

## **An Investigation of Inter and Intra Connectivity Between the Three Major Global System for Mobile Communication (GSM) Operators in Mubi Local Government Area of Adamawa State Nigeria**

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**Abstract:** This study aimed at presenting a report on inter and intra connectivity (signal quality) of the three major GSM operators in Mubi Local Government area of Adamawa State, Nigeria viz Zain communication network, MTN and Global communication which are represented by operator A, B and C, respectively. Questionnaires were administered to 18,000 people for a period 1 year 1,500 in every month from July, 2008 to June, 2009 with view to investigate the current status of the signal quality of the GSM operators. The inter and the intra connectivity between the GSM operators were analyzed in terms of percentage, the analysis shows that connectivity levels were determined as 76.9% A-A, 69.95% B-B, 64.8% C-C, 41.5% A-B, 44.4% A-C, 49.55% B-A, 54.05% B-C, 39.8% C-A, 54.25% C-B all for X, 23.75% A-A, 29.65% B-B, 34.5% C-C, 57.85% A-B, 54.9% A-C, 50.2 B-A, 45.4 B-C, 54.8% C-A, 45.05% C-B all for Y and finally 0.17% A-A, 0.58% B-B 0.68% C-C, 0.58% A-B, 0.73% A-C, 0.2% B-A, 0.5% B-C, 0.33% C-A and 0.7% C-B all for Z. These results obtained would help the GSM operators to improve the signal quality in Mubi Local Government area of Adamawa State Nigeria to maintain or attract more customers.

**Key words:** Intra connectivity, inter connectivity, signal quality, percentage, GSM operators, questionnaire

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### **INTRODUCTION**

The continuity liberalization and technical progress in the telecommunication market means that the providers of mobile radio networks are daily being faced with need challenges. Operators are competing in the race to gain largest share of the growing number of mobile radio user's who naturally require a high quality services. Round the clock availability and complete coverage, coupled with acceptable quality at appropriate terms are important factors that are used to differentiate between the service providers. Operators are not simply desirous of meeting these needs user requirements must be met if aim of customers' satisfaction is to be jeopardized (Emagbete and EdeKo, 2007).

Mubi is the second largest town in Adamawa State of Nigeria, it lies between latitude  $9^{\circ}30'$  and  $11^{\circ}$  North of the equator and longitude  $13^{\circ}$  and  $13^{\circ}34'$  East of Greenwich meridians, Mubi has a land area of 4728.77  $\text{KM}^2$  and a population of 759,045 (Adeba, 2004). Almost 65% (Zain, 2005) of this total population living in Mubi depends solely on the GSM phones as the easiest and the most affordable means of communication but since the introduction of the GSM mobile phone technology in Mubi use of other telephone technology like conventional telephone system and Turaya

technology is completely phase out because of the fact that ordinary man can acquire the GSM phone at a cheaper rate and can make a call of least 50 Nigerian Naira equivalent of 0.35 US dollar (Currency Converter).

Zain communication network is the first to settle in Mubi Local Government area of Adamawa State in 2005, followed by MTN in early 2006 then global communication in late 2006. With the coming of these other two GSM operators in 2006 there is high level of competition among the three GSM operators to attract more customers. The efficiency and the reliability of their service becomes the order of great concern to the customers on which network to subscribe this is as a result of inconsistency of the GSM operators services; these uncertainties may be attributed to unaddressed technical problems, lack of good maintainers culture or inability to expand as the number of subscribers increases, therefore to help out identify which network is efficient or most suitable to the people of Mubi and to categorically state the current status of the GSM signal quality is the reason of conducting this study.

