in similar circumstances, and to formulate its recommendations on that basis.

2. Research Methodology and Data Sources

This study made of primary and secondary data collected from five higher education institutions: four from the private sector while the other one is from the public sector. The sampling technique used to identify the higher educations that would be covered in this study is on the basis of non-probability sampling. The institutions are selected based on the preference of the researcher. Moreover, relevant literature in the area of ICT and education was reviewed. In order to collect data from the aforementioned sources both questionnaire and interviews were employed. To process the data, descriptive statistics that incorporates percentages, ratios and other models was employed. In doing so, SSPS computer package was used. Then, the results of these statistical tools and techniques were interpreted, and thus findings as well as conclusions are forwarded accordingly.

3. Literature Review

Since the emergence of computer, the role which this machine could play has changed rapidly and drastically. Based on the role that computers might act upon, different terms are coined and

introduced to describe the phenomena. The terms Information Technology (IT), Information and Communication Technology (ICT) are among these that are related with the application of computers in the day-to-day life of human beings. These terms may be different things for different people. Some may use these terms interchangeably, while others might think as different concepts that refer to different world. In this regard, it seems plausible to make a distinction between these jargons before we dive into the discussion of the theme.

IT refers to the hardware, software and skills that surround a single stand-alone computer or laptop. Hardware refers to the physical components of a computer such as printers, scanners, CD-ROM, DVD drive and so forth. Whereas software is associated with the set of instructions such as word processors, spreadsheets, databases, and packages. Hence, IT refers to the lowest level of involvement in the use of computer technology for performing tasks (Nance, 2003).

However, the notion of information and communications technology (ICT) incorporates the networking of computers together. This allows computers to do stand-alone type tasks more effectively, in so far as it potentially makes available a wider range of shared software held centrally on servers and can make management of the system easier and more efficient. The key to ICT, however, is in the possibilities for communication, both within and between institutions (Nance, 2003). Moreover, in the case of ICT, your computer is linked to other computers and you have access to the Internet, email, etc. Thus, the convergence of telecommunications, information technology, broadcast media and Internet-based information exchange has facilitated the emergence of more accessible formal, continuing, and life-long learning opportunities, and this phenomenon is termed as ICT.

Progress in ICT is changing the way people live, work and do business, study and do research, and are entertained. The cumulative effect of these changes have brought the transformation of industrial society to information society where information is the most important resource and ICT is a principal means of production.

The term Information Society is coined to describe a society characterized by a high level of information intensity in the everyday life of most citizens i.e., in their personal life as well as in their work environment through the use of modern technology for a wide range of personal, social, educational and business activities. It also embraces the ability of citizens to transmit, receive and exchange digital data rapidly between places irrespective of distance (IBM Community Development Foundation, 1997).

Therefore, in order to become a member of the modern society, one must know and apply ICT, which can be used in almost every aspect of human civilization. Even, there is a hope for less developed countries that ICTs may help countries to leapfrog the development process by moving directly to an information-driven society without passing through the industrial stage if they take the proper steps. Otherwise, the developing world will never close the gap (United Nations General Assembly, 2002).

Thus, to explore the potential of ICT for development and to diffuse this potential to the public at large, it seems inevitable to train qualified ICT human resource in large numbers. Development of ICT human resources requires a new profile of labor forces, that is, the ability to adapt, adopt and exploit new technologies and to manage the change where skills and knowledge learned can be applied. In countries like Ethiopia where the penetration of computers is almost non-existent, capacity-building programs should be tailored to the need of ICT needs. The training of ICT specialists has to be the foremost concern for both the public and the private institutions because it holds the potential to enable realization of the benefit from the Information Society.

According to Lishan Adam (1999), one of the persistent challenges to the growth of information technology in Ethiopia is lack of well established academic institutions that take step as source of study in information and communication technology. Some of the academic departments of the public higher institutions offer specialized courses in ICT related area. Currently, Addis Ababa University offers Bsc. and Msc. degree programs in ICT via the Department of Electrical Engineering, Department of Information Science and Department of Computer Science. More recently, the Addis Ababa Commerce College and other Universities in different regions are also running degree programs in business information system and computer science respectively.

