ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

Broadband – Infrastructural Deficit and ICT Growth Potentials in Cross River State, Nigeria

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ABSTRACT:The study examined Broadband infrastructural deficit and the growth potentials of Information and Communications Technology in Cross River State of Nigeria, by using three–to-five scale closed-ended questionnaires. Cross River State has a population of about 3,104,446; yet by 2014, it was estimated that mobile Broadband connections in Cross River State was below 50,000 subscribers. Government statistics put Internet penetration in Nigeria at 28 per cent. Out of these, only less than 9 per cent were Broadband-based. Key indicators of the result showed that Broadband penetration constituted a major problem to ICT service delivery {X^2 calculated (8.66) was less than X^2 tabulated (9.488)}. The impact of Broadband infrastructure as an antidote to revolutionize ICT service delivery indicated X^2 calculated (4.25) to be less than X^2 tabulated (9.488). A synergy was arrived at between speedy Broadband growth and advancement of technology; when X^2 calculated (0.07616) was less than X^2 tabulated (9.488). The study further noted that 90 per cent of Cross River State Internet subscribers were served by mobile GSM service providers. This poor state of service delivery can be improved if fixed-line networks are deployed as the active driver of Broadband access.

KEYWORDS:Broadband Penetration, ICT Growth Potential, Infrastructural Deficit, GSM Service Provider, and Internet Subscriber.

I. INTRODUCTION

The history of Internet dates back to 1960's, when developers saw great potential in the information sharing ability of macro computers in respect of scientific and military research. Through these innovations, J. C. Licklider proposed a global network of computers in 1962 [11]. He used research projects to develop it. The success recorded in these projects stimulated development in Internet connections. However, the first public access to high-speed Internet occurred in late 1990's when cable modern was introduced [10].

Broadband can be explained as a wide bandwidth that enables reliable, high-speed telecommunication services. On the frequency range, Broadband ranges from 256kbit/s to Ultra High Frequency (UHF); with channel bandwidth of 4MHz [2,4,6]. The cost of access to this essential service varies significantly with respect to speed, type of service, geographical location and nation. Thereby limiting the spread. Example: Broadband services was introduced to many states of Nigeria in the early 2000's, yet available records from National Communication Commission (NCC) indicate that only about 31 million Nigerians have access to the Internet, with about 80 per cent of this group benefiting from services provided by low bandwidth mobile phones and cyber cafes [9].

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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Like all the states of the federation, Cross River State relies solely on GSM network operators to supply broadband services due to poor state of wire line infrastructure in Nigeria.

This paper, therefore, briefly examines the current status of broadband infrastructure in Cross River State and reviews how infrastructural-deficit and bureaucratic bottleneck affect growth in the ICT sector. Government statistics put Internet penetration in Nigeria at 28 per cent. Broadband dissemination for both mobile and fixed broadband stood at 6.1 per cent [1]. This phenomenon is unlike mobile phone subscribers which current statistics indicate more than 90 million active subscribers compared to the ugly past records of about 400,000 subscribers [3,7]. Accordingly, the International Telecommunication Union (ITU), has described the 64.98 per cent tele-density as a huge performance when compared to 0.4 per cent in 2001 [13].

II. RELATED WORK

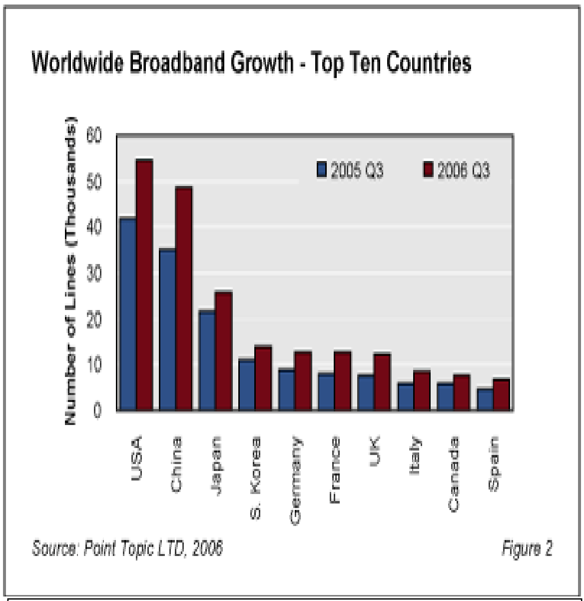
The penetration and cost of Broadband services vary between different regions. Countries that are more developed economically and technologically, like North America, China and the Western nations enjoy more broadband penetration [8,14]. The trend of penetration as presented in Fig. 1 shows Internet penetration levels across selected nations while Fig. 2 shows broadband growth for selected countries.