### **MATERIALS AND METHODS**

The methodology used in collecting the data was questionnaire method the questionnaires were

Table 1: Structure of the questionnaire

Full name: <u>Yohanna Ezekiel Mwada</u>	
Occupation: <u>Lecturer</u>	
Do you own any of the GSM mobile phone	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Which network do you subscribe	MTN <input checked="" type="checkbox"/> Zain <input checked="" type="checkbox"/> GLO <input type="checkbox"/>
For how long have you been using GSM mobile phone	1 year <input type="checkbox"/> 2 years <input checked="" type="checkbox"/> 3 years and above <input type="checkbox"/>
You being experiencing any network problem	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Which network do you prefer presently	MTN <input type="checkbox"/> Zain <input checked="" type="checkbox"/> GLO <input type="checkbox"/>
Have ever live abroad	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
How do you compare the inter and intra connectivity level in Mubi with that of abroad	Better quality <input type="checkbox"/> Same quality <input type="checkbox"/> Below <input checked="" type="checkbox"/> Sub standard <input type="checkbox"/>
Please tick the appropriate column that is applicable to you: What do you experience with your inter and intra connectivity of the GSM Operators in Mubi	
Month	Questions A-A (%) A-B (%) A-C (%) B-A (%) B-B (%) B-C (%) C-A (%) C-B (%) C-C (%)
July 2008	X ✓ ✓ ✓ ✓ ✓ ✓ Y ✓ Z ✓

General comment on the quality of the connectivity in Mubi Adamawa state Nigeria: good intra connectivity and fair inter interconnectivity

Table 2: Inter and Intra connectivity between the three (3) major GSM operators in Mubi Local Government area of Adamawa State Nigeria from July 2008 to December 2008

Months (2008)	Questions	A-A (%)	A-B (%)	A-C (%)	B-A (%)	B-B (%)	B-C (%)	C-A (%)	C-B (%)	C-C (%)
July	X	75.0	45.0	50.0	60.0	85.0	70.0	50.0	66.0	70.0
	Y	24.0	53.0	48.0	39.0	15.0	30.0	50.0	33.0	29.0
	Z	1.0	2.0	2.0	1.0	0.0	0.0	0.0	1.0	1.0
August	X	74.0	45.0	48.0	55.0	83.0	66.0	49.0	65.0	68.0
	Y	24.0	54.0	51.0	45.0	17.0	33.0	51.0	34.0	30.0
	Z	1.0	1.0	1.0	0.0	0.0	1.0	0.0	1.0	2.0
September	X	73.0	44.0	46.0	54.0	81.0	65.0	49.0	65.0	67.0
	Y	27.0	56.0	53.0	46.0	19.0	35.0	51.0	35.0	31.0
	Z	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0
October	X	73.0	45.0	46.0	53.0	80.0	63.0	49.0	63.0	65.0
	Y	27.0	55.0	54.0	46.0	20.0	37.0	51.0	37.0	35.0
	Z	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
November	X	72.0	45.0	45.0	52.0	79.0	62.0	47.0	60.0	64.0
	Y	27.0	55.0	54.0	48.0	21.0	37.0	53.0	38.0	36.0
	Z	1.0	0.0	1.0	0.0	0.0	1.0	0.0	2.0	0.0
December	X	7.0	45.0	45.0	52.0	79.0	61.0	47.0	59.0	63.0
	Y	30.0	55.0	55.0	48.0	21.0	39.0	53.0	41.0	37.0
	Z	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	X	71.8	44.9	46.7	54.3	81.3	64.5	48.5	60.0	66.3
	Y	27.7	54.6	52.5	45.4	18.7	35.2	51.5	36.3	33.0
	Z	0.5	0.5	0.8	0.3	0.0	0.3	0.0	0.7	0.7

administered to 1,500 educated people in every month selected at random from July 2008 to June 2009 with a total sample survey of 18,000 people in a year in Mubi Local Government area with a view to determine the inter and intra connectivity level or signal quality between the three GSM operators. The sample of the questionnaire completed by YOHANNA EZEKIEL MWADA for the month of July 2008 is shown in Table 1.