Despite the existence of these departments and training programs, lack of ICT specialists is still observable. Lishan Adam (1999) has noted that because of lack of academic institutions in this area, the country faces the utmost shortage of ICT human resource. Indigenous efforts on systems development, system analysis and design, network development, application developments have been very limited.

However, the establishment of a private higher education institutions such as HILCOE, Microlink, St. Mary's, Admas, Unity University-college and the like have shown a significant potential for the expansion of education and training in information and communication technology in Ethiopia, especially, in software development field. These institutions are increasing not only their intake

capacity but also in the level and diversity of their ICT training programs. Of course, it is worthwhile to mention that among the private colleges established so far, most of them do have one or more ICT training programs. The role of private higher education institution, especially, in ICT training programs is indispensable because of the fact that this program demands significant investment in ICT infrastructure, which could not be solely affordable by the public institutions due to scarcity of resources.

PHEIs offer various educational programs often not available in the public institutions. This provides access to increasing number of students who might otherwise not be admitted to tertiary education. These institutions enable a significant augmentation of higher education enrollments and hence share the cost that could have been incurred by the government. In fact, PHEIs provide client-oriented and flexible programs focused on the changing needs of the job market (The World Bank, 2003).

In addition, the private institutions represent significant portion of enrollments in certain training programs. For instance, according to the report of the World Bank (2003), PHEIs train three out of four business students and also three out of four computer science students enrolled in the country. The report has also revealed that PHEIs train half of all law students. Moreover, recently, some graduates of private colleges have established a new software services firm that earns foreign exchange through the international sale of its services the report noted.

5. Results and Discussion

This section is devoted to process and analyze the data collected from the selected public and private higher education institutions. First, an overview of ICT training programs in PHEIs was presented to see the extent to which these institutions are providing different options. The demand for ICT training programs is also assessed in this section of the report. Besides, a sub section is devoted to assess the percentage share of the enrolment of students in ICT and non-ICT training programs in the institutions under investigation. Finally, an overview of the ICT infrastructure of these institutions is also incorporated in this section.

5.1. ICT training Programs in PHEIs: An Overview

In the last few years, a number of PHEIs were established and they have been running diverse programs, which include ICT training programs. Since most of the PHEIs are often engaged in client-oriented and flexible training programs that are focused on the changing needs of the labor market, the ICT training programs that are being offered in private institutions are either not available or are in short supply in public higher education institutions.

Table 5.1: *ICT Training programs offered by the PHEIs covered in this study*

ICT Training programs	Degree	Diploma
Information Technology		✓
Management Information Systems	✓	
Software Development & Networking	✓	
Database Management	✓	
System Integration	✓	
Software Development	✓	
Networking & Telecommunications	✓	
Information & Communication Technology	✓	
Computer science		✓
Software Engineering	✓	
Computer Engineering	✓	
Accounting Information Systems	✓	

Table 5.1 portrays the ICT training programs offered by the four PHEIs covered in this study. It is indicated that most of the programs are inclined towards the field of software development. Of course, the degree program of these institutions offers diverse options for applicants, whereas the diploma program comprises only two programs namely computer Science and Information Technology. This circumstance might reveal the fact that PHEIs are steadily transforming themselves to the degree programs via offering diverse options. In fact, most of the ICT training programs that are being offered by PHEIs under consideration are quite different from the ICT training programs that are offered by their counterparts. Hence, this ensures that private institutions are offering alternatives rather than duplicating the existing ones.

5.2 The Demand for ICT Training Programs

Nowadays, the demand for ICT training programs is continuously increasing due to the increase in the awareness of the society in ICT. Every year, a number of applicants are registered for these programs, but due to limited intake capacity of public academic institutions, students are forced either to join programs in which they are less interested or to go to the PHEIs or to defer their study. To justify this fact, reviewing the total number of applicants and those who secured admission for the SIST (School of Information Science and Technology) program of Addis Ababa University could suffice.

