

INFLUENCE OF AVAILABILITY OF ICT INFRASTRUCTURE ON DELIVERY OF HIGH-SPEED BROADBAND TO RURAL AREAS IN KENYA

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Abstract: The research project sought to examine the influence of availability of Information Communication Technology (ICT) infrastructure on delivery of high speed broadband to rural areas in Kenya. The target population for this study comprised of licensed Internet Service Providers in Kenya. They were be; Wananchi Companies (Kenya) Limited, Safaricom PLC, Jamii Telecommunications Limited, Poa Internet Kenya Limited (formerly Argon Telecom Services Limited), Internet Solutions Kenya Limited, Mawingu Networks Limited, Liquid Telecommunications Kenya Limited, Telkom Kenya Limited, Mobile Telephone Networks Business Kenya Limited, and Frontier Optical Networks Ltd. The field engineers, Project managers, and mid-level managers were the respondents. The study targeted the field engineers and project managers as they are directly involved in the rollout of the broadband and other services to customers, mid-level management gave the insight to impact of regulatory and administrative policies with regards to the delivery of broadband services. Structured questionnaire, secondary data analysis, interviews and observations were used as data collection tools to bring out the knowledge gaps. Illustrative and deductive data was instrumental in the analysis of data. These included frequency tables, percentiles, and means, Pearson product moment coefficient. The figures were coded then evaluated by means of Statistical Package for Social Sciences (SPSS). Results acquired formed the basis for interpretation, discussion, conclusion, and recommendations of this research project.

Keywords: Information Communication Technology, Infrastructure, High-speed broadband.

1. INTRODUCTION

The internet dissemination and usage in upcountry areas of established countries like the USA, Canada, and the UK have been on the low in comparison to the urban areas of the same nations. There is low broadband penetration where the assessment showed poor or low telecommunication infrastructure. A blend of poor telecommunications organization coverage, small population concentration, insufficient directive, and emphasis by telecommunications firms on costly know-hows intended for non-rural markets results to Internet connectivity in non-urban areas becoming a millage.

Willis and Tranter (2006) assert that because of poor or lack of ICT infrastructure in rural areas, the provision of high-speed broadband (HSB) and other ICT services is still a challenge. Ogunsola, and Okusaga (2006), scrutinizes disparities surrounding accessibility and application of IT set-up amid advanced and industrialized countries in the North as well as the underdeveloped nations in the South and thoroughly deliberated aspects liable for digital split and suggest a course of action for creating groundwork outlines suitable for the current century ICT.

The study therefore intended to have a critical look at availability of ICT infrastructure, cost of deployment, ICT policy and regulations and demographic factors as determinants and to what extent they influence delivery of high-speed broadband to rural areas in Kenya.

According to Dickes, Lamie, and Whitacre, (2010), survey data suggested over 63% home broadband connectivity of the general U.S. population across most American cities with substantial state and regional broadband gaps across rural areas. Stoel and Ernst, (2008) assert that the rift in broadband assumption charges amid non-urban and non-rural areas has been persistent since the early 2000s even though broadband service providers were said to have stretched out countrywide broadband range from 2001 to 2006.

According to the Federal Communication Commission, the Connect America Fund (CAF) in conjunction with the public and private investment was established in efforts to expand broadband infrastructure in rural communities. However, Hauge and Prieger, (2010); Whitacre, Strover, and Gallardo, (2015) established that effort should be made to increase broadband demand as opposed to supply. According to the Organization for Economic Co-operation and Development-OECD, (2001) report, broadband access gap, in the OECD block countries, exists between urban and rural areas and households in urban areas have occupations where broadband is part of the work environment in the urban areas. The report further established that costs are higher and quality of access lower in rural areas, despite some policy and regulation efforts towards ensuring standardization in pricing and quality.

