

The Assessment of Internet Service Distribution in Ethiopia

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Abstract-*Internet usage in Ethiopia is improved from year to year however it is low as compared to the world and neighboring countries in Africa. This study employed Content analysis, descriptive quantitative research design, and qualitative research method: semistructured interview to assess the determinants of internet service distribution in Ethiopia. It was found that the nature of settlement in rural areas, shortage of foreign currency, high cost of telecom equipments and their installation, and the low level of road, and telecom infrastructure development greatly affected internet service distribution. Problems related to Covid-19 also hindered free movement of employees, resources, and products of the company to different regions. Farmers' compensation for getting rid of their crops becomes another obstacle to expand telecom service in rural areas. Therefore, the government, stakeholders, businesses organizations, and NGOS, need to act together to strengthen the institutional capacity of Ethio-telecom and enable Ethiopia to open up the telecom market for private sectors.*

Keywords: Determinants, Internet service, Farmers' compensation, network costs, Ethio-telecom

I.INTRODUCTION

The introduction of telecommunication services in Ethiopia dates back to 1884 seventeen years after the invention of telephone technology in the world (Potluri&Mangal, 2010). Despite the very early introduction, Ethiopia has one of the most underdeveloped information and communications technology (ICT) infrastructures on the continent (Chekol, 2007). Information communication technology has become an integral part of Ethiopia's development program over the last decade, following initial indifference to the development of the sector. The country faces a substantial gap between interest in the information communication technology, the policy, and regulatory instruments available to enable its development (Lishan, 2009/10). Accordingly, telecommunications infrastructure and value-added services are still owned by the state.

Ethiopia was one of the last countries in Africa to allow its national telecom a monopoly on all telecom services including fixed, mobile, internet, and data communications. For many years Ethio telecom's monopolistic control stifled innovation, restricted network expansion and limited the scope of services on offer. The ICT sector is no longer a narrow sectoral issue, but a national priority that casts policy shadows across the whole economy and society. Ethiopia is one of the last countries in the world to have a monopoly national telecommunications operator. With the liberalization of the Myanmar market five years ago, only Cuba, Eritrea, and Ethiopia have not implemented the first round reforms undertaken by other African countries from the 1990s. Ethiopia's insistence on a monopoly telecom regime did not only reduce the financial gain that it derives from the sector, but has been one of the main reasons for the country falling behind all other countries in terms of its ICT sector development. Despite a range of different technologies and commercial offers for Internet and Data access, both the availability and quality of services are poor within Ethiopia, in Addis Ababa, and more so in the regions, and tariffs remain very high. One of the factors contributing to high prices for telecom services is lack of competition in the market. The broadband Internet speed is very low compared to the theoretical international capacity. The government has been planning and processing the partial privatization of the sector, aiming to allow the participation of a strategic investor, which should bring in new funding and new management techniques and skills (Baron, 2010).

Lishan et al. (2019), stated that Ethiopia can fast-track the development of its telecom infrastructure through privatization and the introduction of competition to achieve the access and affordability comparable to benchmark countries with more mature markets, such as Ghana, Kenya, Nigeria and South Africa. Privatization by itself will not be sufficient to achieve network expansion, quality of services and affordability; however, the anticipated competition that it is expected to initiate will lower network costs and improve consumer choices, thereby having a Significant impact on the country's social and economic development. On the contrary, they argued that if not managed appropriately, privatization could increase corruption and sector dominance by undesirable groups of companies, pushing private rather than public interests. Detractors of privatization in Ethiopia have consistently argued that the private sector can exploit their monopoly power and ignore the extensive social costs. International experience, however, shows that newer wireless technologies and service obligations through universal access strategy can mitigate the challenges of 'cherry picking' by the private sector.

On the other hand, the digital economy in Ethiopia has an untapped potential to increase exports, enhance incomes, create employment, especially for women and youth, and reap other social benefits. Countries that can compete effectively in the digital age will enable its citizens, businesses, and government to reap digital dividends in the form of faster growth, lower transaction costs, more and better jobs. Digital technology adoption can also improve the productivity of traditional sectors, especially agriculture and manufacturing, as well as the transparency, efficiency, and accountability of the government. However, Ethiopia currently lags the continent's tech standouts like Nigeria, Kenya and South Africa — that have become known for digital entrepreneurship in Africa. Ethiopia encounters barriers including: the availability and reliability of digital infrastructure, digital payment and ID systems, low private sector participation in providing supporting infrastructure to entrepreneurs, lack of digital and business skills, lack of access to finance, cultural and behavioral taboos of failures, and regulatory issues(Ethiopia Digital Foundations Project Report,2019).