2007 Worldwide Internet Usage by Users and Penetration

Country	Internet Users	Population (2007 est.)	Internet Penetration (%)	% Users Of World
United States	210,080,067	301,967,681	69.9	19.2
China	132,000,000	1,317,431,495	9.0	12.1
Japan	86,300,000	128,646,345	67.1	7.9
Germany	50,616,207	82,509,367	61.3	4.6
India	40,000,000	1,129,667,528	3.5	3.7
United Kingdon	37,600,000	60,363,602	62.3	3.4
Korea (South)	33,900,000	51,300,989	66.1	3.1
France	30,837,592	61,350,009	50.3	2.8
Italy	30,763,848	59,546,696	51.7	2.8
Brazil	25,900,000	186,771,161	13.9	2.4
Russia	23,700,000	143,406,042	16.5	2.2
Canada	21,900,000	32,440,970	67.5	2.0
Mexico	20,200,000	106,457,446	19.0	1.8
Spain	19,204,771	45,003,663	42.7	1.8
Indonesia	18,000,000	2,925,700	8.0	1.6
Turkey	16,000,000	75,863,600	21.1	1.5
Australia	14,729,209	20,984,595	70.2	1.3
Vietnam	14,509,075	85,031,436	17.1	1.3
Taiwan	13,800,000	23,001,442	60.0	1.3
Argentina	13,000,000	38,237,770	34.0	1.2

Source: internetworldstats.com, 2007 *Figure 1*
Internet usage information comes from data published by Nielsen//NetRatings, by the International Telecommunications Union, by local NICs, and other reliable sources.

Fig. 1: 2007 Worldwide Internet Penetration Levels



Broadband penetration has accelerated through improved infrastructure. This is further nurtured by deliberate government policies to increase penetration and service quality. Available statistics showed that Internet users grew from 360 million users in December 2000 to 1.966 billion in June 2010 [3]. This represents a global broadband penetration of 28.7 per cent. However, North America has the highest broadband penetration per population; as comparative percentage stood at 77.4 per cent. The lowest population penetration was Africa with 10.9 per cent; though presently (2000-2010) [15], it registered the highest growth.

According to the global technical standard threshold body for telecommunication services, International Telecommunications Union (ITU), broadband penetration rate in developed economies is 23 per cent, compared to a one digit growth rate recorded in developing economies. The gap is widest for mobile broadband penetration, which is nearly 39 per cent in developed economies and only about 3 per cent in developing economies. For example, Eastern Europe added 19.5 million subscribers between 2005 and 2008, while African countries added 2.3 million Broadband subscribers; bringing market penetration up, but only to 0.36 per cent [3, 16]. Table 1 presents the level of Broadband penetration rate for selected countries in different parts of the world.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

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TABLE 1: Broadband Subscriber and Penetration Rate.

REGION	FIXED AND WIRELESS BROADBAND SUBSCRIBERS(MILLION)	MARKET PENETRATION RATE(PER100 POPULATION)
Africa	24	2.4
China	103	7.7
West of Asia	292	12.0
Eastern Europe	55	16.2
Latin America	62	10.8
Middle East	42	13.4
US and Canada	174	51.4
Western Europe	262	64.3
TOTAL	1014	15.0

Source: http:// www.nigeriadevelopmentfinance forum.org

The penetration rate and levels achieved by the top 30 countries around the world, and the correlation between connectivity and GDP (Gross Domestic Product) demonstrate that the global leader of broadband connectivity is now the Netherland and Denmark with penetration rate of 37.1 [4]. Further analyses confirmed that though developing nations are improving their Broadband connectivity, there is still a deep divide between more economically developed regions and less economically developed regions.

