

A Study Of The Mobile Network Operators And Technology Preferences For Mobile Communication Network Users In Uyo Metropolis

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Abstract— A study of the mobile network operators and technology preferences for mobile communication network users in Uyo metropolis is presented. Specifically, the study adopted a quantitative research approach to analyse numerical data and patterns so as to draw insights about the Mobile Network Operators (MNO) and technology preferences for the mobile communication network users in the case study area, which is Uyo metropolis in Akwa Ibom State Nigeria. The survey captured responses from 1,753 residents across various demographics in Uyo, as follows; age groups {18–25 (32%), 26–35 (41%), 36–45 (18%), 46+ (9%)} and occupations {Students (28%), Professionals (39%), Business owners (22%), Others (11%)} . The key observations show that first, the younger users (18–35) showed higher adoption of 4G/5G-ready devices, indicating a tech-savvy population and secondly, the professionals and business owners relies heavily on high-speed data, emphasizing the need for reliable 5G coverage in commercial areas. The result for the market share estimation show that the MTN network service provider dominants (having 73% market share) which suggests that MTN's infrastructure investments will heavily influence 5G service quality in Uyo and low penetration of competitors implies less competitive pressure, potentially slowing 5G rollout from other MNOs. Furthermore, the result shows that there is a high 4G usage (66%) which indicates readiness for 5G migration among consumers. The residual 3G users (34%) may require targeted upgrade incentives for 5G migration.

1. Introduction

In recent years, there has been remarkable increase in demand for video gaming, multimedia learning platforms, social media, Internet of Things (IoT) applications and live streaming and this has propelled Mobile Network Operators (MNOs) worldwide to deploy fifth-generation (5G) networks to meet evolving consumer needs [1,2,3,4]. In Nigeria, recent launches of 5G networks have prompted a critical examination of existing infrastructure and resources among major MNOs [5,6,7]. Many regions in Nigeria are still operating with 4G and 3G network technologies [8,9]. Transitioning to 5G would require the building of new BTS (Base Transceiver Station) which comprises infrastructure such as cell towers, radio antennas, power supplies and backhaul links [10,11]. Such high cost infrastructural deployment need to be implemented after thorough analysis of the readiness of the target user community.

Accordingly, this research aims to investigate the details of Mobile Network Operators (MNO) and technology preferences for mobile communication network users in a case study area to identify the readiness for 5G migration in the study area. Through a quantitative research approach, data collection encompassed surveys among residents in the study area, and secondary data from industry reports and academic literature. The data analysis that follows is focused on identifying distinct preferences among users for the MNOs and their network technologies.

2. Methodology

This study adopted a quantitative research approach to analyse numerical data and patterns so as to draw insights about the Mobile Network Operators (MNO) and technology preferences for mobile communication network users in the case study area, which is Uyo metropolis in Akwa Ibom State Nigeria. This quantitative approach's inherent strengths lay in its ability to measure, quantify, and statistically analyse data, facilitating the examination of relationships and trends within large

Keywords—Mobile Network Operators, Technology Preferences, 4G Network, Mobile Communication Network, 5 G Migration

datasets. This approach ensured that the research findings are grounded in empirical evidence and could be generalized to broader contexts. The focus in the study is for a specific mobile network operator which is MTN.

2.1 Data Collection Methods and Sources

The study relied on a combination of primary and secondary data sources. Primary data were collected through surveys administered to users in selected localities

within Uyo metropolis. A section or part of the questionnaire is shown in Figure 1. The survey provided direct insights into user preferences, experiences, and expectations regarding network performance and capacity. Secondary data were sourced from reputable industry reports, academic literature, and regulatory records, contributing historical context and supporting the analysis of network deployment trends.

MTN-Uyo Users Survey

This form seeks to gather information from residents of Uyo metropolis only for research purpose.