In addition, Ethiopia faces a challenge in adopting and fully benefiting from the current ICT revolution and knowledge economy. Studies have indicated that a successful transition to a knowledge economy can be attained through four pillars: the prerequisite economic and institutional regime; education; information and communication technology; and innovation (World Bank, 2007b as cited in Abebe, 2007). Since the development of communication sector plays a vital role in overall development of a country, there is no any question to support this huge sector of economy in communication which in real terms means the rural community. Despite the challenges due to low economic development, the government of Ethiopia has aggressively been moving in expanding the telecom infrastructure.

Ethio-telecom has strongly been working to expand the existing national telecom infrastructure in order to build its network capacity in fixed, mobile, and internet. This really will bring a multidimensional development to the country and as a result the people of the country at large will be benefited. Nationally, the attention and commitment given to the sector by the government to expand telecommunication infrastructure and service delivery are very helpful to increase the number of subscribers and foster socio-economic development of the nation. Rapid telecom expansion including rural and remote areas within a short period of time brought increase in number of telecom service subscribers and level of penetration. This created an opportunity for underserved and un-served areas to have up-to-date market information for the products they sell, economic advantage in saving their money and time, easy working environment by communicating with their line working institutions, and Job opportunity. In contrast to these advantages the telecom industry has encountered challenges of lack of capacity, skills in technical and economic regulation, the nature of settlement in rural areas, and as a result low penetration, high cost of supply and installation of solar panels to use as an alternative power source in rural areas, and lack of adequate infrastructure development (Taye, 2010).

Baron (2010), added that Ethiopia's telecommunications infrastructure is lagging behind. The existing weak telecommunications infrastructure in Ethiopia acts as a severe constraint on the development of the Ethiopian business community and imposes additional costs on business activities. These reduce the private sectors' competitiveness and impede access to foreign markets. The infrastructure problems are the major bottle necks to expand telecom services in the country, besides the existing infrastructures are not well developed in remote areas. Hence, this holds back the rural telecom service expansion process. In addition, Covid-19 hindered the production, export, and import of goods and services around the world. Therefore, the purpose this research article is to investigate the determinants of internet service distribution in Ethiopia by using content analysis and qualitative research method: key informant interview.

The main objective of the study is:

- To identify the determinants of internet service distribution in Ethiopia
- To compare internet usage of Ethiopia with selected East African countries, and
- To suggest ways to reduce the prevailing challenges of internet distribution in the country

II. LITERATURE REVIEW

The following section reviews the role of ICT on organizations' performance, ICT development, penetration, facilities, and ICT use and adoption in Africa, Barriers to internet use, and Determinants of ICT distribution in Ethiopia.

II-A. *The role of ICT on organizations' performance*

Henrique et.al (2014), outlined in their study, IT governance is an important organizational ability to promote IT-business strategic alignment and IT value delivery to businesses. To implement IT governance, businesses can utilize a set of practices associated with decision-making structures, processes, and relational mechanisms; however, the specific contributions of these

different practices remains poorly understood. Their study indicated that how businesses can be successful in terms of IT governance practices and presents potential deficiencies based on organizations with lower IT and business results.

Maria do Céu Gaspar Alves (2010), stated that the reasons given for today's globalization high information technology (IT) investments and the rapid pace of technological change. They further elaborated that organizations are responding in different ways and at different rates to the wide range of IT based opportunities and pressures. The companies studied have high levels of investment in information technology. The area of sales/marketing was found to use laptops more significantly than the other areas due to the nature of their activities. They also suggested that accounting and IT are inseparable. Accountants' use of sophisticated management accounting techniques is clearly dependent of IT existence.

Brynjolfsson & Hitt (2003), explored the effect of computerization on productivity and output growth using data from 527 large U.S. firms. Their finding stated that computerization makes a contribution to measured productivity and output growth in the short term consistent with normal returns to computer investments. However, the productivity and output contributions associated with computerization are up to five times greater over long periods. In addition, they presented a direct evidence that computerization contributes to productivity and output growth. Furthermore, the pattern of rising growth contributions over longer time periods suggests that computers are part of a larger system of technological and organizational change that increases firm-level productivity over time. On the other hand, Smith (2008), research result concluded that information technology's influence on productivity magnifies the effect of decentralized decision making and improved business processes.