In Africa, remote and non-urban areas still undergo a severe deficiency of connectivity and merits associated with Internet access. According to the Cisco study, The ICT environments in Angola and Libya point to the need for greater ICT infrastructure investment in order to achieve economic and social goals through rural broadband reach. According to the Networked Readiness Index (2009); and International Telecommunications Union (ITU) statistics, Africa is set to five internet usage stage lives and notes that most countries in the region are in a moderate or poor part of the ICT map.

Information Technology and Innovation Foundation, (2009) notes that the problems facing delivery of broadband to rural areas are; one, broadband is not being deployed fast, and secondly, it's pricing puts most businesses and households at a disadvantage. This is happening despite the fact that ITIF established that broadband already exists virtually all countries in Africa. Further ITU asserts that the global average household connectivity, which still masks strong regional disparities in access, rates vary between 18.0% for Africa and 84.2% for Europe as of 2017. According to the Commonwealth Telecommunication Organization report 2017, 25.5 million South Africans live further than a 10km stretch, 4.9 million outside a 25km range, and 326,759 away from a 50km stretch of a functional FOC node while mobile broadband data services EDGE and GPRS are being stretched to extend over the entire 2G footprint. This range is constrained to the availability of FOC nodes.

As it is in his report "Networked Readiness Index" Cann (2016), notes that Kenya has improved to position 86th globally and 4th position in Africa. According to the CA sector statistics for the third quarter of 2017, the number of broadband subscriptions increased by 10.9 percent to stand at 19.9 million from 18.0 million subscriptions recorded during the previous quarter. As at the close of the quartile under assessment, the broadband penetration stood at 42.9 per cent.

ICT infrastructure is a critical enabler for trade, local and foreign investment, socio-political progress as it seeks to correct, improve and make more relevant the very processes with which trade and socio-political engagement are conducted within a country. It's through this infrastructure that ISPs will deliver HSB to the rural users in the country. This service provides large knowledge and information to different users comprising but not restricted to; homes as well as offices, institutions, hospitals and community centers.

2. STATEMENT OF THE PROBLEM

High speed broadband diffusion and dispensation facilitate achievement of a high degree of valuable communication which is vital and diverse and rapid compared to what former technologies deployed offer hence a focused-on broadband as postulated by Chinecherem, Awodele, Kuyolo, and Izang (2015). This is true as 10% upsurge in bandwidth penetration results in an added 1.38% upsurge in GDP progress for developing countries thereby economically sound to invest in broadband (World bank study, 2009).

Chinecherem et al. (2015) further assert that worldwide mobile-bandwidth dispersion will get to 32% by the end of 2014, whereas in technologically advanced countries, mobile-broadband diffusion will hit 84% which is four times higher as compared to third-world countries (21%). Mobile-bandwidth dissemination ranks are leading in the Americas (59%), and Europe (64%), trailed by CIS (49%), the Arabic countries (25%), with the least being Asia-Pacific and Africa holding 23% and 19% respectively.

According to CA quarterly sector statistics for quarter two 2017-18 financial year, the accumulative sum of broadband subscriptions rose up to 18.0 million from 17.6 million subscriptions listed in the preceding quartile. This interpreted to bandwidth dispersion degree of 39.7% for the duration in assessment, and the fixed bandwidth subscription was speed based as speeds those smaller than or equivalent to 256Kbps registered the smallest amount of subscriptions and speeds higher than 2Mbps recorded the uppermost sum of subscriptions. CA (2016) report asserts that the growth of ICT infrastructure such as FOC subscriptions has stagnated with quarterly reviews showing a very small rise from 111,354 to 122,437 translating to a 9.9 percent. This project, therefore, strived to study issues impelling delivery of high-speed broadband to rural areas in Kenya.