The story in United Kingdom (UK) is different. Broadband in the UK is now available on nearly every copper telephone line. However, 14 per cent of residential Broadband connections are currently operating at 24 Mbps speed which the government wishes to make available to virtually all homes by 2016 [5]. Data from London Internet Exchange shows that traffic over its network routers which interconnects the UK'$_S$ Internet Service Providers (ISP$_S$), has increased seven fold in the past five years.

A. Nigerian Broadband – Infrastructural Deficit and Implication on ICT growth.

In looking at what has been achieved with broadband in the ICT sector today, the modest success recorded so far has been with several initiatives that rode on the back of the success of the digital mobile services in Nigeria. These have encouraged huge investment and subsequent landing of several high bandwidth capacity submarine cable systems [10, 12]. However, ineffective distribution and transmission of the available broadband Internet access at more affordable end-users' prices have been a major challenge and a barrier to faster realization of the desired broadband boom in Nigeria.

Broadband supply chain comprises of international connectivity, a national backbone network, metropolitan access links and the local access network (the last mile). In Nigeria, there are now an appreciable number of submarine cable landings on the shore of the country through very high bandwidth capacity [13,16]. However, there is concern on the fact that all the landings are highly limited to urban locations; and access to other parts of the country is chocked due to the limitations of distribution and infrastructural deficit.

The Nigeria ICT sector has witnessed phenomenal growth in the last decade; becoming the leading subscriber based country in Africa. The growth has been due largely to regulatory and policy reforms in the country. However, in spite of this phenomenal growth, the country's over 113 million active mobile users are yet to benefit from the huge broadband capacity provided by subsea cable such as Glo-one, Main-one, Sat–3 and WACS [11]. This is due to inadequate last mile infrastructure, which has resulted to very high cost of Internet at an embarrassing slow speed.

With Tele-density in the country growing from 2 per cent in 2001 to about 65 per cent within 10 years, the broadband segment is yet to catch-up. Recent statistics show that there are over 45 Million Internet users in Nigeria, representing only 27 per cent of the population. This statistics places Nigeria behind South Africa, Kenya and Ghana in the sub-Saharan Africa [5].

With the advent of Main-one and Glo-1 submarine optic fiber cable systems, Nigeria has sufficient bandwidth capacity and the fundamental ingredient to drive the growth of data and broadband penetration to the last mile.

Presently, Nigeria accounts for five international submarine cables (SAT-3, Glo–one, Main-one, NACS and ACE), which crashed the price of wholesale international bandwidth to US $100 per Mbps per month from about US

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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$6,000 per Mbps per month in 2004 [12]. The cost of international wholesale bandwidth will remain highly competitive, and has ceased to be a barrier to cheaper retail broadband prices.

The mobile market (being the major means of providing broadband) in Nigeria is currently led by GSM operators: MTN, GLO, AIRTEL and ETISALAT, while CDMA and WMAX operators remain limited to major towns and cities. Table 2 shows major policy institutions involved in Broadband policy in Nigeria. It analyses different agency and their statutory services.

TABLE 2: Key Institutions in Broadband Policy in Nigeria

NCC	ICT industry regulation.
NITDA	IT industry support and development
NIPOST	Portal service delivery and access infrastructure
GALAXY BACKBONE	ICT infrastructure provision for Federal Government and its Agencies
NIGCOMSAT	Commercialization of Government's Satellite resources
USPF	Management of universal access incentive fund.
NITDF	Management of universal access incentive fund.
NFMC	Coordinate and allocation of frequency resource
MINISTRY OF COMMUNICATION AND TECHNOLOGY	Policy formulation, policy impact assessment, supervision and oversight of ICT related projects and initiatives.