II-B. ICT use in Africa

Birba & Diagne (2012), study proposed a two-level hierarchical modeling that favor or slow down the use of the Internet in Africa, it's based on unpublished data from a survey covering 17 African countries. The model results showed that the important role of urbanization and the spread of Internet infrastructures in individual decisions to adopt this technology. They also revealed that an individual will have a larger probability to use the Internet if its household has a computer or Internet connection. They also showed that the chance of using it increases with the rate of completion of primary education. Moreover, the individual characteristics (the sex, the age, the level of education, and the belonging to a social network) are the underlying factors of the Internet adoption. Indeed, a man is more likely to use the Internet than a woman; this chance is larger if he is young (16 to 30 years) or if he reached at least the secondary education level or if he is member of a social network. In this paper, the notions of digital inequality and digital divide have been employed to describe two levels of information and communications technologies (ICTs) access. On the one hand, the inequality of access to the cluster of technology measured by Internet use and on the other hand the confluence of skills and other resources that differentiate countries in sub-Saharan Africa. Their research result confirmed that the vital importance of telecommunications infrastructure represented by the high correlation of telephone density with Internet irrespective of per capita income level of the country.

Miguel et al. (2009), study result revealed that the average level of income in the African countries is very low, so a one percent increase in the average family income level should be used to finance basic necessities and not the use of Internet. Secondly, they concluded that both price variables the three minutes call cost and the monthly subscription cost, have a negative effect on the Internet use. They observed that there is an important effect, with a very high significance, of technological factors on the Internet use in African countries. Their paper concluded about a double digital divide: Firstly the world digital divide, and secondly the African digital divide, explained by the importance of telecommunication infrastructures on the Internet penetration.

Novice et al. (2017), study indicated that the key determinants of internet adoption and use were gender (being male), education level, age (being below 45 years of age), computer skills, and social environment (having Internet users among one's social network). Moreover, the coefficients associated with marginal effects for most of these factors increased over time in the two models (of Internet adoption and the Internet use). This shows that in the future the digital divides will occur more in terms of Internet use than of Internet adoption. These results are likely to help the government develop and implement more effective digital policies aimed at promoting mass Internet use in Cameroon. According to ITU media centre (2019), Internet use in developed countries is nearing saturation levels, with close to 87 per cent of individuals online. Europe is the region with the highest Internet use (82.5 per cent), while Africa is the region with the lowest (28.2 per cent). By the end of 2019, ITU estimates that 57 per cent of households globally will have Internet access at home. However, the number of households with a computer at home is only expected to rise by about one percentage point - to 49.7 per cent - between 2018 and 2019. Slowing growth in domestic computer ownership is accounted for by the fact that in many countries computers are no longer needed for home Internet access, with people simply connecting over smart phones.

II.1): Barriers of Internet use

The following are some of the major bottle necks of internet use

- Affordability and lack of digital skills remain some of the key barriers to the uptake and effective use of the Internet, especially in the world's Least Developed Countries.
- In 40 out of 84 countries for which data are available, less than half the population have basic computer skills, such as copying a file or sending an e-mail with an attachment.
- Although more data are needed, initial findings indicate a strong and pressing need for governments to focus on measures to develop digital skills, particularly in the developing world
- Even where connectivity exists, the critical issues to be addressed are like affordability of service, cost of handsets, and lack of digital skills, and literacy to enable more people – and especially women – to participate and flourish in the digital economy (ITU media centre, 2019).

II.2): Determinants of ICT use and distribution in Ethiopia

According to(Abebe,2007), Ethiopia faces a challenge in adopting and fully benefiting from the current ICT revolution and knowledge economy. World Bank(2007b, as cited in Abebe,2007),Study indicated that a successful transition to a knowledge economy can be attained through four pillars: the prerequisite economic and institutional regime; education; information and communication technology; and innovation. Furthermore, it is indicated that a lack of resources, language barriers, and a low level of skills and capacities, including awareness of the benefits of ICTs, are the major hurdles to ICT development in the country. Most rural communities in Ethiopia, which form more than 80% of the population, have not woken up to the issues of the information society. Baron (2010), found that the Ethiopian telecommunications sector today collects lower revenue compared to GDP than in other countries. Due to the very low mobile penetration, compared to Uganda, Nigeria, and Egypt and significantly lower than the rates in Vietnam, Ivory Coast, and Kenya. The study further indicated that ICT development Index of ITU for 154 countries for growth in information and communication technologies (ICT) by combining 11 indicators into a single measure related to ICT access, use and skills, such as households with a computer, the number of Internet users, and literacy levels. The results indicated that Ethiopia is low as compared to Egypt and Vietnam. Moreover, it was concluded that all the indicators used by ITU to measure telecommunications activity are far lower in Ethiopia than in all the countries of the selected sample.