Table 5.2: *Number of applicants and those who secured admission for the SIST program of Addis Ababa University for the year 2004/2005*

Type of program	Program	Number of applicant		No. Admission		Percentage of admitted students From applicants
		Female	Male	Female	Male	
Computer science	Day	127	554	13	87	14.7%
Computer science	Evening	254	1281	14	86	6.5%
Information Science	Day	178	290	32	68	21.4%
Information Science	Evening	452	722	36	64	8.5%
Total		1011	2847	95	305	10.4%

Source: *Addis Ababa University, Registrar office*

The above table reveals the number of applicants and those who secured admission for the SIST program of Addis Ababa University for the 2004/2005 academic years. This table indicates that out of the total, 3858 applicants only 400, which accounts for 10.4% of the total number of applicants, have secured admission in both Computer Science and Information Science programs in the day as well as evening programs. This seems a good indicator to show the existence of chronic demand for ICT training programs as well as the restricted intake capacity of public higher education institutions in this realm. Here, what is important is, although SIST is one of the programs in AAU, unlike other programs, students are expected to pay 70 birr per credit hour, which is almost the same as the tuition fees in private higher educations. This indicates that students are ready to pay if they are sure that adequate knowledge could be acquired and accredited credential could be earned.

Therefore, the role of PHEIs is not an addition to the existing public institutions; rather it is to absorb the abundant training seekers who cannot be accommodated by the public institutions. In other words, unless the PHEIs are in the position to provide a room to absorb the excess demand, the fate of those applicants who could not get a chance to be admitted in public higher educations will be regrettable. This fact magnifies the indispensable role of PHEIs in providing alternatives for potential citizens. Specially in the Ethiopian context, the role of PHEIs becomes very crucial as the public institutions are blamed for their rigid programs and limited intake capacities particularly in ICT programs.

In these institutions, once a program is designed, regardless of the demand for such a program, the program will be persistently offered. As a result, programs with utmost demand will not have a room. However, in the case of PHEIs, the story is quite different; it is usually market-driven. Thus, students could be trained based on their preference and programs with high demand will have a space to accommodate those students.

Table 5.3: Enrolment of students of Addis Ababa University (AAU) in ICT and non-ICT programs from 2000/2001- 2003/2004

Year	AAU								Percentage Share of ICT
	ICT programs				Non - ICT programs				
	Diploma	Degree	Post graduate	Total	Diploma	Degree	Post graduate	Total	
2003/04	129	796	90	1015	5928	6155	1052	13135	7.2%
2002/03	43	293	76	412	2243	4123	840	7206	5.4%
2001/02	153	1037	24	1214	2030	2295	466	4791	20.2%
2000/01	130	214	24	368	3243	1058	453	4754	7.2%

Source: Addis Ababa University, Registrar office

Table 2 portrays the enrolment of students of Addis Ababa University in ICT and non-ICT programs from 2000/2001- 2003/2004. As it can be seen from this table, the enrolment rate in ICT training programs is very low in spite of its significant importance for economic, social and political developments of the country. In the year 2001/02, the percentage share of students in ICT programs accounts for 20.2% of the total enrolment of the University. This unforeseen rise in enrolment in ICT training programs is attributed to the opening of new program, that is SIST, which already took about 723 students during the indicated year.

On the other hand, the years 2000/01 and 2003/04 have shown the same percentage share although this is ironic as the University claims that it is expanding its ICT training programs. Actually, the total number of enrolment in ICT program in the year 2003/04 is much higher than in the year 2000/01. However, since the university's expansion program in the non-ICT training programs has increased substantially, then this has lowered the percentage share. Finally, in the year 2002/03 the percentage share is 5.4% and this is the lowest rate recorded in the last four years.