Other innovative projects initiated by the Nigerian Government to bridge the Broadband gap is the Wire Nigeria project (WIN) and State Accelerated Broadband Initiative (SABI). These projects were aimed at expanding the transmission network across the length and breadth of the country, by providing a national Optical fibre transmission infrastructure. The NCC offered government support and incentives to encourage the private sector to build and run a broadband infrastructure in all state capitals and selected major commercial cities in the country.

The Nigerian Communication Act, 2003, established a Universal Service Provision Fund (USPF) to provide subsidy for delivering of Broadband services in high cost area; like the rural and under-served parts of the country. A number of initiatives promoted through the fund are:

- Community communication center (CCC)
- School, Universities Access programme
- Rural Broadband Internet (RUBI) Access
- Accelerated Mobile Phone Expansion (AMPE) project(New Media and Development Communication, 2014).

B. Broadband Subscribers

Cross River State has a population of about 3,104,446 (2006 census in Nigeria); and Calabar, the capital city has a population of 377,022. By 2014, it was estimated that mobile broadband connections in Cross River State was below 50,000 subscribers [12].

III. METHOD OF DATA COLLECTION

Analyses were carried out by comparing the acquired data with the statistical data provided by the International Telecommunication Union (ITU). Secondly, sampling the opinion of stake-holders was done through distribution of questionnaires.

A. Questionnaires and Data Presentation

The study used three–to-five scale closed-ended questionnaires in order to avoid ambiguity from the respondents. In responding to the items on this scale, the subjects indicated whether they strongly agree (SA), agree (A), neutral (N), disagree (D) or strongly disagree (SD). While in some cases, yes (Y), no (N) and undecided (U) were scaled. Weighted scale of 3, 2 or 1, and also 5 ,4 ,3, 2 or 1 were analyzed in conjunction with a statistical test tool known as Chi-square (x^2); to test the hypothesis based on 0.05 level of significance (alpha - $\propto$). Three null hypotheses were formulated and tested against their respective alternative hypotheses. The null hypothesis, designated as H_0 showed no assumption of

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ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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contradiction between the two measures. The supposed mean and the sampled mean where the alternative hypotheses designated as H_1, H_2 andH_3 showed the difference between two or more measures such as sample mean and population mean.

The reason for the choice of Chi-square, symbolized by X^2, was because X^2 had a theoretical sampling distribution that permits addressing research problems involving frequencies, where the variables have been classified into two (2) or more mutually exclusive categories [5]. Besides, X^2 had been most often employed in evaluating research data reported in frequencies and percentages. It has been noted as one of the best statistical methods available to compare observed frequencies against expected frequencies.

The sampling statistic for testing the feasibility of the null Hypothesis under Chi-square was defined by the formula:-

$$X^2 = \frac{\sum(O_F - E_F)^2}{E_F} \qquad (1)$$

Where X^2 =Chi-square

O_f = observed frequencies in the category (generated from the sample data);

E_f = Expected frequencies in the same category.

∑= Summation.

The number of degree of freedom for contingency was calculated using (r-1) (c-1), where:

r = number of rows

c = number or columns

IV. RESULTS AND DISCUSSION

Table 3 is percentage distribution of respondent by occupation and the selected study population. Table 4 is the frequency of usage of Internet by the respondents, while Table 5 is Internet speed rating by the studied population.

TABLE 3: Percentage Distribution of Respondent by Occupation

OCCUPATION	FREQUENCY	PERCENTAGE (%)
CIVIL / PUBLIC SERVANT	150.00	30.00
SELF EMPLOYED	114.00	22.80
STUDENT	204.00	40.80
OTHER	32.00	6.40
TOTAL	500.00	100.00

TABLE 4: Frequency of Internet Usage by Respondents.

FREQUENCY OF USE OF INTERNETS BY RESPONDENT	PERCENTAGE/ NUMBER OF RESPONDENTS		
	DAILY	OCCASIONALLY	UNDECIDED
BROWSING FOR RESEARCH	(213) 42.60%	(202) 40.40%	(173) 34.60%
SMS / FILE TRANSFER PROTOCOL	(194) 38.80%	(104) 20.80%	(214) 42.80%
	(93) 18.60%	(194) 38.80%	(113) 22.60%

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ISSN (Print) : 2320-9798

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GAMES / DISCUSSIONS GROUPS	(93) 18.60%	(194) 38.80%	(113) 22.60%
TOTAL(N= 500)	500	500	500

TABLE 5: Internet Speed Rating by Respondents.