The analyses employed percentage as given in Eq. 1-3:

$$X = \frac{a}{1500} \times 100\% \quad (1)$$

$$Y = \frac{b}{1500} \times 100\% \quad (2)$$

$$Z = \frac{c}{1500} \times 100\% \quad (3)$$

- a = The number of people agreed on inter and intra connectivity is easily accessible
- b = The number of people agreed on inter and intra connectivity is not easily accessible
- c = The number of people agreed on inter and intra connectivity is not accessible (Ezeowu, 1990)

The data were further analyzed as shown in Table 2-4 to clearly give precise and explain the current status of the inter and intra connectivity services of the three GSM operators in Mubi Local Government area (Ezeowu, 1990).

Table 3: Inter and Intra connectivity between the three major GSM operators in Gombi Local Government area of Adamawa State, Nigeria from January 2009 to June 2009

Months (2009)	Questions	A-A (%)	A-B (%)	A-C (%)	B-A (%)	B-B (%)	B-C (%)	C-A (%)	C-B (%)	C-C (%)
January	X	69.0	43.0	44.0	51.0	78.0	60.0	45.0	57.0	63.0
	Y	29.0	56.0	56.0	49.0	22.0	39.0	55.0	43.0	37.0
	Z	2.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
February	X	60.0	33.0	40.0	46.0	70.0	53.0	41.0	50.0	48.0
	Y	39.0	66.0	60.0	53.0	29.0	47.0	58.0	50.0	51.0
	Z	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0	1.0
March	X	59.0	38.0	42.0	40.0	69.0	49.0	19.0	45.0	70.0
	Y	41.0	61.0	57.0	60.0	31.0	50.0	79.0	54.0	29.0
	Z	0.0	1.0	1.0	0.0	0.0	1.0	2.0	1.0	1.0
April	X	65.0	40.0	45.0	42.0	78.0	32.0	30.0	41.0	66.0
	Y	35.0	60.0	54.0	58.0	31.0	67.0	70.0	58.0	33.0
	Z	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0
May	X	80.0	31.0	46.0	49.0	60.0	51.0	18.0	52.0	64.0
	Y	19.0	68.0	54.0	51.0	40.0	49.0	81.0	47.0	35.0
	Z	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0
June	X	70.0	44.0	36.0	41.0	80.0	17.0	24.0	28.0	69.0
	Y	30.0	56.0	63.0	59.0	20.0	82.0	76.0	71.0	31.0
	Z	0.0	0.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0
Average	X	67.1	38.2	42.1	44.8	72.5	43.6	31.2	45.5	63.3
	Y	32.2	61.1	57.2	55.0	27.2	55.7	68.1	53.8	36.0
	Z	0.7	0.7	0.7	0.2	0.3	0.7	0.7	0.7	0.7

Table 4: Inter and Intra connectivity between the three major GSM operators in Gombi Local Government area of Adamawa State, Nigeria from July 2008 to June 2009

Months	Questions	A-A (%)	A-B (%)	A-C (%)	B-A (%)	B-B (%)	B-C (%)	C-A (%)	C-B (%)	C-C (%)
Average	X	69.96	41.55	44.40	49.55	76.90	54.05	39.80	63.00	64.80
	Y	29.45	57.85	54.85	59.20	22.93	45.45	59.85	36.30	34.50
	Z	0.60	0.60	0.75	0.25	0.17	0.50	0.35	0.70	0.70
Total (%)		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

## RESULTS AND DISCUSSION

Table 2 shows the percentage of questionnaires distributed and responses from people in the month of July to December 2008. For these 6 months B has the best intra and inter connectivity followed by A then C. The study revealed that the intra connectivity A reduces uniformly by 1% from the month January to September 2008 and maintains its status in the month of October 2008 reduces again by 1-2% in the month of November to December 2008, respectively while the intra connectivity of B reduces by 2% from July to September 2008 further goes down again by 1% in the month of October through November 2008. The intra connectivity of C reduces with inconsistent variation of 1-2% from the month of July to December 2008. C has better inter connectivity followed by A then B though the inter connectivity of the GSM operators were inconsistent throughout the period of 6 months. Table 3 also presents the percentage of questionnaires administered to 18,000 subscribers and their responses. In the month of January, February, April and June B has the best intra connectivity better than that of A and C with 10 and 11% in January, 10 and 22% in February, 13 and 12% in April and 10 and 11% in June 2009, respectively. Perhaps in some peculiar cases like in the month of May 2009 A has best intra connectivity better than that of B and C with 20 and 28% where A seems to improved by 15% from the month of April 2009 and decay