Table 5.4: Enrollment of students In AAU and PHEIs

<i>Institutions</i>	<i>Enrolment of students in ICT and non-ICT programs and Percentage Share of ICT From the Total Enrolment</i>												<i>Weighted Average Percentage Share of ICT</i>
	<i>2003/04</i>			<i>2002/03</i>			<i>2001/02</i>			<i>2000/01</i>			
	<i>ICT</i>	<i>Non-ICT</i>	<i>% Share</i>	<i>ICT</i>	<i>Non-ICT</i>	<i>% Share</i>	<i>ICT</i>	<i>Non-ICT</i>	<i>% Share</i>	<i>ICT</i>	<i>Non-ICT</i>	<i>% Share</i>	
AAU	1015	13135	7.2%	412	7206	5.4%	1214	4791	20.2%	368	4754	7.2%	9.2%
College A	391	1810	17.8%	284	2071	12.1%	98	728	1.2%	0	1557	0%	9.9%
College B	594	2319	20.4%	323	2253	12.50%	214	3000	6.7%	0	1025	0%	11.6%
College C	2383	3819	38.4%	820	1870	30.5%	953	2904	24.7%	748	2700	21.7%	30.3%
College D	798	32	96.2%	925	347	72.7%	1027	498	67.3%	665	499	57.1%	71.1%

Table 5.4 depicts the percentage share of enrolment in ICT training programs from the total enrolment in each higher institution in the last four years. In this table, the ICT column refers to the number of students enrolled in the ICT training programs, which encompasses diploma, degree and masters (only for AAU) levels, in each year in the corresponding institutions. The non-ICT field stands for the total enrolment in the programs, which are different from ICT related training programs. On the other hand, the '% share' column represents the percentage share of enrolment in ICT training programs from the total enrolment in all programs in each year in the corresponding higher education institutions. The Weighted Average Percentage Share of ICT column seems self explanatory, which refers to the weighted average percentage share of the enrollment in ICT training programs in the last four years.

As shown in the same table, in all the private higher education institutions there is persistent growth in the percentage share of ICT enrolment from the total enrolment in each institution. The outcome has also revealed that in the last four years the weighted average percentage share of enrolment in ICT training programs is 26.9 percent. In contrast, as it can be observed from the same table the growth of the percentage share of ICT program, enrolment in AAU has declined over the last four years although there is a significant growth in the total number of students enrolled in all programs in each year. In fact, the weighted average percentage share of ICT enrolment of the university accounts 9.2 percent. This indicates that from 100 students of the university 9 of them are in ICT training programs.

Table 5.5: Growth rate of percentage share of enrolment in ICT training programs

Year	Percentage Share of Enrolment in ICT Training Programs in each Institution				
	AAU	College A	College B	College C	College D
2000/01	7.2%	0%	0%	21.7%	57.1%
2001/02	20.2%	1.2%	6.7%	24.7%	67.3%
2002/03	5.4%	12.1%	12.5%	30.5%	72.7%
2003/04	7.2%	17.8%	20.4%	38.4%	96.2%
Growth rate in Log Linear (%)	-13.2	134.8	55.7	19.2	16.4
Significance Level	0.706	0.249	0.044	0.007	0.027

Table 5.5 shows the growth rate of the percentage share of enrolment in ICT training programs from the total enrolment in each higher education institution in the last four years. To ensure the statistical significance of the growth of the percentage share, a test was applied and results of this statistical test has shown that among the five higher education institutions included in this study, the growth of the percentage share of enrolment in ICT training programs of the three institutions were found to be statistically significant. As it can be seen from the table in College B, every year

the percentage share is growing at a rate of 55.7 percent, whereas in College C and College D the percentage share is growing at a rate of 19.2 and 16.4 percents respectively per annum.

All the same, the growth rate of the percentage share of enrolment in ICT training programs in AAU and in College A was found to be insignificant. This indicates that these institutions are not responding positively to the ever-growing demand of ICT training in the country. Particularly, in the case of AAU, the growth rate is not only insignificant but also its sign is negative, which reveals a decline over the last four years.

To sum up, although the growth rate of the percentage share of enrolment in ICT training program in one of the PHEIs covered in this study was found to be insignificant, the outcome of this study has indicated that the growth of PHEIs is in favor of ICT training programs. This is confirmed through a consistent growth in the percentage share of enrolments in ICT training programs in the last four years in the remaining PHEIs covered in this study.

ICT infrastructure

ICT infrastructure is the most important resource required in offering ICT training programs. The lack of ICT infrastructure is one of the constraints that might hamper the expansion of ICT training programs in most of the academic institutions. Moreover, it has a significant impact in the quality of education in ICT training programs.