More over Lishan et al. (2019), in their research based on ITU data, ICT development Index (2017), showed the growth of ICT development in Ethiopia is low as compared to Kenya, Sudan, Egypt, Nigeria, Mali, and Rwanda. They further indicated that Ethiopia has not been able to catch up with Africa's most populated nations such as Egypt and Nigeria. Its neighbors' Kenya and Sudan also have the highest ICT penetration among countries in Africa. While the number of subscribers has increased in recent years, access has not translated into the improved effectiveness and efficiency of the incumbent. Taye(2010), indicated that Telecom sector development in countries that have liberalized the sector, like Kenya and Uganda, shows that the Ethiopian government loses tax revenues of at least US\$0.5 billion per year by not opening its communication sector for investment. The stance on monopoly has also been delaying Ethiopia's global and regional integration. Ethiopia is poorly integrated into the regional and international economy and it has not been able to reap the benefits. Moreover, Lishan(2009/10), study showed that although Ethiopia has been one of the countries in the world which has acquired telephone system few years after its invention, it has remained far behind other countries in telecommunication services penetration rate and development of required infrastructures. It is worth noting that while much is known about ICT and its use in developed world, studies of issues related to ICT specifically to Internet service are rarely found in developing countries (Carroll, Barnes, Scornavacca & Fletcher, 2007), hence is highly inconsistent and fragmented. In addition, a major part of studies on telecom service has been carried out in the US, UK, or Scandinavian countries (Lim & Ang, 2008). Additionally, there is little research conducted in the context of Ethiopia concerning internet service distribution. Therefore, features of demographically different area like Ethiopia can help to explore more on determinant factors that influence internet service distribution.

III. METHODS

III-A. Research Approach

There are three approaches that commonly used for research. They are quantitative, qualitative and mixed methods (Creswell, 2003). quantitative research approach is based on measurement of quantity or amount in order to increase the ability to draw conclusions. On the other hand, qualitative approach is concerned with subjective assessment of attitudes, opinions and behavior (Kothari, 2004). In this research mixed approach: Descriptive quantitative research and semi structured interview was followed.

III-B. Content analysis

Content analysis is a research tool used to determine the presence of certain words, themes, or concepts within some given qualitative data. Using content analysis, researchers can quantify and analyze the presence, meanings, and relationships of such certain words, themes, or concepts. Holsti(1968), explained that content analysis as any technique for making inferences by systematically and objectively identifying special characteristics of messages. This study used content analysis to assess the determinants of internet service distribution based on secondary data. Data collected from secondary sources were further discussed and elaborated using own tables and figures.

III-1): *Qualitative research method*

Key informant interviews involve interviewing a selected group of individuals who are likely to provide needed information, ideas, and insights on a particular subject. Such informants are selected because they possess information or ideas that can be solicited by the investigator (Kumar, 1989). Key informant interview was conducted in this research with Ethio telecom net work and sales department managers to substantiate the secondary data analysis. The interview took 40 minutes.

III-2): *Data collection methods*

The study was conducted by using both primary and secondary data. The methods of collecting primary and secondary data differ since primary data are to be originally collected, while in case of secondary data the nature of data collection work is merely that of compilation (Kothari, 2004). The primary data was collected by using Key informant interview which was conducted with Ethio telecom net work managers and employees. Secondary data was collected from books, research works of different scholars, ITU reports, and internet sources were used to supplement the primary data.

IV.RESULTS

ITU data (2005-2019), confirmed that Internet use continues to grow globally, with 4.1 billion people now using the Internet, or 53.6% of the global population. However, an estimated 3.6 billion people remain offline, with the majority of the unconnected living in the Least Developed Countries where averages of just two out of every ten people are online. Table 1 below shows the progress of individuals using internet in Ethiopia from year 2000(2%) to 2018(18.62%).