SPEED RATING	**FREQUENCY**	**PERCENTAGE**
YES	66	13.20%
NO	382	76.40%
UNDECIDED	52	10.40%
TOTAL	500	100.00%

Table 5 shows the speed rating (bandwidth) of Internet services for the population of interest.

Here 13.20 per cent were satisfied with the speed, 10.40 per cent could not really ascertain the network speed, while 76.40 per cent were not satisfied with the speed.

A. Mobile Broadband Operators in Cross River State.

There were four (4) main GSM operators in Cross River State licensed with 3G UMTS. They are: MTN, GLO, AIRTEL and ETISALAT. Together, these operators served about 90 per cent of Cross River State subscribers. The unaccounted 10 per cent of the market was serviced by a number of CDMA operators and Internet Service Providers. **Figure 3 is the frequency and percentage of service providers, while Table 6 tabulates functional telecommunications' masts in Cross River State. Analysis from the table shows that more than 40 per cent of the infrastructure is concentrated in Calabar. Calabar accounts for less than 10 per cent of the population.**

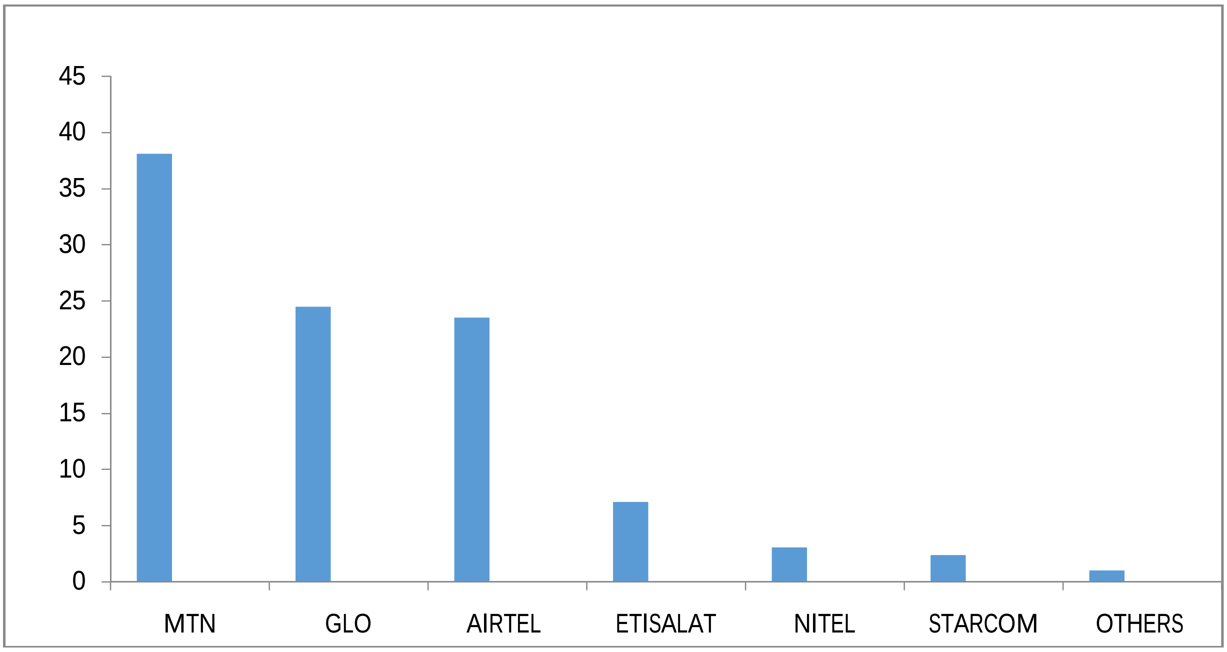

FIG 3: Frequency and percentage of service providers.

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TABLE 6: Functional Telecommunications Masts in Cross River State.

