

# 1 ANALYSIS OF CONGESTION OF MOBILE 2 NETWORK IN OFFA

## 3 ABSTRACT

4 The study of congestion of mobile network in Offa is necessary as congestion  
5 remains a major challenge to telecommunication service provision both to  
6 service providers and the subscribers as well, even in developed country.  
7 Cellular wireless systems such as GSM suffer from congestion resulting in  
8 overall system degradation and poor service delivery. Obviously, subscribers  
9 are susceptible to quite network providers who fail to meet up with the services  
10 required of them. However, vacating the network service providers will not  
11 resolve the problems; instead it will pose more problems. In science, problem  
12 opens avenue for investigation and development, which eventually happen to be  
13 the mindset for this project work. The inadequate infrastructure regarding the  
14 immense number of subscribers has occasioned high-level congestion in Offa.  
15 Also, areas on the GSM network where congestion occurred were analyzed  
16 including the various causes of congestion on GSM network. This research  
17 work also brought to bear recommendation that necessitate the need for service  
18 providers to create a mutual benefit between the service providers and  
19 subscribers.

20 Therefore, the tool used for data collection was a Five Point Likert attitude scale  
21 questionnaire. The Data collected for this study were analyzed using frequency  
22 counts, simple percentage (%) and mean score (x)

23

24 **Keywords:** Congestion, Mobile Network, GSM, Control Channel, Intra and  
25 Inter Congestion

## 26 INTRODUCTION

27 In the global trend today the newest phone communication technology is the  
28 cellular telephone, which is known as the cell phone or simply mobile phone. A  
29 mobile phone is invented to give the user full liberty of movement. It is worth  
30 noting that in this regard, the number of mobile users keeps increasing daily and  
31 yearly at a reasonable progression. Therefore, the importance of mobile phones  
32 soar-up with the improvement in services render, reduction in service cost, and  
33 the range of services available. According to Mehrotra, 1997, mobile or simply  
34 cellular systems started in the United States with the release of the advanced  
35 mobile phone service (AMPS) system in 1983. Asia, Latin America, and  
36 Oceanic countries adopted the AMPS standard and started creating the largest  
37 potential market in the world for mobile phone.

38 Considering the early invented technology of mobile phone in the early 1980s,  
39 most mobile telephone systems were analog rather than digital (Kuboye B.M. et  
40 al, 2009). However, as recently witness in the country one can affirm that  
41 mobile technology has graduated in expedition from analog to digital. Digital  
42 system has a lot of benefits compare to analog type which include but not  
43 limited to ease of signaling, lower levels of distortion and interference,  
44 integration of transmission and switching, and increased propensity to meet  
45 capacity demands. Nowadays the Global System for Mobile communications  
46 (GSM) adopted digital systems rather than the obsolete analog systems and uses  
47 digital data, which accommodates more subscribers even beyond one would  
48 imagine. Along the line, the GSM mobile telephone offers lots of advantages  
49 which include high quality voice communications and low bandwidth data  
50 connections for fax, short message service (SMS) and full dial-up connection to  
51 the Internet.

52 Also, many people are engrossed to GSM due to its unique mobility features.  
53 Thus, it has turned to a means of living for many people across the globe as they  
54 are getting involved in mobile phone-related ventures. The Mobile depots are  
55 now becoming complex entrenched systems, with rigorous real time necessities  
56 for signaling and voice processing (Scourias, 1997). Furthermore, the marketing  
57 strategies of the GSM network providers and competition to get many  
58 subscribers have lured lots of subscribers to mobile network communication,  
59 even though their infrastructures cannot sustain them. Some mobile network  
60 providers also complain that they pay an outrageous and huge sum of money to  
61 acquire licenses for operation in Nigeria, consequently the need for them to get  
62 as many subscribers as they can so as to recover their money. These and many  
63 more have led to congestion on the Nigerian GSM telecommunication systems.  
64 Also, during network dimensioning process, there are some essential tasks to be  
65 well-thought-out. Switches need to be dimensioned in agreement with the  
66 projected desired capacity, taking for example, average conversation time, the  
67 need for signaling, projected number of handovers, location updates, short  
68 message distribution etc. (Ani and Ogbuabor, 2015).

## 69 **STATEMENT OF THE PROBLEM**

70 According to Kuboye B.M. et al, 2009, the following are areas of congestion in  
71 the GSM network:

72 **Common Control Channels (CCCH):** Common Control Channel is a group of  
73 control channels that support the establishment and maintenance of  
74 communication links between the mobile Stations and Base (Harte, et al 1999).  
75 It consists of Random Access Channel (RACH), Paging Channels (PCH), and  
76 Access Grant Channel. Usually, RACH is used to make demand for Network  
77 consignment, PCH is used to inform the mobile station of incoming calls. Also,

78 AGCH is used to allocate Mobile Station to a precise Dedicated Control  
79 Channel (DCCH) or Stand-alone Dedicated Control Channel (SDCCH) for  
80 onward communication. As a matter of fact, on Common Control Channels  
81 congestion occur under three conditions, which are: **Random Access Channel**  
82 **Congestion (RACHC)** – Error of this type occurs when there is no free  
83 Random Access Channel to use, either for making call or reply to a call. **Paging**  
84 **Channel Congestion (PCHC)** – This is another type of congestion that occurs  
85 as a result of no free PCH to use in informing the mobile station of an incoming  
86 message. **Grant Channel Congestion (AGCHC)** – This is the third type of  
87 congestion which also occurs when there is no free Access grant channel to  
88 validate the responding Mobile station. Thus, when any of these three control  
89 channels is being congested, there cannot be any call launch between the sender  
90 and receiver. This failure is called a “Call Launch or Establishment Failure”  
91 (BoulMalf and Akhtar, 2003; Kuboye B.M. et al, 2009).