Table 5.6: ICT infrastructure of some selected PHEIs

Institutions	Total Number of computer Laboratory	Total Number of computers in Laboratories	Average Number of computers in each Laboratory	Local Area Networks (LAN)	Internet Access	Capacity of lab at a time in percent from total students
AAU	19	475	25	Yes	Leased line	2.8
College A	8	160	20	On progress	Dialup	6.5
College B	9	180	20	Yes	Leased line	5.2
College C	12	300	25	10 Labs	Leased line	6
College D	8	111	14	8 Labs	Leased line	8.6

In the light of the above table, the ICT infrastructure in the PHEIs covered in this study has revealed that efforts are being made to equip their programs with the necessary ICT infrastructures. For instance, out of the four PHEIs, have already developed Local Area Networks and with regard to Internet, they are already connected through Leased Line three of them. As a result, students as well as staff members of these institutions would have an extensive access to the

Internet. The fourth institution is also currently developing a LAN, which is supposed to encompass all computers in its computer laboratories. Nevertheless, the type of Internet connection of this institution is dialup, which offers a limited access to the Internet. As a result, although so many computers would be connected to the network, the functionality of the network for Internet service would not be visible. Thus, students and staff members of this institution would have a limited access to the Internet.

It has also been learnt that one of the PHEIs included in this study has already established an Internet café that encompasses about 40-70 computers and was functional for the last couple of years. Students, staff members and other individuals could use this café at reasonable price. Actually, the institution charges only 0.08 cents per minute, which is much lesser than the price being charged in the prevailing Internet cafés in the city. This seems a very important deed as it contributes a lot in the teaching and learning process of the institution. Moreover, it would also have a significant role in increasing the number of Internet users in the country and thereby exploit the potential of ICT. As a result, one could envisage the extent to which PHEIs could contribute in acquainting its with such technologies if such gears could be provided in other similar institutions.

According to the standard set by the Ministry of Education, institutions could secure accreditation among other things if their computer laboratories could accommodate 20 percent (for TVET and 25 percent for degree programs) of the total students in the institution assuming that two students could use one computer. Considering this standard, PHEIs are by far below the standard as can be seen from the table. However, what is surprising is that the AAU itself is even below the figures indicated in all the PHEIs covered in this study. In other words, the PHEIs are much better than AAU in terms of their computer facilities against the number of students they have.

In general, although efforts have to be made to strengthen their ICT infrastructure, the prevailing ICT infrastructure seems to be promising. Basically, the ICT infrastructure is designed and developed as a prerequisite for the ICT training programs; however, the infrastructure would have additional benefits such as providing various services to the community of each institution. For instance, students and teachers would become Internet users and they will also introduce themselves to the current technologies. As a result, these institutions could play an important role in disseminating information and technology to their community. Hence, they could have a positive impact on the effort to transform the nation to the information society.

6. Conclusions and Recommendations

So far an attempt has been made to assess the role of PHEIs towards promoting ICT in Ethiopia with particular emphasis on ICT training program. Thus, the outcome of the study has shown that in the last four years, the enrolment in ICT training programs has persistently increased significantly which in turn justifies that PHEIs are playing an essential role in mitigating the shortage of skilled humanpower in this field. Based on the findings of the study, the following remarks are made.

- ❖ The demand for ICT training programs is continuously increasing due to improvements of awareness of the society in ICT. Every year, a great number of applicants are registered for these programs. But due to limited intake capacity in the public academic institutions, students are forced either to join programs in which they are less interested or to go to the PHEIs or to defer their study.
- ❖ As compared to the ICT training programs in AAU, the ICT training programs of PHEIs offer diverse options for applicants. Hence, PHEIs are emerging as institutions that offer specializations in various programs that are not available in their counterparts.
- ❖ In all the private higher education institutions, there is persistent growth in the percentage share of ICT enrolment from the total enrolment in each institution. The outcome has also revealed that in the last four years the weighted average percentage share of enrolment in ICT training programs is 26.9 percent. In contrast to this, the growth of the percentage share of ICT program enrolment in AAU has declined over the last four years although there is a significant growth in the total number of students enrolled in all programs in each year.
- ❖ The ICT infrastructure in the PHEIs covered in this study has revealed that efforts are being made to equip their programs with the necessary ICT infrastructure. Although efforts have to be made to strengthen their ICT infrastructure, the prevailing ICT infrastructure in the PHEIs seems to be promising.
- ❖ It is indicated that most of the ICT training programs in PHEIs are inclined towards the field of software development. However, there are other fields, which are left untouched like Networking and Communication, Hardware, Information Science, etc, which are equally important. Thus, PHEIs should look into these fields in order to further diversify their training program.
- ❖ Although this study has come out with results that justify the inevitable role of PHEIs in strengthening ICT in Ethiopia through mitigating the lack of skilled humanpower in ICT in the market, the quality of education should not be taken for granted. Therefore,