The symbol * indicates required question

1. 1. Do you stay in Uyo? *
Mark only one oval.
☐ Yes
☐ No

2. 2. Do you own/use an MTN line? *
Mark only one oval.
☐ Yes
☐ No

3. If Yes, which MTN network SIM are you using? *Mark only one oval.
☐ 2G
☐ 3G
☐ 4G
☐ 5G

4. If No, which network SIM are you using?
Check all that apply.
☐ Airtel
☐ 9mobile
☐ Glo
☐ Others

5. If others specify _____

6. What is your age group? 18 -25 ☐ 26 -35 ☐ 36 -4 ☐ 4 ☐

7. What is your occupation? Student ☐ Professional ☐ Business owners ☐ others ☐

Figure 1 A section of the questionnaire used for the data collection from MTN users in Uyo metropolis

Structured surveys were distributed to a representative sample of users in Uyo metropolis. The surveys was designed to capture user perceptions of the network quality, coverage, and data speeds. Through targeted questions, the surveys quantified user experiences and preferences, forming a quantitative foundation for analysis.

The collection of secondary data involved the compilation of industry reports detailing network deployment, regulatory policies, and technological advancements. Academic literature was reviewed to extract insights and context related to network densification strategies.

2.2 The Study Area and Mobile Network Operator Selection

The selection of appropriate study area is fundamental to the accuracy and relevance of this research. In this section, the selected localities for the study are described, along with the criteria employed in their selection. The primary study area for this research is Uyo metropolis, a city located in Akwa Ibom State, Nigeria. Uyo was chosen as the focal point due to its significance as a major urban centre within the Akwa Ibom State. The choice of Uyo aligns with the study's objective of examining network densification in a real-world urban environment. Furthermore, Uyo offers a diverse user base,

allowing for the collection of a wide range of user perspectives and experiences related to mobile communication networks. The criteria for selecting the study area are given in the following paragraphs. The screenshot in Figure 2 shows Uyo as it is captured on the Google map.

Uyo is one of the largest and most densely populated cities in Akwa Ibom State, making it an ideal representation of urban areas where mobile network infrastructure is critical. Uyo's accessibility for data

collection and fieldwork simplifies the research process, facilitating survey distribution and interviews. The study focused on analysing the practices and network technologies deployment of MTN, which is a major Mobile Network Operator (MNO) in Nigeria. The MTN's deployment of a variety of mobile communication technologies, including 2G, 3G, 4G, and 5G, was selected to comprehensively capture the spectrum of network evolution.