NAME OF LGA	SERVICE PROVIDERS							
	MTN	GLOBACOM	AIRTEL	ETISALAT	NITEL	STARCOM	OTHERS	TOTAL
Abi	2	1	1	1		0	0	5
Akamkpa	4	5	2	0		0	0	11
Akpabuyo	0	0	2	0		0	0	2
Bakassi	3	1	1	0		0	0	5
Bekwara	2	2	1	1		0	0	6
Biase	5	2	4	0		0	0	11
Boki	3	2	2	1		0	0	8
Calabar Municipal	28	14	7	9		4	1	62
Calabar south	17	6	7	1		3	0	35
Etung	2	4	1	0		0	0	7
Ikom	13	9	9	2		0	0	33
Obanliku	2	2	1	0		0	0	5
Obubra	4	3	7	0		0	1	15
Obudu	2	4	1	0		0	0	7
Odukpani	9	5	4	1		0	0	19
Ogoja	5	5	4	3		0	0	17
Yakurr	8	5	5	0		0	0	18
Yala	1	2	6	0		0	0	9
Total	110	72	65	16		7	2	275

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

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B. Test of Hypothesis

Testing of Hypothesis 1

H_o: Internet speed rate is very slow.

H_1: Internet speed rate is not very slow

Data collected based on this hypothesis are presented in Table 7 below. The numbers in each cell without brackets are observed frequencies, while those in the brackets are the expected frequencies. **Table 7 presents responses on Broadband Network penetration rate, while Table 8 is the contingency table for test of Hypothesis 1**

TABLE 7: Internet Penetration Rate is very Slow and Constitutes a Major Problem to ICT Stockholders.

QUEST/ RANK		**STRONGLY AGREE**	**AGREE**	**NEUTAL**	**DISAGREE**	**STRONGLY DISAGREE**	**ROW TOTAL(R_i)**
1		120 (120)	90(100)	40(30)	0(0)	0(0)	250
2		120(120)	110(100)	20(30)	0(0)	0(0)	250
COLUMN TOTAL (C_i)		240	200	60		0	500

From Table 7, rank 1 is responses from males and rank 2 shows responses from females. Also, the first data is the observed frequency while the data in brackets are the expected frequencies.

Table 8: Contingency Table for Test of Hypothesis 1

CELL	O_f	E_F	$O_F - E_F$	$(O_F - E_F)^2$	$(O_F - E_F)^2 / E_F$
A :r_1 c_1	120	120	0	0	0
B :r_1 c_2	90	100	-10	100	1
C :r_1 c_3	40	30	10	100	3.33
D :r_1 c_4	0	0	0	0	0
E :r_1 c_5	0	0	0	0	0
F :r_2 c_1	120	120	0	0	0
G :r_2 c_2	110	100	10	100	1
H :r_2 c_3	20	30	-10	100	3.33
I : r_2 c_4	0	0	0	0	0
J : r_2 c_5	0	0	0	0	0

Expected frequencies were obtained thus:

e_{11} = (250 x 240)/ 500 =120

e_{12} = (250 x200)/ 500 =100

e_{13} = (250 x60) / 500 =30

e_{14} = (250 x 0) / 500 =0

e_{15} = (250 X 0) / 500 =0,etc

Designing a 10 – cell contingency table where r = number of rows, c = number of columns.

The Chi – square data statistical computation is given by

$$X^2 = \frac{\sum(O_F - E_F)^2}{E_F}$$

$= X^2 =$ 0 + 1 + 3.33 + 0 + 0 + 0 + 1 + 3.33 + 0 + 0 =8.66

Hence X^2=8.66

Having obtained the value of X^2, the degree of freedom (df), which refers to the independent key information the researcher can use in a sample can be calculated using the formula shown below:

df = (r-1) (c-1)

Where,

Df = degree of freedom

r= number of rows

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

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c= number of columns
Hence, using the formula
Df= (r-1) (c-1)
= (2-1) (5-1)
=(1) (4)
= 4
With 4 df, the critical X^2 value required for significance at 0.05 level is 9.488 (from the table).
That is X^2 (tabulated) =x^2 (r-1) (c-1)
0.05 = X^2df, 0.05= 9.488

Remark: If the compared Chi-square value exceeds the tabulated critical Chi square value at a specified level of significance, then the null hypothesis is rejected. In other words, there is a clear justification for the claim that Internet deployment rate is very slow. Since X^2 calculated (8.66) is less than X^2 tabulated (ie 9.488), H_0 is accepted and it is concluded that Internet deployment rate is indeed very slow.