TABLE I. PERCENTAGE OF INDIVIDUALS USING THE INTERNET IN ETHIOPIA

Year	Percentage
2000	0.02
2001	0.04
2002	0.07
2003	0.11
2004	0.16
2005	0.22
2006	0.31
2007	0.37
2008	0.45
2009	0.54
2010	0.75
2011	1.10
2012	2.90
2013	4.60
2014	7.70
2015	13.86
2016	15.37
2017-2018	18.62

Source: (ITU, 2000-2018).

The data in table 1, above shows internet usage rate is increasing from year to year in the country. A very small increase (0.73) is observed from year 2000-2010. From year 2011-2014 progressed to (6.6), further progress (4.76) is registered between years 2015-Dec, 2018. This indicates that although the growth rate is very low, the rate of internet usage rate is increasing from year to year in the country

TABLE 2. PROGRESS OF INDIVIDUALS USING THE INTERNET IN ETHIOPIA FOR THE YEAR (2000-2018)

Year	Mean	Std.dev
2000-2005	.1033	.0761
2006-2011	.5867	.2948
2012-2018	10.51	6.3456

Source: (own computation)

Table 2, above shows the progress of individuals using the internet in Ethiopia. The mean result in the table depicted that the average number of people is increasing from the year 2000-2005 (M=.1033, S.D.0761) to (M=.5867, S.D=.0761) in the year 2006-2011. The progress of usage of internet further increased at increasing rate in the year 2012-2018(M=.10.51, S.D=6.3456).

TABLE 3. PERCENTAGE OF INDIVIDUALS USING THE INTERNET AMONG EAST AFRICAN COUNTRIES FOR THE YEAR (2010-2018)

Year	Name of the Country				
	Ethiopia	Kenya	Uganda	Djibouti	Tanzania
2010	0.75	7.2	12.5	6.5	2.9
2011	1.1	8.8	13.01	7	3.2
2012	2.9	10.5	14.1	8.27	3.95
2013	4.6	13	15.5	9.50	4.4
2014	7.7	16.5	16.9	10.71	7
2015	13.86	16.6	17.83	11.92	10
2016	15.37	16.6	21.88	13.13	13
2017-2018	18.62	17.83	23.71	55.68	16

Source : ITU (2010-2018)

Table 3, above shows that percentage of individuals using the internet among East African countries for the year 2010-2018. The table revealed that for the year 2010-2012 percentages of individuals using the internet is low in Ethiopia as compared to Kenya, Uganda, Djibouti, and Tanzania. For the year 2013-2015 Ethiopia's percentage of individuals using the internet is low when compared to Kenya, Uganda, and Djibouti, however the percentage usage rate is high as compared to Tanzania. The percentage usage rate is improved in Ethiopia when compared to Djibouti and Tanzania for the year 2015-2016.

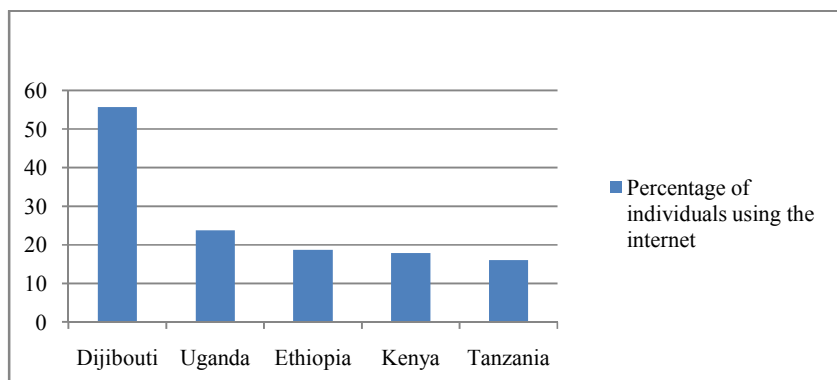


FIG. 1. PERCENTAGE OF INDIVIDUALS USING THE INTERNET FOR THE YEAR (2017-2018)

Source: ITU (2017-2018)

Figure 1 above shows that from 2017 –2018 percentage of individuals’ internet usage rate in Ethiopia is improved as compared to Kenya and Tanzania, but it is low as compared to Uganda and Djibouti. In the same year percentage of individuals’ internet usage rate is high in Djibouti compared to other countries in East Africa.

