merging or taking strategic moves to stay relevant and competitive in the market. On the other hand, consumers, have found themselves dancing to the tunes set by operators. From consumer standpoint, services offered by the operators is what they will buy factoring among other things, price. This has resulted to most subscribers to own two or more telephone lines.

Scholars and other stakeholders often find it hard to predict the future of the industry. This paper looks at Tanzania telecommunication data in the past 10 years focusing on subscribers' trends, data usage, texts, calls, mobile money usage and other relevant information. It them compare these data to global trends.

Data have shown a steady growth in all aspects of communication with cellular technologies leading the way. The increase in the number of subscribers of mobile phone numbers has also increased the number of people using the internet, mobile money and traditional phone calls. Tanzanians using the internet are mostly online to communicate by using email and chat applications, getting information and knowledge. The use of internet for entertainment and business is still low. Tanzania Internet and telephone penetrations are at 40% and 80% respectively.

On telecommunication companies, there is an intense competition between Vodacom, Tigo and Airtel while Zantel seems to fade gradually. The arrival of Halotel in the market have sheen all incumbent companies losing their market shares to Halotel in calls and data business.

The paper is useful to researchers, telecom operators and other stakeholders.

Key words: Tanzania, Internet, telecommunication, TCRA

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Introduction

Tanzania like any other country in the world has undergone a rapid transformation on the way its citizens communicate. Moving from a country that banned all the electronic importation in the 70's to having over 40milion mobile phone subscribers in 2016, Tanzania is surely changing the way it uses technology. Despite these good numbers, Tanzania internet penetration is still at 40%, which bellow global average of 42% [TCRA 2017, IS 2015, ITU 2016].

The fast-moving telecommunication industry can sometimes confuse regulators. For example, in early 2017, Tanzania government banned online radio and TV temporarily because there was no law or regulation in place to monitor them. While in many countries online TV and radio operate with no special laws, Tanzania is setting up a specific parliamentary act related to these new media. Furthermore, there has been a rise in several acts rated as crime by the government pointing to internet miss use in which individuals were accused and some convicted of using improper language online. These are some of the activities that are viewed as evidence of lack of clear understanding from both regulators and users of Internet and related services in this fast-moving sector.

Although there are several areas that need to be studied and analyzed, this paper focuses on the telecommunication sector trends and statistics with comparisons to the global standard. It analyses and presents analysis of what has been happening in the past 10 years and their implications to the future.

About Tanzania

Situated in East Africa, Tanzania is a country with around 50 million people. The country is considered a developing country with most of its citizens depending on agriculture as a main economic activity. This means, most Tanzanians live in rural areas and suburban towns. In the past 25 years, this country has witnessed major changes in communication sector which has gone parallel with rural area electrification (fig. 1).

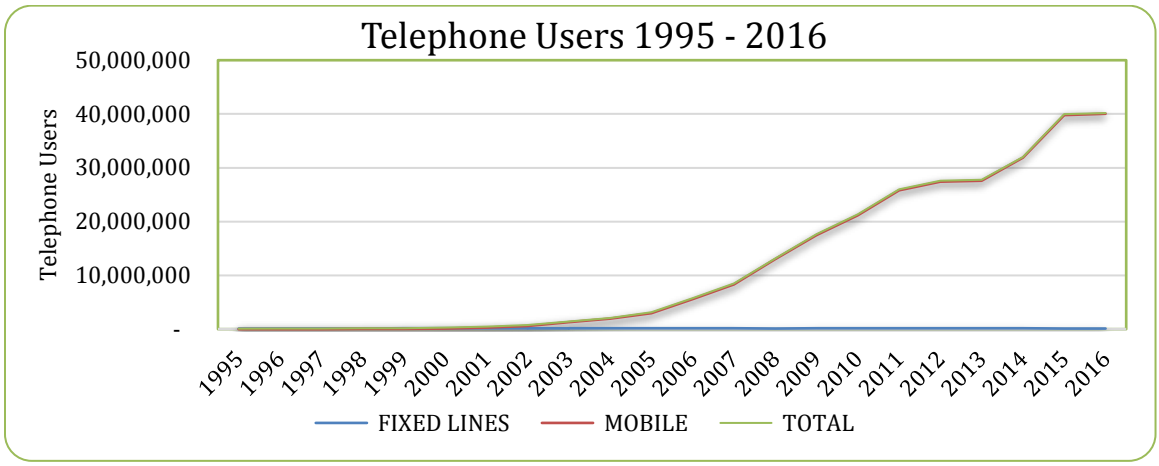


Figure 1. Tanzania telephone users 1995 – 2016 [TCRA 2017].

After the introduction in this section, related literature is presented in the next chapter followed by a short methodology. Discussion and analysis comes after methodology while conclusion will summarize the main discussion points of this paper at the end.

Literature

Globally, telecommunication companies have gone through several revolutions. From 1960's when computer networks were at the early stages, the old telephone companies slowly started providing data services to scientific organization and some banks [Leiner et.al., 2009]. It was during the birth of personal computers when the need for connectivity grew as computers became a common machine in every office in developed world. The explosion of telecommunication networks came in early 1990s with the discovery of hypertext make up language (HTML), where internet as we know now became a reality [Nowery and Simcoe, 2002]. Most telephone operators made it possible to use the same infrastructure to access the Internet. The birth of web browser made it possible to send email, publish articles and on the other hand, web browser made it simple to consume information from the internet [Leiner et.al., 2009].

The second half of 1990s witnessed another leap with the birth of Windows 95, which simplified the use of personal computer and on the same period, cellular networks were born. At this period, billions of dollars were invested in telecommunication and internet related businesses which led to the collapse of an era, famously known as dot com crash at the end of 1990s [Preissl et.al.,

2013]. After the dot-com bust, many companies that invested in telecom infrastructure and e-commerce collapsed and new ones emerged [Malone 2004].

The cellular technologies first generation, analog technologies, came with only calls capability while the second generation came with the ability to send text messages and multimedia messages (MMS), a digital generation with GSM (Global System for Mobile Communications) as a main technology. The third generation (3G) made it possible to send data, and this is when smart mobile devices such as smart phones and tablets came to life. This generation used Wideband Code Division Multiple Access (W-CDMA) and Edge as the main technologies. The 3G era stayed for a while with a few variations such as 3.5G, High Speed Packet Access [HSPA], HSPA+ and 3.75G High Speed Uplink Packet Access (HSUPA) and Long Term Evolution (LTE). At the same period, technologies such as WiMAX came to life facing competition from LTE. [Steele et.al., 2000, Zhao 2002, and Agar 2013]. Now, 4G LTE is becoming a common technology in most urban areas and in some few cities, 5G is being tested

Another major development that occurred in the last decade in Africa was the submarine connectivity that connected the continent to the world. The most notable projects were the ESSAY submarine cable and Kenya national backbone project. Having being utilized by telecom operators, these major projects have provided super-fast connections which also made broadband affordable to many [Dhliwayo 2005 and Mareu et.al., 2016].