Test of Hypothesis 2

H_0: The impact of Internet deployment rate can revolutionize ICT Service-delivery.
$H_{1:}$ The impact of Internet deployment rate cannot revolutionize ICT Service- delivery.
Table 9 presents data on **Test of Hypothesis 2, while Table 10 is the contingency table for test of Hypothesis 2.**

TABLE 9: Data onTest of Hypothesis 2

QUEST/RANK	SRONGLY AGREE	AGEE	NEUTRA L	DISAGREE	SRONGLY DISAGREE	ROW TOTAL (R_i)
3	90 (90)	104(100)	37(38)	20(20)	0(2)	250
4	91(90)	96(100)	39(38)	20 (20)	4(2)	250
COLUMNS TOTAL (C_i)	180	200	76	40	4	500

TABLE 10: Contingency Table for Test of Hypothesis 2

CELL	O_F	E_F	$O_F - E_F$	$(O_F - E_F)^2$	$(O_F - E_F)^2/E_F$
A : r_1 c_1	89	90	-1	1	0.011
B : r_1 c_2	104	100	4	16	0.160
C : r_1 c_3	37	38	-1	1	0.026
D : r_1 c_4	20	20	0	0	0
E : r_1 c_5	0	2	-2	4	2
F : r_2 c_1	91	90	1	1	0.011
G : r_2 c_2	96	100	-4	16	0.016
H : r_2 c_3	39	38	1	1	0.026
I : r_2 c_4	20	20	0	0	0
J : r_2 c_5	4	2	2	4	2

Expected frequencies are obtained thus:
e_{11} = (250x180)/500 = 90
e_{12} = (250x200)/500 = 100
e_{13} = (250x76)/500 = 38
e_{14} = (250x40)/500 = 20
e_{15} = (250x4)/500 = 2
Designing a 10-cell contingency table, where r = number of rows and c = number of columns. The Chi-square computation is given by the formula:

$$X^2 = \frac{\sum(O_F - E_F)^2}{E_F}$$

X^2 = 0.011+ 0.160 + 0.026 + 0+ 2 + 0.011 + 0.016 + 0.026+ 0+ 2 = 4.25

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

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Hence; df =(r-1) (c-1)
= (2-1) (5-1)
= (1) (4)
= 4
With 4 df, the critical x^2 value required for 0.05 significance level is 9.488 (from table).

Remark

Since X^2 calculated (4.25) is less than X^2 tabulated (9.488), H_0 is accepted. It is then concluded that the impact of high Internet deployment can revolutionize ICT service-delivery.

Test of Hypothesis 3

$H_{0:}$ The adaptation and implementation of high speed broadband growth strategy will launch Cross River State into the 21st century technological change.

$H_{1:}$ The adaptation and implementation of high speed broadband growth strategy will not launch Cross River State into the 21st century technological change.

Collection of data based on this hypothesis is presented in Table 9 below.

Table 11 presents data on **Test of Hypothesis 3, while Table 12 is contingency table for test of Hypothesis 3**

TABLE 11: Data onTest of Hypothesis 3

QUEST/RANK	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	ROW TOTAL/(R_i)
5	106 (105)	111(112)	17(18)	9(8)	7(7)	250
6	104 (105)	113(112)	19(18)	7(8)	7(7)	250
COLUMN TOTAL	210	224	36	16	14	500