IV-A. RESULTS OF INTERVIEW

Key informant Interview was conducted with south region network and sales department managers of Ethio telecom to triangulate the secondary data. Accordingly, the following responses were organized.

Concerning the supply and demand of internet distribution, they stated that still there is a problem to satisfy the increasing needs of internet users in Ethiopia, this causes network jam. Even though the company is currently expanding its capacity to satisfy the needs of internet users, covid-19 hampered the expansion work of the company because foreign firms are not producing telecom products at their full capacity.

The second question was about the adequacy of telecom employees training and qualification to expand internet throughout the country. They replied that Ethio telecom hired qualified employees based on the needs of the company. In addition, ethio-telecom adopts these technologies from different companies. Employees learn the new technology by using peer to peer learning. The company also provides free internet data services for its employees to cope up them with the current technology.

Thirdly, the managers asked whether the company has enough telecom equipment related to the current technology in order to expand internet and other telecom services in the country, they answered that based on the development of the country; the company frequently imports telecom equipments by using vender financing. The company currently imports these equipments from companies like ZTE, Huwawei, and Ericson. These vendors also provide training to employees when they sell new technology related equipments to the company; the overall cost for the training is covered by Ethio telecom.

The fourth question was whether road infrastructure, power supply, and banks and other financial agencies affect Ethio telecom to expand internet and other telecom services in the country. They responded that there are sites for which 60-70% of the internet and other telecom services are provided by using generator and other sites also receive 30-40% of their internet and other telecom services through commercial power. They added that lack of adequate road infrastructure makes the company employees walk 2-3k.m to reach people and offices in woreda and rural areas.

The existing low level development in road infrastructure stands as a major obstacle to expand internet and other telecom services in the country. This causes a decrease in the companies’ telecom expansion performance. Besides, the government of Ethiopia devaluated Ethiopian currency (birr) by appreciating dollar and other foreign currencies, causing an increase in the cost of imported telecom and internet service installation equipments. Shortage of foreign currency in banks of Ethiopia is another major constraint for import of telecom facilities from abroad.

The nature of settlement in rural areas is another factor which affects telecom and internet service distribution in Ethiopia. Ethiopia is a land of rugged mountains, broad savannahs, and many lakes and rivers. The country is composed of an elevated central plateau generally varying in height from 2,000m and 3,000m (<https://guidetoethiopia.com>). As the managers elaborated, Ethio telecom has 511 towers at regional level and expands its service up to Woreda level. The mountainous topography of Ethiopia affects the transmission of telecom cables in rural Kebles. Though Ethio telecom expanded its service up to Woreda, the low level development of rural road and other telecom infrastructure greatly distracted the expansion of internet and other telecom services in rural Ethiopia.

V.CONCLUSION

The development of telecom industry is very dynamic in its nature of innovation and dissemination. The development of communication the sector plays a vital role in overall development of all sectors related to social, political, and economic affairs. Despite internet usage rate in Ethiopia is improved from year to year it is low as compared to its population size and neighboring countries in Africa . Lack of capacity, lack of skills in technical and economic regulation, the nature of settlement in rural areas, high cost of supply and installation, lack of adequate infrastructure development, and technological factors in internet use are the major constraints for the distribution of internet service. Affordability and lack of digital skills remain some of the key barriers to the uptake and effective use of the Internet. Besides, cost of net work service, lack of availability of funds to compensate farmers for getting rid of their crops remains a great hurdle for internet and telecom service expansion in rural Ethiopia.

In addition, users suggested that the slow internet connection in the country also exacerbated by the intermittent nature of the service where connection is cut unpredictably as much as several times in one working day. It is also claimed that the break in the internet connections are usually due to damage received by fiber optic lines buried in the ground and repeated cutoff in electric power. It is obvious that foreign exchange shortage has been a recurrent problem over the years in Ethiopia. The shortage of foreign currencies in banks hampered the import of telecom service products. This in turn influences the expansion of internet service in different regions of Ethiopia. Therefore, the government, Ethio telecom, and other responsible bodies need to be stronger in addressing critical issues like affordability of internet and telecom service, lack of digital skills, and literacy especially related to computer skills to enhance education, health, agriculture, and production and marketing services. On the other hand, Ethiopia's economy is suffering from shortage of foreign currency, apart from encouraging export and working on remittances, the country's economy needs a workable solution in order to improve the availability of foreign currency in banks.

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