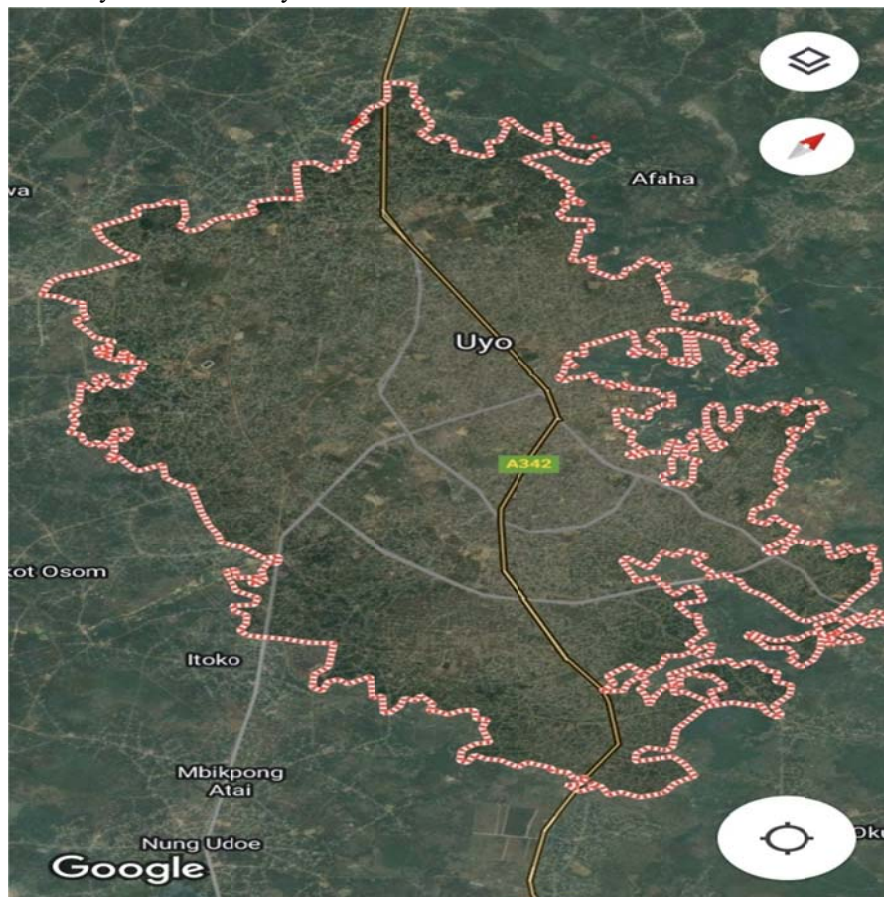


Figure 2 Google map screenshot of Uyo metropolis

2.3 Estimation of Number of Users in the Study Area

This section explains the methodology employed to estimate the number of users served by the selected Mobile Network Operators (MNOs) within Uyo city, in the absence of readily available data. Recognizing the lack of existing records, the approach integrated survey-based techniques to extrapolate user preferences and patterns.

In order to obtain data regarding user preferences and MNO choices, a well-designed and structured survey was administered to a representative sample of Uyo residents. The survey questionnaire (part of which is shown in Figure 1) encompassed inquiries about participants' primary MNO to gather information on mobile network preferences. Participants were asked about their current mobile network provider, service plans, and location of residence. By capturing these responses, the aim was to

measure the distribution of user preferences and usage patterns across different MNOs.

Upon collection of the survey data, the number of users served by each MNO was extrapolated. Participants who identified a specific MNO as their primary service provider contributed to the estimation of that MNO's user count. Extrapolation involves utilizing known data to predict or estimate values beyond the range of the collected data.

As stated, the focus of the study is on MTN, and after the survey data collection calculation of the percentage of MTN users from the samples was done. This was achieved by dividing the number of respondents who reported using MTN by the total number of individuals surveyed. The formula for this calculation is as follows:

$$\text{Percentage of MTN users in sample} = \left(\frac{\text{Number of surveyed using MTN}}{\text{Total number surveyed}} \right) \times 100 \quad (1)$$

This computation provided a representative percentage of MTN users within the surveyed group.

Following the determination of the percentage of MTN users in the sample, the next step is to extrapolate this percentage to estimate the population of MTN users in Uyo. This extrapolation assumes that the surveyed sample is a fair representation of the entire population of Uyo. The formula for estimating the MTN user population in Uyo based on this percentage is as follows:

$$MTN\ users\ in\ Uyo = \left(\frac{\text{Percentage of MTN users in sample}}{100} \right) \times \text{Population of Uyo} \quad (2)$$

This extrapolation allows for an estimation of the approximate number of individuals in Uyo using MTN services.

2.4 Assumptions and Limitations of the Estimation Approach

The estimates were reliant on the assumption that the sample is representative of the entire population of Uyo city. While efforts were made to ensure representativeness through random and stratified sampling, inherent variability within the sample might lead to deviations. It is also assumed that survey participants accurately reported their primary MNO and usage patterns. Variability in reporting accuracy or recall bias could impact the precision of our estimates.

The accuracy of the estimates also depends on the willingness of participants to engage in the survey. Non-response bias could arise if certain demographics are more likely to participate, leading to potential underrepresentation of certain user groups. It is acknowledged that users' actual usage patterns might vary from reported usage in the survey. Factors such as secondary SIM card usage and changing preferences over time introduce a level of uncertainty. The mobile network landscape is subject to continuous changes, including user migration between MNOs, market dynamics, and service offerings. The estimates represent a snapshot in time and might not account for future shifts.

3. Results and discussion

3.1 Results of the analysis of user distribution , MNO penetration and market share of MNOs in Uyo metropolis

The survey captured responses from 1,753 residents across various demographics in Uyo, including:

- (i) Age groups: 18–25 (32%), 26–35 (41%), 36–45 (18%), 46+ (9%)

- (ii) Occupations: Students (28%), Professionals (39%), Business owners (22%), Others (11%)

The key observations are as follows;

- (i) The younger users (18–35) showed higher adoption of 4G/5G-ready devices, indicating a tech-savvy population.
- (ii) The professionals and business owners relies heavily on high-speed data, emphasizing the need for reliable 5G coverage in commercial areas.