3. LITERATURE REVIEW

For delivery of high-speed broadband across rural areas in Kenya, the stability, reliability, and availability of a network of infrastructure are key. Shitole and Ritesh (2013) asserts that ICT infrastructure plays a critical role in socio-economic and political development enabling innovation and creation of employment in a country. Broadband connectivity majorly prejudiced by the prevailing network set-up or provision of it (World Bank, 2012). The development of cheap and robust ICT infrastructure posed great opportunities for private and public sectors while connecting rural and remote communities. Further asserting the need to embrace emerging technologies, fixed wireless and mobile Broadband know-how, and conjunction in non-urban and isolated with other technologies like Optic fiber technology which has been confirmed to provide the finest bandwidth to be used for broadband service conveyance.

Therefore, this project examined the extent to which availability, reliability and stable ICT infrastructure will influence the delivery of high-speed broadband to rural areas in Kenya. Sanjib Tiwari; Michael Lane; Khorshed Alam, (2016) in a study on the setbacks and prospects of providing cordless top speed bandwidth facilities in non-urban localities. Australia: A Case Study of Western Downs Region (WDR) desired to evaluate cordless broadband internet set-up, in the non-urban and remote societies of WDR in supply, demand and utilization points of view (Alam, K., 2017). The study established that 40% of the towns had ADSL/ADSL2+, and only 15% of the towns had 4G mobile network coverage. On the other hand, all of the towns had difficulties with speediness, dependability of service and capability to support broadband needs in the WDR. Satellite broadband internet for remote localities was also inconsistent and was not to satisfaction.

4. METHODOLOGY

The target population for this study comprised of licensed Internet Service Providers in Kenya. They were be; Wananchi Companies (Kenya) Limited, Safaricom PLC, Jamii Telecommunications Limited, Poa Internet Kenya Limited (formerly Argon Telecom Services Limited), Internet Solutions Kenya Limited, Mawingu Networks Limited, Liquid Telecommunications Kenya Limited, Telkom Kenya Limited, Mobile Telephone Networks Business Kenya Limited, and Frontier Optical Networks Ltd. The field engineers, Project managers, and mid-level managers were the respondents. The study targeted the field engineers and project managers as they are directly involved in the rollout of the broadband and other services to customers, mid-level management gave the insight to impact of regulatory and administrative policies with regards to the delivery of broadband services. Structured questionnaire, secondary data analysis, interviews and observations were used as data collection tools to bring out the knowledge gaps. Illustrative and deductive data was instrumental in the analysis of data. These included frequency tables, percentiles, and means, Pearson product moment coefficient. The figures were coded then evaluated by means of Statistical Package for Social Sciences (SPSS).

5. FINDINGS

This section sought to examine the impact that availability of ICT infrastructure has on delivery of high-speed broadband to rural areas in Kenya. The respondents were asked to indicate the number of infrastructure projects that have been undertaken by their respective organization and they participated in. trainings sponsored by the organization to improve its staffs' skills and knowledge with regards to effective implementation of the projects. The results were as shown in Table 4.3. The findings in 2018 show that 21.6% of the respondents participated in less than 2 infrastructure projects undertaken by their organizations, 29.4% of them participated in 2 to 5 projects and 49% of the in over 5 projects.

In 2017 the results show that 27.5% of the respondents participated in less than 2 projects, 31.4% in 2 to 5 projects and 41.2% participated in over 5 projects undertaken by their respective organizations. In 2016 the found out that 45.1% of the respondents participated in over 5 projects, 23.5% in 2 to 5 projects and 31.4% of the respondents participated in less than 2 projects undertaken in the organization. In 2015 the results show that 41.2% of the respondents participated in less than

2 projects and 29.4% of the respondents participated in 2 to 5 projects undertaken by the organization which was equal to those who participated in over 5 projects.

This shows that most of the respondents actively participated in infrastructure projects and equally, organizations undertook infrastructure projects over the period under study.