While the changes in telecommunication were occurring, the world was changing with business undergoing digital transformation. The witnessed the rise in computer business and internet subscriptions. This however, had some limitation to average citizens to participate in this changes. One was required to have a computer to be able to access the internet and benefit from information freedom. Because of this, digital divide was gradually widened [Sedoyeka 2012].

The expansion of mobile phone coverage and the arrival of 3G and smartphones have made it possible for many people to get connected. This has seen a major shift on the way information is created, consumed and communicated and the number of subscribers have risen exponentially. This mobile phone growth has also slowed down the expansion of fixed lines in many places in the world [Barth 2014].

The rise of mobile phone subscribers and the upgrade on mobile phone capabilities means the rise on the number of people getting access to internet. Smartphones have removed the need of having a computer to access the internet. With fast broadband and affordable connectivity, people in developing word such as Tanzanians are now getting online to create, consume of communicate information. Globally, access to information changes the way people of different ages communicate [Sum et.al., 2009].

While all those transformations were unfolding, another major leap in the way humans use technologies came in the form of mobile money, the ability to send and receive money using mobile phones [Dunn 2015]. As other technologies, mobile money started in developed country but did not reach its full potential until East African countries, Kenya [Safaricom] and Tanzania [Vodacom] launched M-Pesa [Osah et.al., 2017, Horne et.al., 2015]. In developing countries, poor public infrastructure especially roads and electricity had led to the lack of banking facilities in many places especially rural areas. This situation left millions without banking services which meant they could not send or receive money which highly affected business [Chalemba 2017]. Lack of business and money movement became a burden to many who were already living in poverty [Jang and Par, 2016]. As observed by Batuo [2015], development in communication infrastructure has a direct impact in economic wellbeing of a country. To date, most telecom operators in developing countries offer mobile money services [Gosavi 2015].

Literature have shown how fast technologies have changed and how we as people have changed the way we live adopting to the rapid changes of technologies. However, there is gap in knowledge on how telecommunication industry have changed in Tanzania in the last 10 years. This paper presents data from literature, regulatory and recent research data to show the changes in terms of technologies, subscriber growth, services and challenges the industry faced on the process.

Methodology

Data presented in this paper comes from two major sources. The main one is the secondary data, gathered from Tanzania Telecommunication Authority (TCRA). These are quarterly data posted in TCRA website. The second source was the study conducted by the author to investigate the use of internet in Tanzania, considering personal aspects and choices made by internet users.

While the first source was basically a desk job as it consists of secondary data, the second study used an online questionnaire hosted by Google forms. The questionnaire was distributed via social media mainly Facebook from which over 2500 questionnaires were filled.

Data were collected and transferred into spreadsheet for cleaning and organizing. After cleaning process, 1931 questionnaires were considered useful and were analyzed. Chats were created using Microsoft Excel.

Findings and Discussion

After the analysis, findings and discussion is categorized in several subsections such as subscribers, looking into the number of telephone users and data uses, this one looks mainly into the use of Internet. The discussion is also based on phone calls, looking into ten years' trends of calls traffic, mobile money use, and broadcasting data, analyzing the rise and usage of digital television in the country.

Subscribers

Tanzania has witnessed its mobile phone subscribers growing exponentially, which has been a global trend in the past decade. While the number of fixed telephone lines stayed flat (163,269 in 2007), mobile subscribers grew from 8 million to 40 million in the ten years [fig. 2].

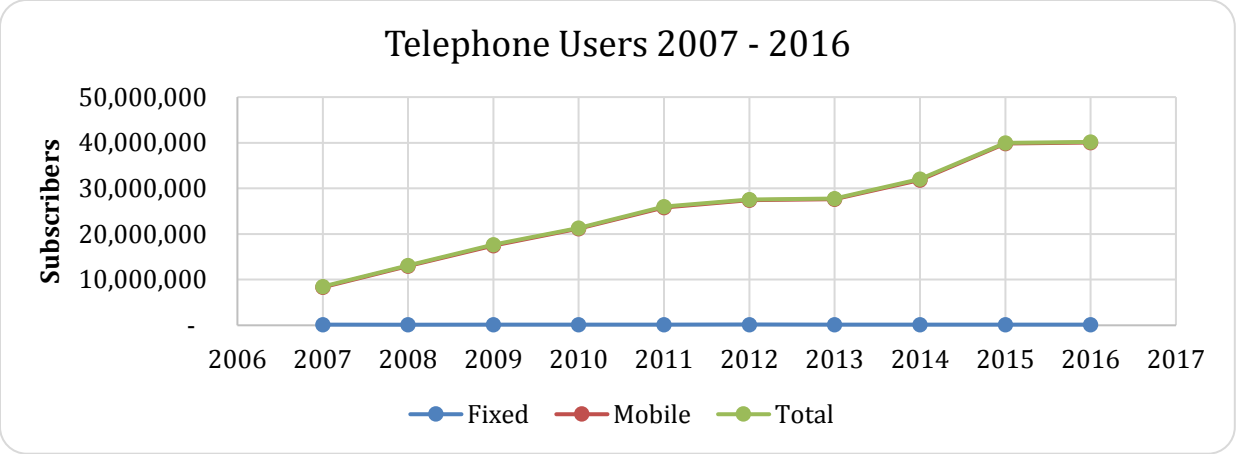


Figure 2: Tanzania Telephone subscribers from 2006 to Dec 2016 [TCRA 2016].

Operators and Market share

In the past Ten years, there has been companies that entered the market and some that left the market. By 2007 there were five active companies, namely Vodacom, Tigo, Celtel (now Airtel), Zantel (mobile and fixed) and TTCL (fixed line). At the time, Vodacom was leading with 46% market share, followed by Celtel (Airtel) with 30% and far third was Tigo with 14% and Zantel with 8%. At that time, Halotel and Smart were not in the market. While Celtel market share stayed constant for years, despite rise in subscribers' base, Vodacom Market share shrank to 39% in 2009 while Tigo rose to 24%. Vodacom regained the rapid growth and jumped to 45% market share by 2011 while Tigo shrank to 21% and Celtel almost stayed the same [fig. 3]. In the past six years, telephone penetration raised from 59% on 2011 to 80% on 2016 [fig 6].