The result for the market share estimation for the various MNOs in Uyo is presented in Table 1. From Table 1 it is noted that the MTN's dominance (having 73% market share) suggests that its infrastructure investments will heavily influence 5G service quality in Uyo and low penetration of competitors implies less competitive pressure, potentially slowing 5G rollout from other MNOs.

Table 1 The market share analysis

MNO	Percentage of Users (%)	Estimated subscribers in uyo
MTN	73	1280
Airtel	8	140
Glo	11	193
9Mobile	8	140

3.2 The extrapolation calculation for estimation of approximate number of individuals in Uyo

Estimated users of MTN in Uyo = (Percentage of MTN users in sample / 100) × Total population of Uyo.

Now, given that that from the survey, the percentage of MTN users in sample = 73%, and that the total population of Uyo = 1,393,000 (Macrotrends, 2024), then;

Estimated users of MTN in Uyo = $(73 / 100) \times 1,393,000 \approx 1,016,090$

Similar calculations can be applied for other MNOs, yielding an approximate user count for each operator.

3.3 MNO Subscribers Distribution in Uyo

The survey results among a representative sample of Uyo residents unveiled distinct preferences and choices regarding Mobile Network Operators. Respondents were queried about their primary MNO, service plans, and residential locations. The results of the MNO user distribution in Uyo showing (A) the percentage by technology generation and (B) the percentage of users by MNO is presented in Figure 3.

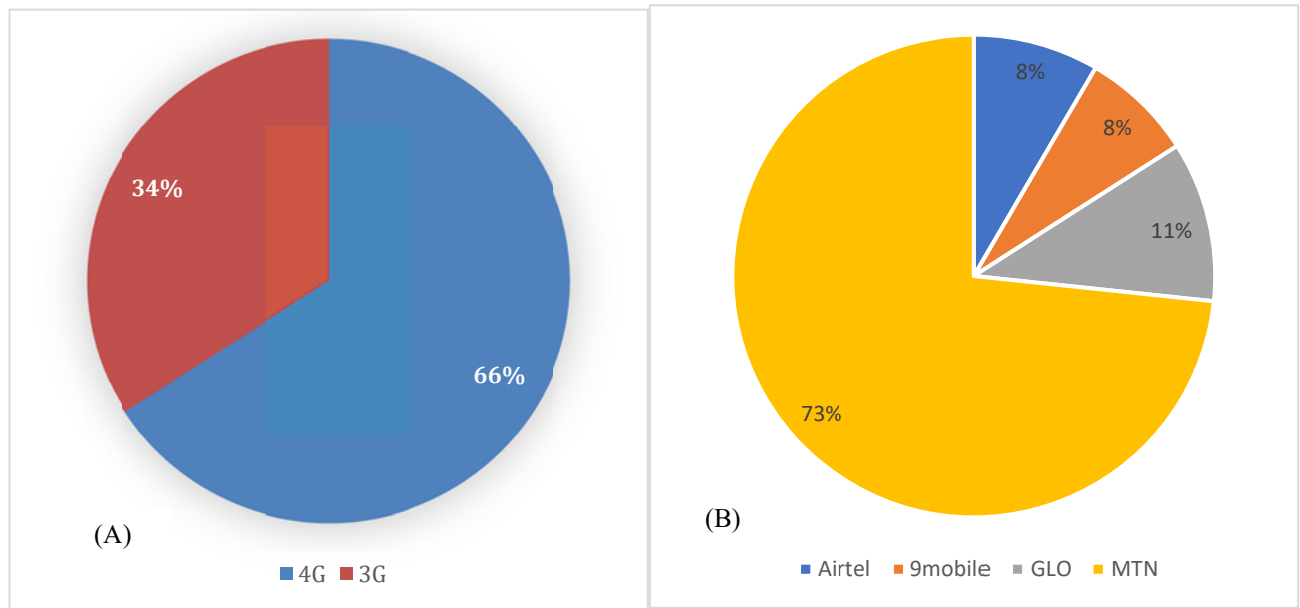


Figure 3 User distribution in Uyo showing (A) percentage by technology generation (B) percentage of users by MNO