TABLE 12: Contingency table for test of Hypothesis 3

CELL	O_F	E_F	$O_{F-}E_F$	$(O_{F-}E_F)$	$(O_F.E_F)^2/E_F$
A : r_1 c_1	106	105	1	1	0.00952
B : r_1 c_2	111	112	-1	1	0.00952
C : r_1 c_3	17	18	-1	1	0.00952
D : r_1 c_4	9	8	1	1	0.00952
E : r_1 c_5	7	7	0	0	0
F : r_2 c_1	104	105	-1	1	0.00952
G : r_2 c_2	113	112	1	1	0.00952
H : r_2 c_3	19	18	1	1	0.00952
I : r_2 c_4	7	8	-1	1	0.00952
J : r_2 c_5	7	7	0	0	0

Expected frequencies were obtained, thus:
e_{11}= (250x210) / 500 = 105
e_{12} = (250x 244) / 500 = 122
e_{13} = (250x 36) / 500 = 18
e_{14} = (250 x 16)/ 500 = 8
e_{15} = (250 x 14)/ 500 = 7
Designing the 10 – cell contingency table; where
r = number of row
c = number of columns
The Chi – square computation is given by:

$$X^2 = \frac{\sum (O_{F\,-}E_F)^2}{E_F}$$

Therefore:
X^2 = 0.00952 + 0.00952 + 0.000952 + 0.000952 + 0 + 0.00952 + 0.00952 + 0.000952 + 0.000952 + 0 = 0. 07616

Hence:
df = (r-1) (c - 1)
(2 - 1) (5 - 1)
(1) (4)
= 4

With 4 df the critical X^2 value required for 0.05 significance level is 9.488 (from the table).

Remark

Since Chi–square (X^2) calculated (0.07616) is less than X^2 tabulated (9.488), H_0 is accepted and it is concluded that the adaptation and implementation of a speedy broadband growth strategy will launch Cross River State into the 21st century technological change.

V. CONCLUSION

The study examined Broadband infrastructural deficit and growth potentials of ICT development in Cross River State of Nigeria. This was with a view to finding solution to improve the level and speed of connectivity in Cross River State. Accordingly, multi- staged sampling technique was used to access stakeholders' views through stratified and simple random sampling methods. Key indicators of the result showed that broadband penetration constituted a major problem to ICT service delivery {X^2 calculated (8.66) was less than X^2 tabulated (9.488)}.

The impact of broadband infrastructure as an antidote to revolutionize ICT service delivery indicated X^2 calculated (4.25) to be less than X^2 tabulated (9.488). A synergy was arrived at between speedy broadband growth and advancement of technology when X^2 calculated (0.07616) was less than X^2 tabulated (9.488).

It was evident, that many interior places of the region lacked capacity for high speed Internet usage; except the cosmopolitan section. The study found the growth rate of broadband penetration in Calabar to be slower. The study further noted that 90 per cent of Cross River State Internet subscribers were served by four (4) major service providers: MTN, GLOBACOM, AIRTEL, and ETISALAT through low bandwidth facilities. Other high bandwidth network operators such as Starcom and Internet Service Providers contributed minimally. The study also discovered that out of 294 telecommunication masts distributed across the state; basically used by service providers, 101 of these masts were installed in Calabar urban; an indication of very poor spread. The study also unveiled that "digital divided" exists between the rural and urban region across the state and to a larger extend, the nation. In addition, the survey underscored browsing for social networking and research as the most used Internet resources.

This poor state of service delivery can be improved if Broadband access is implemented. While we can review service delivery through wire-line network, there is need for government to develop a clear broadband strategy that correctly places broadband as an economic stimulus. Such strategies should provide a balance between government intervention and private sector investment under a strong regulatory environment.

The government and policy makers should handle spectrum management to ensure the availability of 2.6 GHZ spectrum, using internationally best practices.

The government of Cross River State is in a concession agreement with MTN Nigeria limited to provide 115km of optic fibre cable (OFC) infrastructure for the city of Calabar and its environs; spanning from Tinapa to Anantigha. This system when completed will provide complete access to broadband infrastructure for all residents of Calabar making the city the most wired city in Nigeria in terms ofcoverage .The system is expected to significantly improve the quality of voice services in Calabar as well as make video services a reality over wired and wireless channels.

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ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2016

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