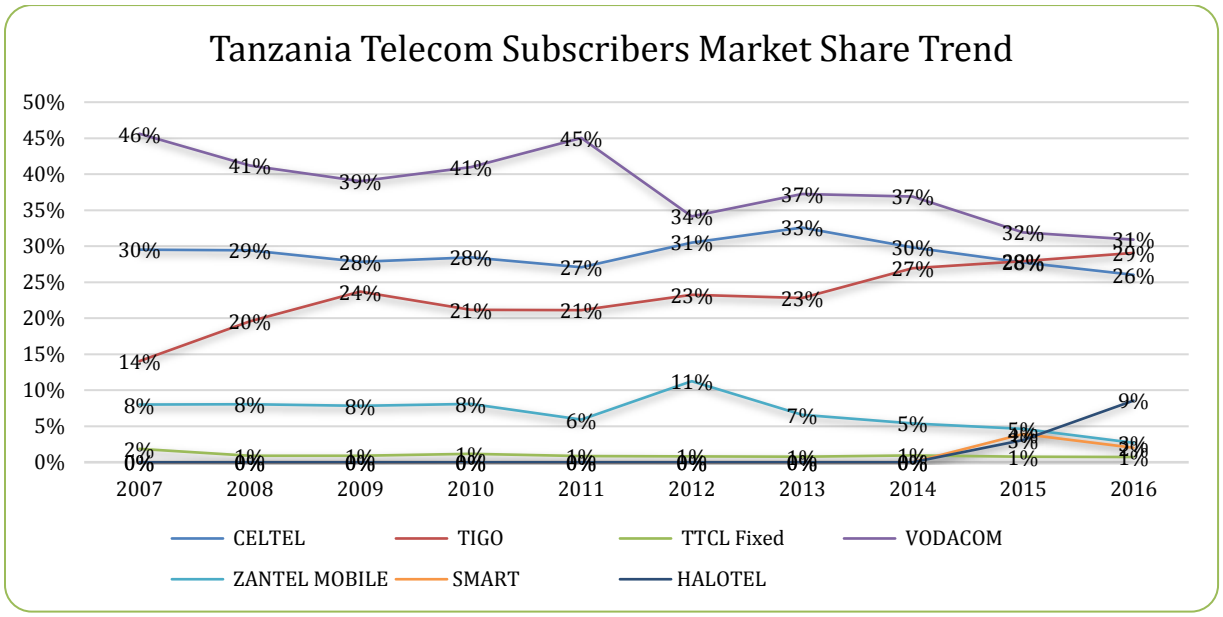


Figure 3: Subscribers Market Share Trends – 2007 – 2016 [TCRA 2017].

By 2016, new companies had entered the market, notably Smart and Halotel and quickly started to gain market share. Halotel for example, gained 9% in two years since its inception in 2014. The shift in the market saw Vodacom losing its dominance down to 31% and Airtel (formerly Celtel) slightly decline to 26%. Tigo has been the fastest growing company with 29% of market share. Zantel also declined to 3% from 6% market share in 2011. Smart had gained 2% of market share while TTCL fixed lines had 1% that has stayed for over a decade [fig. 4]. After being acquired by Tigo, Zantel's market share have been shrinking.

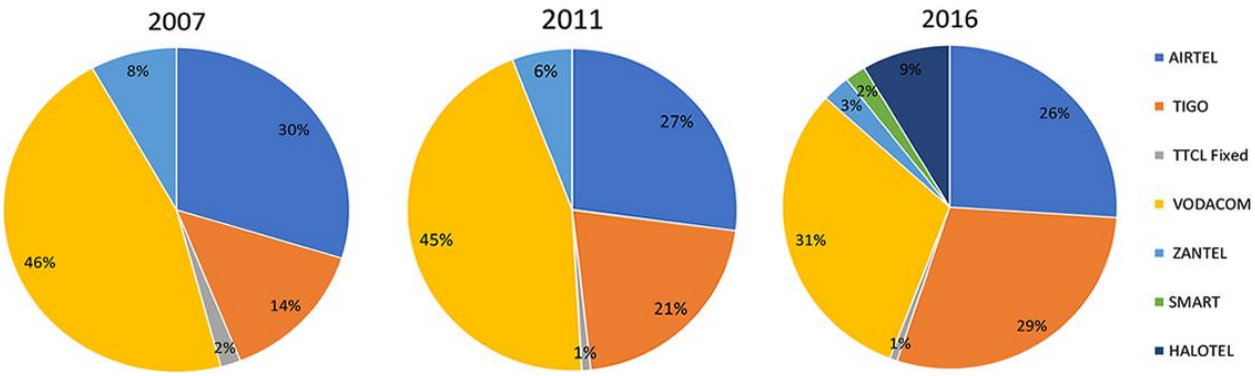


Figure 4: Snapshots of Tanzania telecom market share in different times [TCRA 2017].

Data users and use

In the past 10 years, Tanzania has seen its citizens getting online by millions which also goes parallel to the rise on mobile phone subscribers. The authors could not ascertain the accuracy of data before 2011 and therefore relied on data available from 2011 in which there were just over 5 million data users. By the end of 2016, data users had risen to over 19 million users [fig. 5].

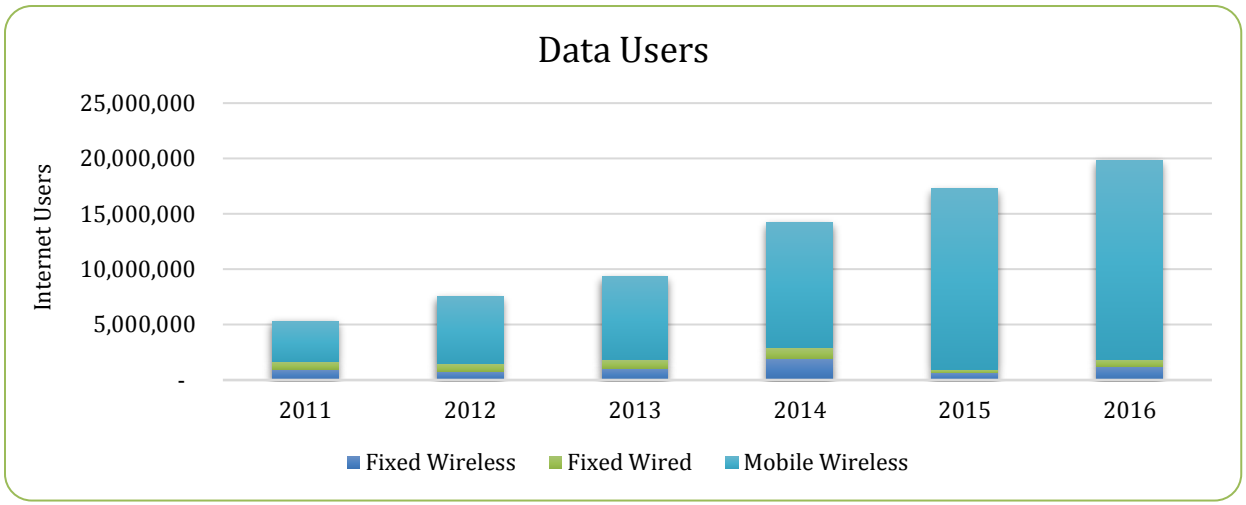


Figure 6: Tanzania Internet users trend from 2011 to 2016 [TCRA 2017].