From the pie charts in Figure 3, about 1753 people responded to the survey, providing valuable insights into mobile network usage in Uyo metropolis. Among Uyo residents sampled, 635 individuals have MTN lines, while 233 do not. Additionally, 73 people use Airtel, 93 use Glo, 65 use 9mobile, and 2 use Vodafone. Regarding network technology, 213 residents have 3G, and 422 have 4G connections. Also, based on the extrapolation, it is

estimated that approximately 1,016,090 users in Uyo are subscribed to MTN services.

3.4 Spatial Network Model Analysis

The spatial network model provides insights into the distribution and coverage aspects of the mobile communication network within the study area. The spatial details of the BTS locations that were visited are displayed on Google earth as presented in Figure 4.

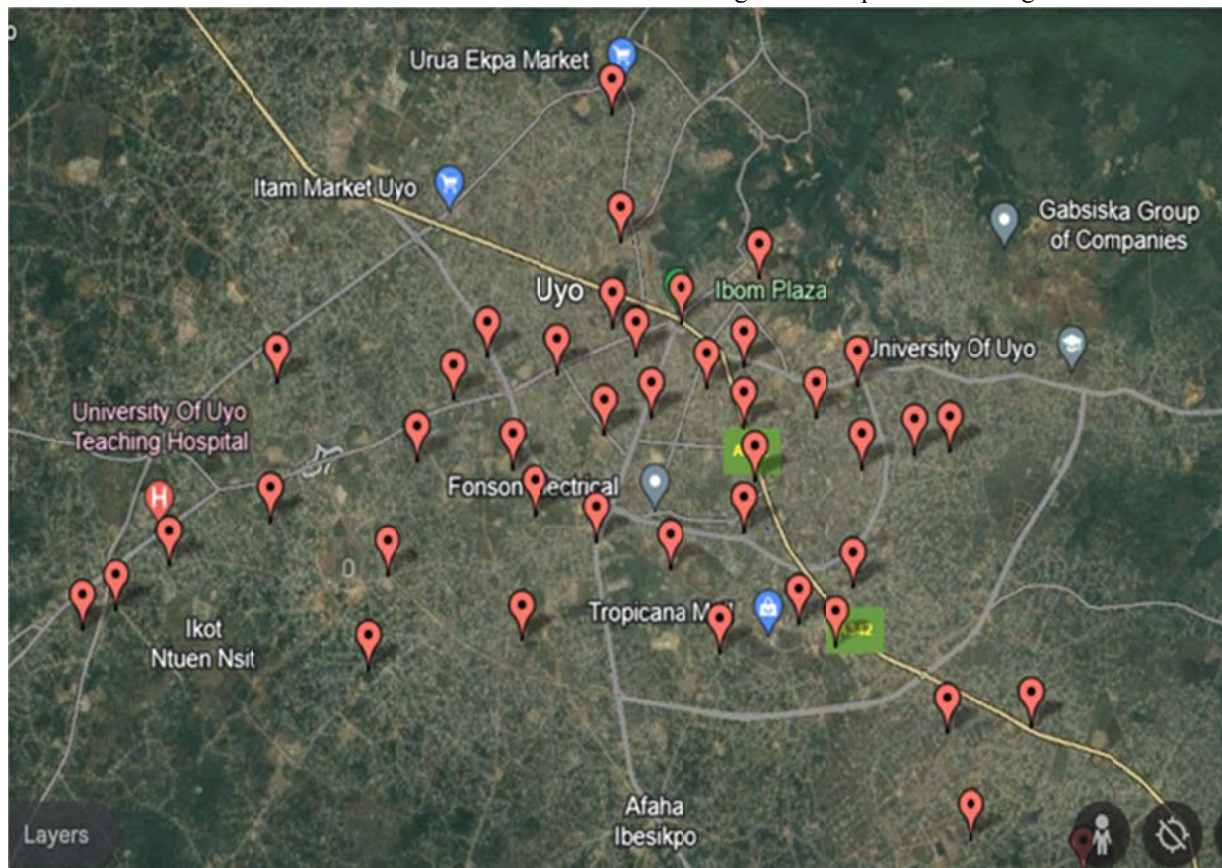


Figure 4: Geographic Distribution of BTS Locations from Google earth

3.5 Technology adoption trends

The results on the analysis of the percentage of 4G and 3G technologies penetration in Uyo metropolis is shown in Figure 5 and the result shows that there is a high

4G usage (66%) which indicates readiness for 5G migration among consumers. The residual 3G users (34%) may require targeted upgrade incentives for 5G migration.