Table 1: Number of projects participated in undertaken by the organization

Year	Less than 2	2 - 5	Over 5
2018	11(21.6%)	15(29.4%)	25(49%)
2017	14(27.5%)	16(31.4%)	21(41.2%)
2016	16(31.4%)	12(23.5%)	23(45.1%)
2015	21(41.2%)	15(29.4%)	15(29.4%)

The respondents were requested to indicate the extent to which availability of ICT infrastructure affected the roll-out of ICT services. The results were as shown in Table 2 From the results 70.6% of the respondents indicated that availability of ICT infrastructure affected roll-out of ICT services to a very great extent, 25.5% indicated that availability of ICT infrastructure affect roll-out to a great extent, 3.9% indicated that availability of ICT infrastructure affect roll-out of ICT services to a moderate extent. This implies that availability of ICT infrastructure affects the roll-out of ICT services.

Table 2: Effect of availability of ICT infrastructure on roll out of ICT services

	Frequency	Percent
Very great extent	36	70.6
Great extent	13	25.5
Moderate extent	2	3.9
Total	5150	100100.0

Below are statements on the availability of ICT infrastructure with regards to delivery of high-speed broadband to rural areas in Kenya. The respondents were asked to indicate their level of agreement with each statement on how it affects delivery of high-speed broadband to rural areas. The findings were as shown in Table 3. From the findings the respondents agreed that availability of infrastructure allows timely and quality broadband deployment.as shown by a mean of 4.804, the infrastructure network reach has a direct impact on deployment of ICT services as shown by a mean of 4.608.

Table 3: Project team management structure

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	St. Deviation
The availability of infrastructure allows timely and quality broadband deployment.	42	8	1	0	0	4.804	0.4481
The infrastructure network reach has a direct impact on deployment of ICT services.	33	16	2	0	0	4.608	0.5684

The respondents were asked to give their opinion on the effect of availability of ICT infrastructure on deployment of high-speed broadband. The results were as shown in Table 4 From the findings 43.1% of the respondents indicated that availability of ICT infrastructure improves delivery of HSB to rural areas by 50% to 75%, 54.9% indicated that availability of ICT infrastructure improves delivery by 75%, 2% respondents indicated that it improves delivery of high-speed broadband to rural areas by between 25% to 50%. These findings show that availability of ICT infrastructure improves delivery of HSB to rural areas in Kenya.

Table 4: Effect of availability ICT infrastructure on delivery of HSB.

	Frequency	Percent
Improves delivery by over 75%	28	54.9
Improves delivery by between 50% to 75%	22	43.1
Improves delivery by between 25% to 50%	1	2.0
Total	51	100.0

Availability of ICT infrastructure is statistically significant to delivery of high-speed broadband to rural areas as shown by ($\beta = 0.660$, $P = 0.000$). This shows that availability of ICT infrastructure had significant positive relationship with delivery of high-speed broadband to rural areas in Kenya. This implies that a unit increase in availability of ICT infrastructure will result to increase in delivery of high-speed broadband to rural areas. From the results, there was a significantly positive correlation between Availability of ICT infrastructure and delivery of high-speed broadband to rural areas in Kenya as shown by $r = 0.574$, statistically significant $p = 0.000 < 0.01$.

6. CONCLUSION AND RECOMMENDATION

From the study, it is recommended that a reliable, robust and vast network of ICT infrastructure be in place to enable easy, fast and reliable delivery of high-speed broadband to rural areas in Kenya. With a growing general desire to access news and other media contents that in turn necessitates the need of high-speed broadband. A reliable ICT Infrastructure network will enable faster and timely development of high-speed broadband to deserving areas.

Availability of ICT infrastructure is statistically significant to delivery of high-speed broadband to rural areas in Kenya. This implies that availability of ICT infrastructure had a positive relationship with delivery of high-speed broadband to rural areas in Kenya. Consequently, a unit increase in availability of ICT infrastructure will result to increase in delivery of HSB to rural areas in Kenya. The study therefore concludes that availability of ICT infrastructure is positively related to delivery of high-speed broadband.

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