As it can be seen in figure 6, most data users are using mobile connectivity. These are either internet dongles or mobile phones. With the rise in smartphones and their capabilities such as tethering [ability to create a mobile internet hotspot], mobile phone users often use their smartphone as a wireless fidelity [Wi-Fi] broadcasting hub and share their data with others. Despite

the significant rise in data users [12% at 2011], internet penetration is still at 40%, leaving over half of Tanzanians unconnected [fig. 6].

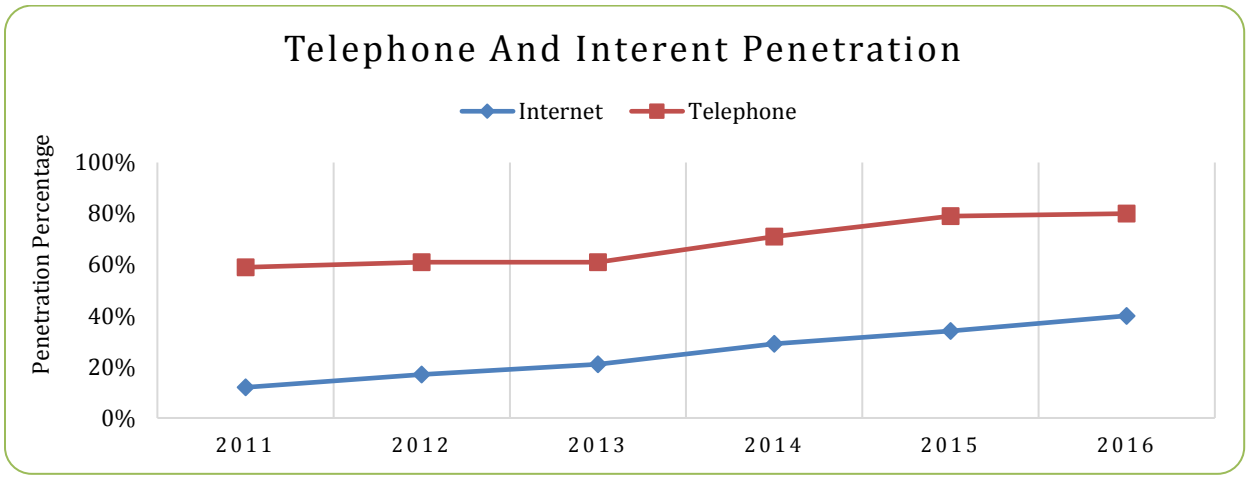


Figure 6: Tanzania Internet penetration [TCRA 2017].

According to Meeker [2016], average global internet penetration is at 42%, indicating that Tanzania is not too far from the target. With the current rural electrification projects, telecom competition, rural access initiatives and lowering cost of smartphones, internet penetration ratio will surely rise. On a study conducted by Sedoyeka [2017], it was found out that Halotel is fast becoming a strong competitor in data, surpassing Airtel and trying to reach Tigo in second place, Vodacom is leading [fig. 7].

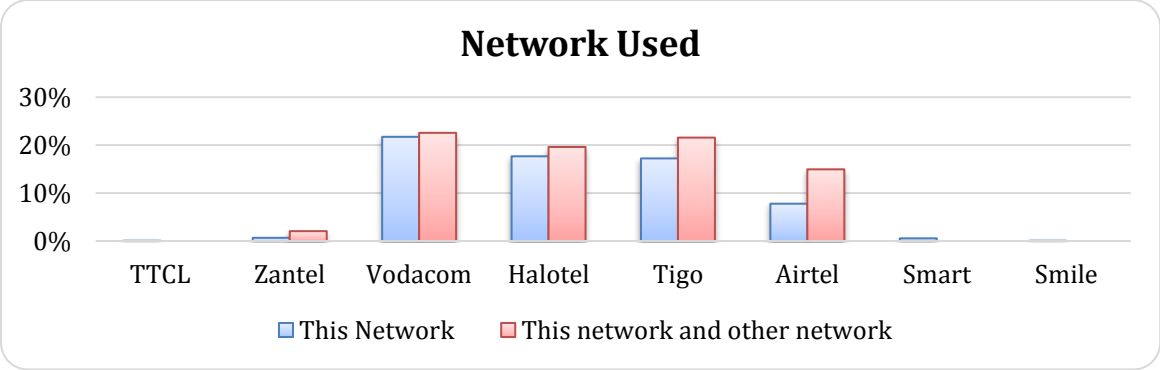


Figure 7. Network being used to access the Internet [Sedoyeka 2017]

In the same study that over 2500 participants shared their usage experiences, it was noted that most Tanzanian go online to communicate and get informed. It was also noted that still few use internet

as an entertainment or business tool. This has a huge implication on missing out the potential that could be brought by Internet. For example, while online business is booming in the world, only 18% of Tanzanians have ever use internet for the e-commerce.

Although there are local and regional initiatives with mobile apps such as Kupatana, that people can conduct business and Twende, a city transport application, the use of internet for business is still low. Another notable data is the low use of internet for office use such as video conferencing. While in the developed economies the number of physical meetings is being minimized, only 5% of Tanzanians use video conferencing. Despite the growing trends, youth, who were expected to use the internet for entertainment are not doing so, registering only 4% on video games, 10% on listening to music and online radio, while only 7% on watching TV online (figure 8).