again by 10% in June 2009 whereas in the March, A has the best intra connectivity better than of A and B with 11 and 1% though in May 2009, the intra connectivity level of A goes down by 4% again. As discussed above B have the best intra and inter connectivity level followed by A then C, however the intra connectivity level of B seems to decay gradually in ascending order by an average of 1% from January to June 2009.

Table 4 shows the overall average percentage of questionnaires administered to 18,000 subscribers and their responses for 1 year. B has the overall best intra connectivity with 76.9% followed by A with 69.96% then C with 64.8% whereas C has the best inter connectivity to B with 63% followed by B-C with 54.05% followed by B-A with 49.55% while the other inter connectivity lies almost in the same range with minimum of 39.8-44.4% maximum.

Table 2-4 show wealthy information about the intra and inter connectivity levels between the three GSM operators, frequency of occurrence of the successful and unsuccessful connectivity levels.

Table 2 shows that B has the best intra connectivity with 81.3% followed by A with 72.8% then C with 66.3%. The inter connectivity of B-C seems to be the best with 68.7% followed by C-B with 63.7% followed by B-A with 54.6%, all the other inter connectivity falls <50%.

Table 3 shows still B has the best intra connectivity better than of A and C by 5.4 and 9.2%, respectively while

C has best inter connectivity level to other network better than of A and B but this time around all the other inter connectivity level goes down <45%.

Table 4 shows the average percentage of the questionnaires administered to 18,000 people and their responses in the period of 1 year. B has the best intra and inter connectivity with 76.9 and 77.1%, respectively.

In the overall assessment, the intra and inter connectivity level decays appreciably from the July 2008 to June 2009, therefore it is worthy to say that in this study the inter connectivity levels is poor and far below expected standard. Finally, the average inaccessibility level of intra and inter connectivity of all the GSM operators A-C falls <1% this is negligible.

### CONCLUSION

The study was carried out successfully without any hitches the results obtained shows that intra connectivity level of all the GSM operators is better than the inter connectivity in Mubi Local Government area of Adamawa State, Nigeria. It is rated that B intra and inter connectivity is the best followed by A then C. The study also revealed that great improvement is needed on the inter connectivity of all the major three GSM operators operating in Mubi. I therefore strongly believed that this study had highlighted much on the current status of the connectivity levels of all the GSM operators.

**Nomenclature:** The nomenclature of the items used in the questionnaire are presented below:

- A = MTN GSM operators
- B = ZAIN GSM operators
- C = GLO GSM operators
- A-A = MTN to MTN intra connectivity
- A-B = MTN to ZAIN inter connectivity
- A-C = MTN to GLO inter connectivity
- B-B = ZAIN to ZAIN intra connectivity
- B-A = ZAIN to MTN inter connectivity
- B-C = ZAIN to GLO inter connectivity
- C-C = GLO to GLO intra connectivity
- C-A = GLO to MTN inter connectivity
- C-B = GLO to ZAIN inter connectivity
- X = Easily accessible
- Y = Not easily accessible
- Z = Not accessible

### REFERENCES

- Adeba, A.A., 2004. Mubi Region: A Geographical Synthesis. Paraclete and Sons, Yola, Nigeria, pp: 135.
- Emagbete J.O. and F.O. EdeKo, 2007. An evaluation of outgoing calls quality of GSM network services in Orghara, Delta State. Res. J. Appl. Sci., 2: 1016-1018.
- Ezeowu, O., 1990. Statiscal for Professional Students, Theory Problems and Solution. Hydra Publisher Ltd, Onicha, Nigeria.
- Zain, 2005. Information, tools, product and service for Zain telecommunication network community. <http://www.zain.com>.