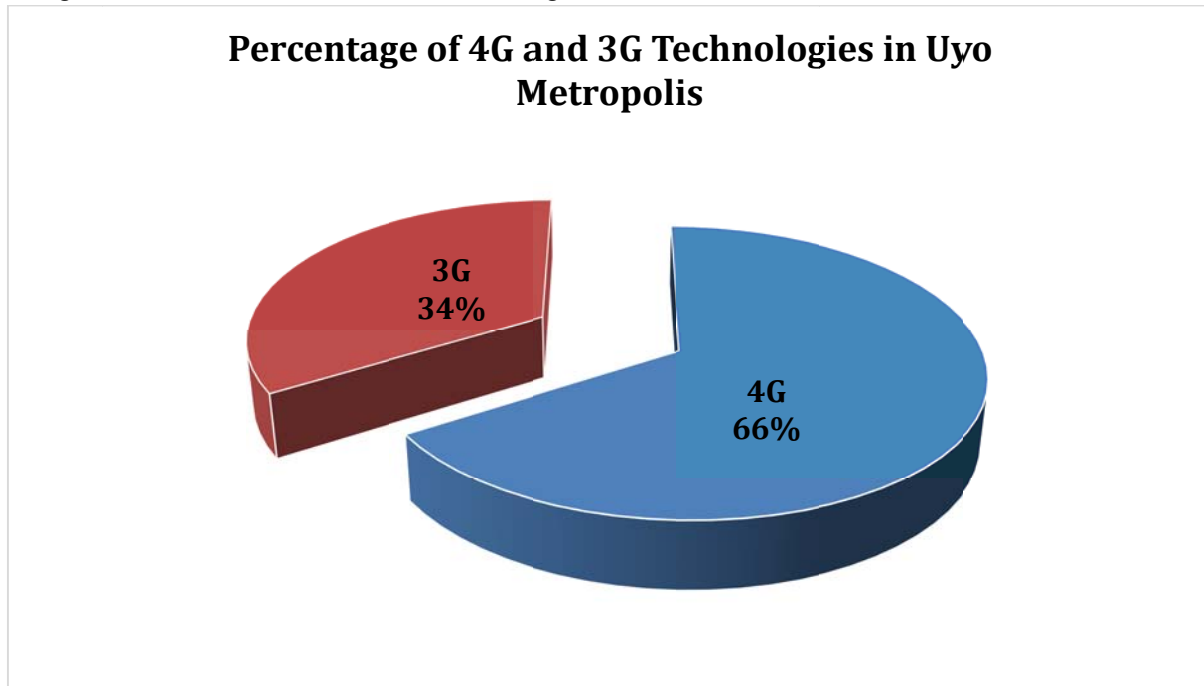


Figure 5 Percentage of 4G and 3G Technologies in Uyo Metropolis

4. Conclusion

The study investigated the details of Mobile Network Operators (MNO) and technology preferences for mobile communication network users based on a case study MNO and a case study area in Akwa Ibom State, Nigeria. The study is meant to assess the readiness for 5G migration among consumers of the case study MNO. Through a quantitative research approach, data collection methods including both primary surveys and secondary sources were employed to gather insights into user preferences, network deployment trends, and technological advancements. The study area, focused primarily on Uyo metropolis, was strategically selected for its representativeness of urban environments where mobile network infrastructure plays a critical role. The key findings from the research shed light on the preferences and distribution of Mobile Network Operator (MNO) subscribers, with MTN emerging as the key player in the region and that the users in that region have higher preference for 4G network.

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