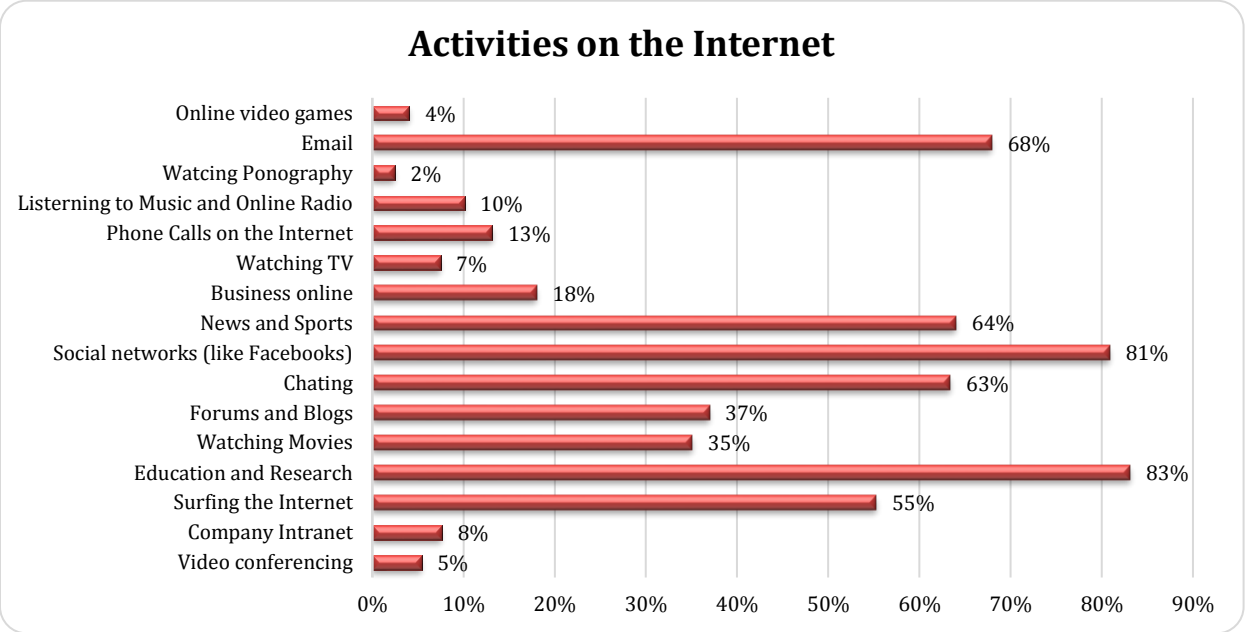
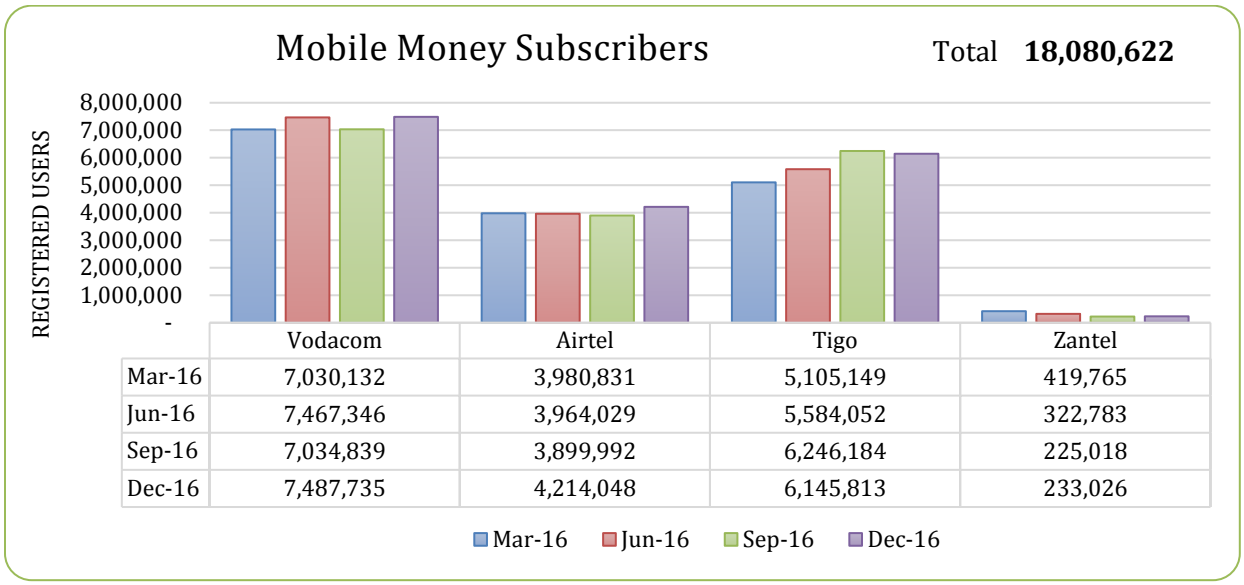


Figure 8: Activities performed by Tanzanians online [Sedoyeka 2017].

Mobile money uses and users

Tanzania have also witnessed a jump in the use of mobile money in the past five years. According to the data obtained from TCRA, there are over 18mil simcards registered to use mobile money on various networks with strong performance by the three-leading companies in 2016 (fig 9).



	Vodacom	Airtel	Tigo	Zantel
Mar-16	7,030,132	3,980,831	5,105,149	419,765
Jun-16	7,467,346	3,964,029	5,584,052	322,783
Sep-16	7,034,839	3,899,992	6,246,184	225,018
Dec-16	7,487,735	4,214,048	6,145,813	233,026

Figure 9: Tanzania mobile money subscribers by the end of 2016 [TCRA 2017].

In 2015 and 2016, Vodacom's M-Pesa and Tigo's Tigopesa have expanded their market share steadily while Airtel Money have stayed flat and Zantel's Easymoney experiencing a decline (fig 10). Data from Halotel's Halopesa could not be verified.

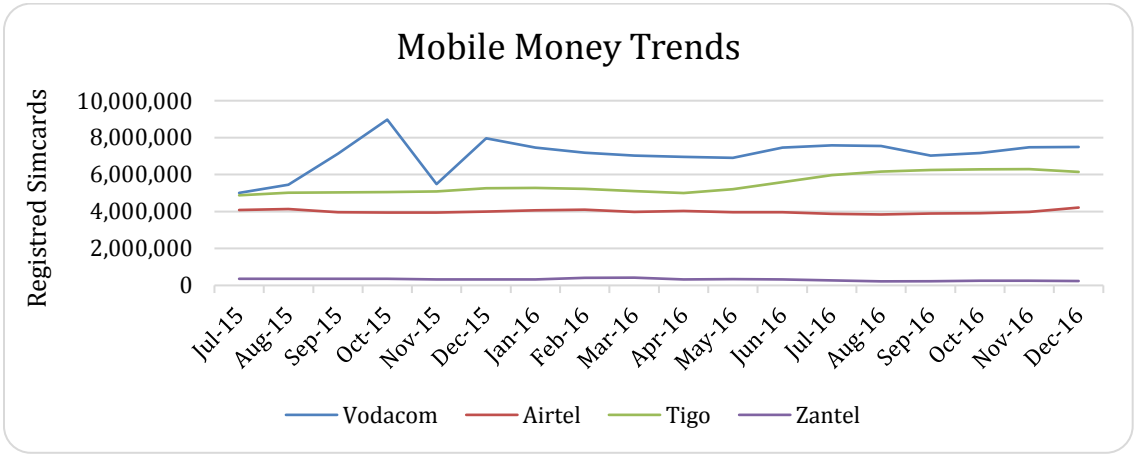


Figure 10: Mobile money trend in Tanzania [TCRA 2017].