potential researchers could assess the quality of education in the ICT training programs of the PHEIs.

- ❖ The public ICT literacy in developing countries particularly in Ethiopia is very low. To be more specific, the ICT literacy among teachers and students in higher education in Ethiopia is still low as compared to what is expected. Thus, the expansion of ICT training programs in PHEIs will have a positive external effect in increasing ICT literacy among teachers and students as well as the public at large. As a result, PHEIs could shore up the nation in order to be a partner of progress in the ICT age. Nevertheless, to boost their efforts in this regard, PHEIs should expand and incorporate programs that are aimed at acquainting ICT to their community. To this end, they should provide extra services such as Internet services, teleconferencing and state-of-the-art technologies.
- ❖ Assuming the standard set by the Ministry of Education related to computer laboratories, PHEIs are by far below the standard. Thus, ways and means have to be sought to raise the level of ICT infrastructure, particularly, the capacity of computer laboratories.

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የቴክኒክና ሙያ ትምህርትና ስልጠና የተቋማት የደረጃ ብቃትና ማረጋገጫ የቅድመ እውቅና እና የከፍተኛ አሰጣጥ መመሪያ
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Appendix A: Enrolment of Students in Sample PHEIs in ICT and non-ICT Programs (2000/2001- 2003/2004)

Table A.1: Enrolment of Students in College A for ICT and Non-ICT Programs (2000/2001- 2003/2004)

Year	College A							
	ICT Programs			Non - ICT Programs			Total Enrolment in each year	Percentage Share of ICT
	Diploma	Degree	Total	Diploma	Degree	Total		
2003/04	391	0	391	1375	435	1810	2201	17.8%
2002/03	284	0	284	2071	0	2071	2355	12.1%
2001/02	98	0	98	728	0	728	826	1.2%
2000/01	0	0	0	1557	0	1557	1557	0

Table A.2: Enrolment of Students in College C for ICT and Non-ICT Programs (2000/2001- 2003/2004)

Year	College C							
	ICT Programs			Non - ICT Programs			Total Enrolment in each year	Percentage Share of ICT
	Diploma	Degree	Total	Diploma	Degree	Total		
2003/04	327	2056	2383	1129	2690	3819	6202	38.4%
2002/03	0	820	820	666	1204	1870	2690	30.5%
2001/02	0	953	953	2293	611	2904	3857	24.7%
2000/01	0	748	748	1997	703	2700	3448	21.7%

Table A.3: Enrolment of Students in College B for ICT and Non-ICT Programs (2000/2001- 2003/2004)

Year	College B							
	ICT programs			Non - ICT programs			Total Enrolment in each year	Percentage Share of ICT
	Diploma	Degree	Total	Diploma	Degree	Total		
2003/04	381	213	594	1752	567	2319	2913	20.4%
2002/03	272	51	323	2130	123	2253	2576	12.50%
2001/02	214	0	214	3000	0	3000	3214	6.7%
2000/01	0	0	0	1025	0	1025	1025	0%

Table A.4: Enrolment of Students in College D for ICT and Non-ICT Programs (2000/2001- 2003/2004)

Year	College D							
	ICT programs			Non - ICT programs			Total Enrolment in each year	Percentage Share of ICT
	Diploma	Degree	Total	Diploma	Degree	Total		
2003/04	116	682	798	32	0	32	830	96.2%
2002/03	925	0	925	347	0	347	1272	72.7%
2001/02	1027	0	1027	498	0	498	1525	67.3%
2000/01	665	0	665	499	0	499	1164	57.1%