With over 18 million simcards registered to use mobile money in the country, it is estimated that there are at least 10 million active mobile money users in the country. The availability of four options, now five with Halopesa just entered the market, people in all corners of Tanzania have access to mobile money, meaning they can send, receive, pay or sell products and use mobile money for payments or transfer. Being an industry leader in the country, Vodacom is enjoying 41% market share, followed by Tigopesa at 34% and Airtel Money at 23% [fig 11]

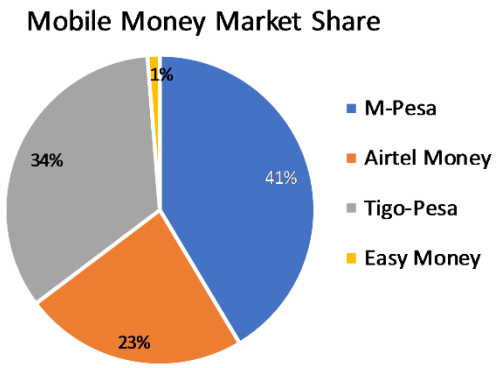
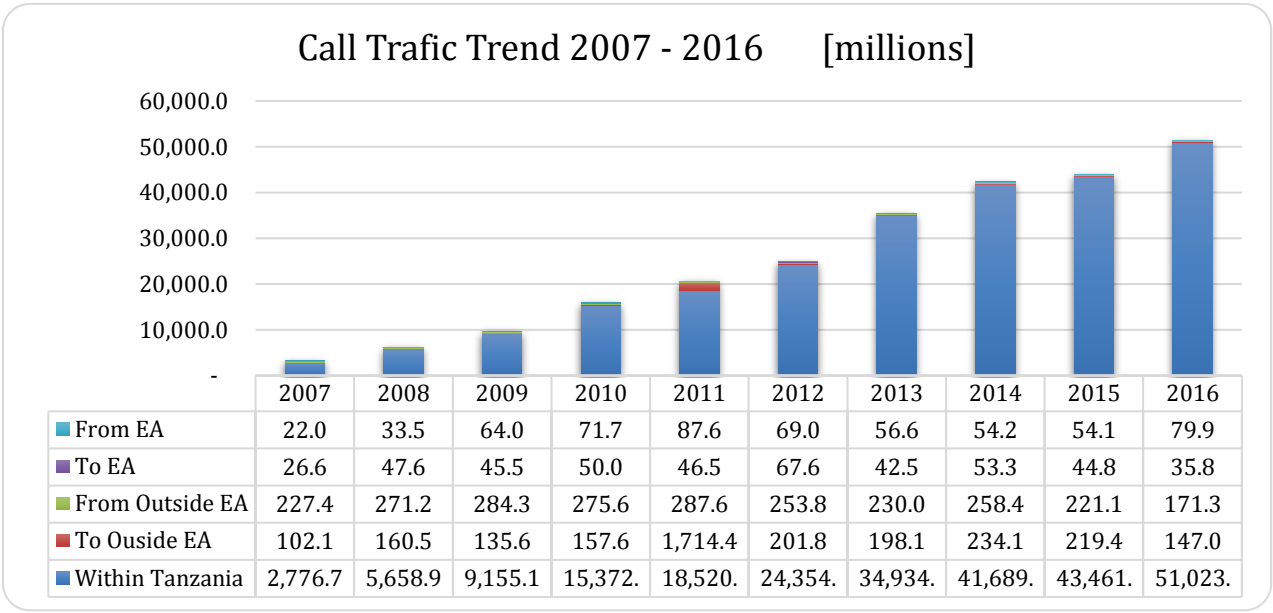


Figure 11: Mobile Money Market Share

Phone Calls

The primary function of a mobile phone is making phone calls and short messages (SMS). In the past ten years, number of phone calls have increased proportional to the number of subscribers in the country. Figure 12 shows that number of calls made has grown exponentially in the ten years (2007 to 2016) with majority of calls made to numbers inside Tanzania, which saw the number growing from 2 billion calls in 2007 to over 51 billion calls in 2016.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
From EA	22.0	33.5	64.0	71.7	87.6	69.0	56.6	54.2	54.1	79.9
To EA	26.6	47.6	45.5	50.0	46.5	67.6	42.5	53.3	44.8	35.8
From Outside EA	227.4	271.2	284.3	275.6	287.6	253.8	230.0	258.4	221.1	171.3
To Ouside EA	102.1	160.5	135.6	157.6	1,714.4	201.8	198.1	234.1	219.4	147.0
Within Tanzania	2,776.7	5,658.9	9,155.1	15,372.	18,520.	24,354.	34,934.	41,689.	43,461.	51,023.

Figure 12: Phone Calls Trend 2007 – 2016 [TCRA 2017].

Vodacom and Airtel are dominating the international calls market by posting strong numbers for most of the years while Tigo coming third. TTCL seams to completely missing out after posting strong data on 2014 and 2015 (fig. 13).

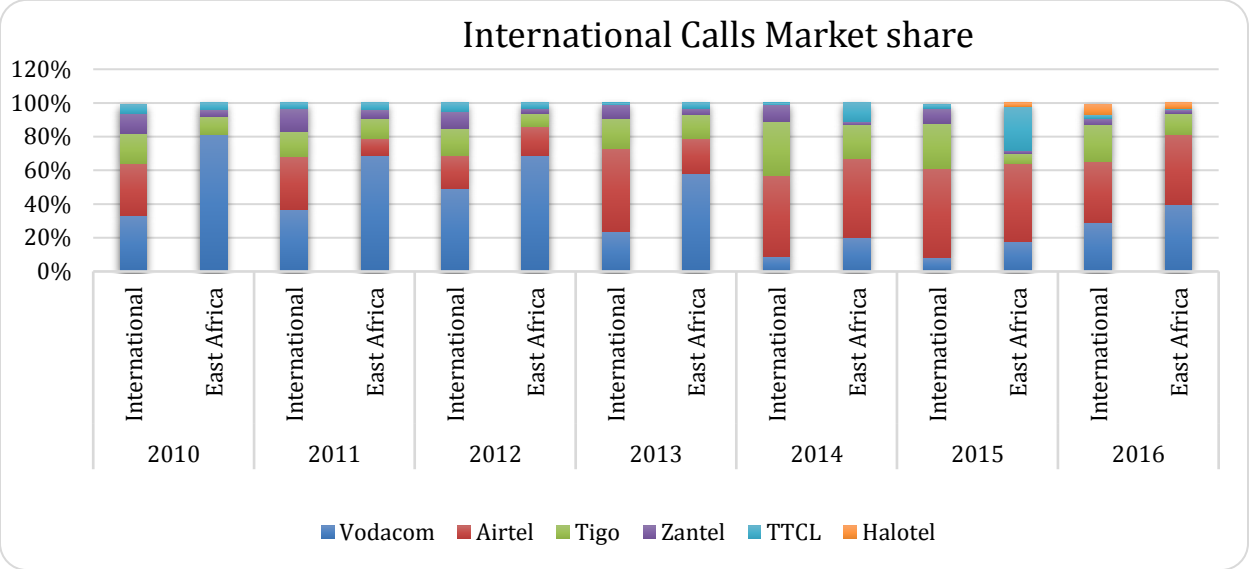


Figure 13: International Calls market share [TCRA 2017].

On the other hand, Tigo, Vodacom and Airtel are strongly competing on the local calls arena. In the past two years, a new name has emerged, Halotel, and already posting competing data, which seems to eat from the big three companies as demonstrated on figures 14, 15, and 16.

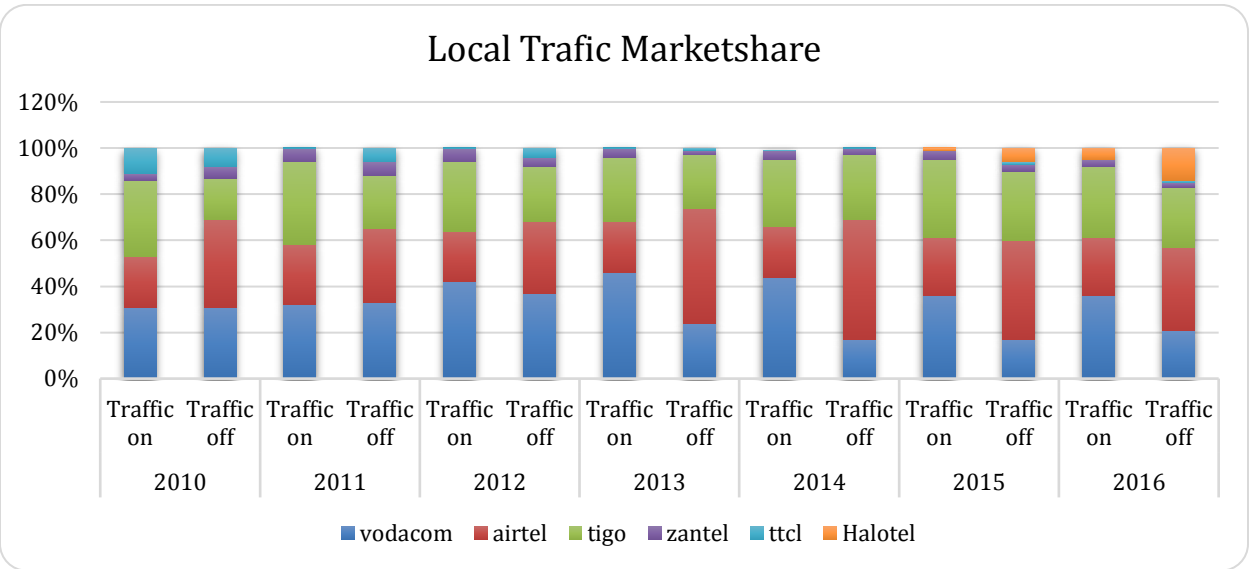


Figure 14: Local Calls market share [TCRA 2017].

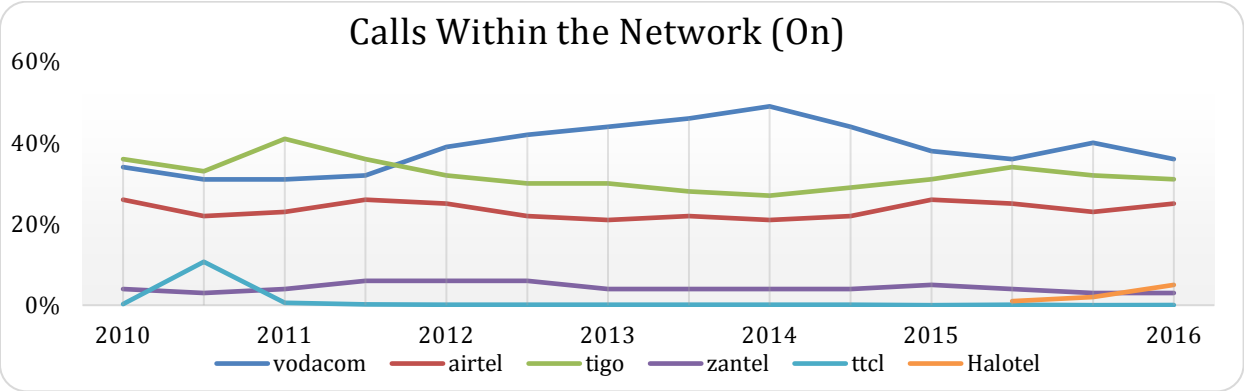


Figure 15: Traffic within the network (ON Net) [TCRA 2017].

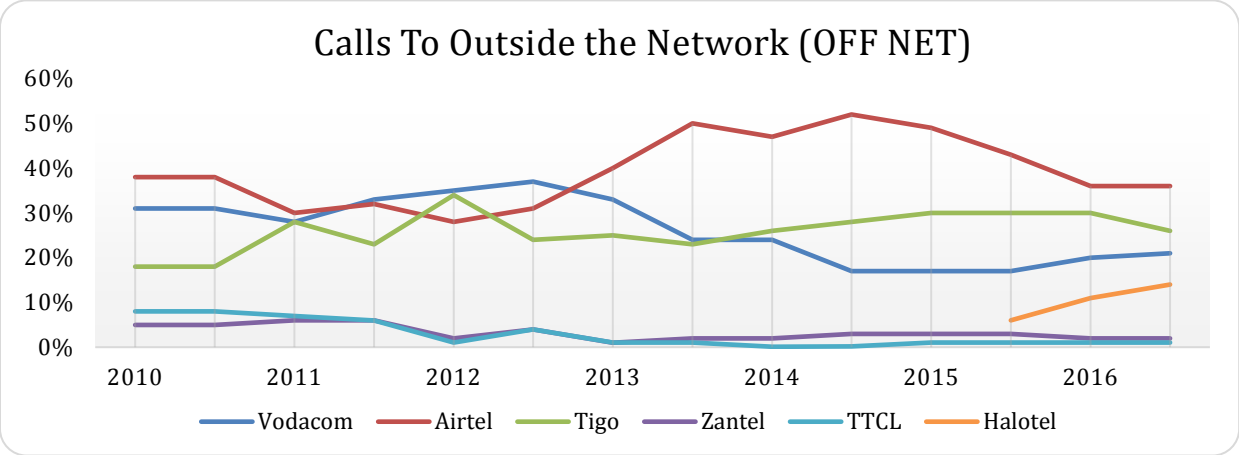


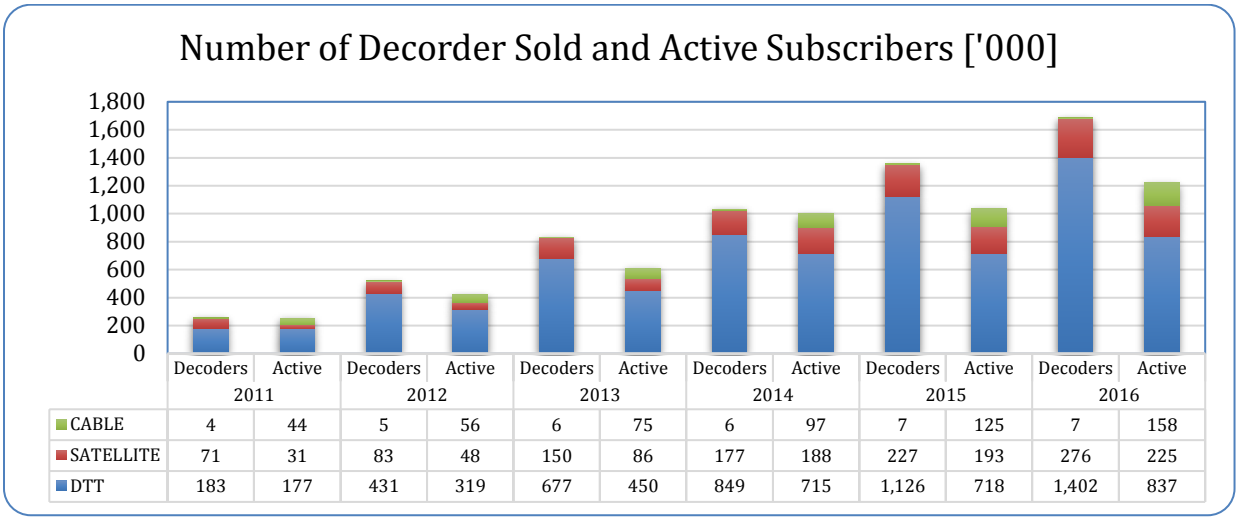
Figure 16: Traffic to Other Networks (OFF Net) [TCRA 2017].

Data have shown an intense competition among three major networks Vodacom, Airtel and Tigo. Of the three network, Tigo is the most improved operator in the past ten years going neck and neck with Vodacom and Airtel. The arrival of Halotel in the market has caused a shift in the telecom market share, with all the three networks losing some market share to Halotel. It should also be noted that despite the rise of calling applications that uses internet, traditional calls have continued to rise with the rise of new sim card subscriptions.

Broadcasting Services

The past decade also witnessed Tanzania switching off analogue television signal into digital, taking a leading role in Africa. According to the available data, broadcasting sector did not undergo major changes after the switch to digital. To date, Tanzania has 46 television channels, a slight

change from 40 in 2010. The digital change over let to the rapid number of TV watchers as number of decoder sold and active subscribers started to grow linearly (fig 12).



	Decoders 2011	Active 2011	Decoders 2012	Active 2012	Decoders 2013	Active 2013	Decoders 2014	Active 2014	Decoders 2015	Active 2015	Decoders 2016	Active 2016
CABLE	4	44	5	56	6	75	6	97	7	125	7	158
SATELLITE	71	31	83	48	150	86	177	188	227	193	276	225
DTT	183	177	431	319	677	450	849	715	1,126	718	1,402	837

Figure 12: Number of Decoder sold and **Active** Subscribers from 2011 to 2016 [TCRA 2017].

At the end of 2016, Tanzania had over 1.6 million decoders in homes and offices with over 1.2 million of these being active subscribers. Tanzania public is enjoying a variety of digital television options which comes with two main options, paid and free to air. Tanzania Broadcasting Corporation (TBC) with its flagship free channel TBC 1 is available in all decoders. Other free channels include ITC, EATV, STAR TV, Clouds TV and Channel Ten which are available when a subscriber pays the minimum subscription fee.

Conclusion

This paper has presented data about Tanzania telecommunication sector for ten years' period from 2017 to 2016. The paper has looked into telephone subscriptions, considering the trends in the ten years, mobile money registration and usage as well as internet use. Data about tradition phone calls as well data regarding television and radio broadcasting have been analyzed. To write the paper, the author relied on official data from Tanzania Communication Regulatory Authority [TCRA] and a study conducted at the end of 2016 that investigate the usage of Internet in Tanzania.

It has been established that by the end of 2016 Tanzania had over 40 million mobile phone subscribers equivalent to 80% telephone penetration. The ten years have seen Vodacom dominance been cut to 31% mostly by Tigo which stands at 29% and Airtel at 26%. The industry has also

welcomed several new players, notably Halotel which is already owning 9% of subscribers' base. Despite the rise of smartphones and internet based calling applications, traditional phone calls have continued to rise and on 2016, there were over 51 billion phone made within Tanzania and over 182 million phone calls been made to international destinations.

By the end of 2016 Tanzania had over 19 million internet users with just over 40% penetration which is considered low as the global average is at 42%. To provide these users with Internet, Vodacom is also the leaders followed by Tigo and surprisingly by Halotel ahead of Airtel. It has also been learnt that activities most performed online include education and research, emailing, and social media where mobile applications such as Whatsapp are on the rise. Activities least performed online include online games, online TV, company intranet, online business and video conferencing.

The use of mobile money is also on the rise with over 18 million registered accounts whilst Vodacom's M-Pesa and Tigo's Tigopesa leading the way, with Airtel following third. In the last ten years, Tanzania switched from analogue to digital broadcasting and by the end of 2016 there were 46 registered channels with over 1.6 decoders and over 1.2 million active subscribers.

In these ten years, Airtel have stayed stable posting good performance on subscribers' base and phone calls while Vodacom, though still strong, has been shrinking slowly in the same period. Starting with 46% market share on 2017, the company has lost its market share to Tigo and now to Halotel. On internet use, Vodacom is still leading but Tigo is catching and in a long run Halotel is coming fast. On mobile money, Vodacom is the leader while Tigo is catching up fast, we are yet to see how Halotel is intending to compete in this area. While Zantel is continuing to decline in all areas, Tigo has shown an impressive growth in the ten years. However, in the last two years, Halotel has shown a remarkable growth. Entering the market using Rural-Urban approach, Halotel has invested in rural areas and thus hurting Vodacom that had been using rural areas as a strong base after losing some of the urban market share to Tigo. With Halotel now eyeing urban areas, the dynamics of the market share will surely change.

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