92 **Dedicated Control Channel Congestion (DCHC):** Congestion of this type  
93 occurs when there is failure to allocate Stand-alone Dedicated Control Channel  
94 (SDCCH) to provide validation to mobile station, location updating and  
95 assignments to traffic channels during idle periods (Mehrotra, 1997).  
96 Observation shows that the messages on SDCCH channel include short message  
97 service. When making a call or replying to paging message for the sharing of an  
98 SDCCH for validation, if there is no vacant SDCCH to use at that time, then the  
99 call will be terminated abruptly (Boulmaif and Akhtar, 2003; Kuboye B.M. et  
100 al, 2009).

101 **Traffic channels congestion (TCHC):** As for TCHC, failure occurs when an  
102 Access Grant Channel cannot get any free traffic channel (TCH) to allocate to  
103 the request of the mobile station through the random access channel. Traffic  
104 channels (TCH) is used to transfer voice, data, and control information and  
105 when there is no vacant TCH, the voice communication on the GSM network  
106 cannot be authenticated (Kuboye B.M. et al, 2009).

107 **Pulse Code Modulation Congestion (PCMC):** Pulse Code Modulation (PCM)  
108 is the link required to connect together the Base station (BS) and Mobile-  
109 switching center (MSC). Meanwhile, each PCM can carry between 1 and 32  
110 calls. When PCM is not vacant to carry the call signals between the BS and  
111 MSC, then we have Pulse Code Modulation Congestion (PCMC). This type of  
112 congestion can either occur within the network or between networks (Hartel et  
113 al., 1999; Kuboye B.M. et al, 2009).

114 **THE ENVISAGED CAUSES OF CONGESTION OF MOBILE**  
115 **NETWORK IN OFFA ARE STATED BELOW:**

116

**117 Inadequacy of Base Stations:**

118 Study shows that there is no adequate base stations in Offa presently, compare  
119 to the sizable number of subscribers that are patronizing each of the network  
120 operators. The numbers of subscribers to different networks providers has  
121 increased drastically because of the landslide reduction in the price of their  
122 network SIM card recently experienced in the area. However, the base stations  
123 do not had a matching increase as one will expect. The present ratio probably is  
124 about 8,000 subscribers to one base station.

**125 Inadequacy of the needed Channels:**

126 One will definitely expect to experience inadequate channels to support the  
127 subscribers and the service rolled out by the different operators in such area,  
128 since there are not enough base stations. Meanwhile, the channels usually  
129 determine the total number of subscribers that can be allowed to use a base  
130 station concurrently at any point in time (NCC, 2005). This track remains the  
131 same because any time a base station is added to their network; a high-level of  
132 promotion will be provided in order to lure more consumers.

**133 Competition for Subscribers among the Operators:**

134 Observation shows that the ulterior motive of GSM Providers in Nigeria, of  
135 which Offa is not exempted, is the profits they will effectually make from the  
136 subscriber base and not the overall quality of service they want to offer. Most of  
137 them falsify information and make fallacious advertisements all with the intent  
138 of luring customers to their network, whereas they lack basic infrastructure to  
139 satisfy subscribers' demands.

**140 Inadequacy of End-to-End System:**

141 Most Mobile Network operators in Nigeria are still relying on radio waves to  
142 convey speech and data from base stations to mobile switching centers. Usually,  
143 as far as microwave region is concern, radio wave signals are subject to certain  
144 interference that may emanate from other electromagnetic waves generating  
145 systems such as radio and television. It is possible that interference of such  
146 could cause call setup failure, call drop, or other impairment.

**147 Absence of Good Quality Phones:**

148 According to Electronic Design, 2008 ([www.elecdesign.com](http://www.elecdesign.com)), common to any  
149 radio link telecommunication system, it is the radio link between mobile phone  
150 and base station that will be the weakest part of the communication system.  
151 However, provided conditions are not favorable, or the user transits into a  
152 tunnel during a call, they will lose connection.

153 Mobile Phone with better quality and higher frequency wave intensity will  
154 make a call more steady and shrink interference from another caller. This is  
155 supported by the parameter of the power control that links power between the  
156 terminal and base station. It is highly very necessary to maintain efficient power  
157 control so as to hold interference at a lowest.

158 **Inadequacy of Good Communication Terms between Different Networks:**  
159 Another colossal reason why there is poor inter-network communication is the  
160 incapability to reach a decision on the sharing ratio of the income between the  
161 network providers. Owing totally to this, the statistics of lines that are open for  
162 interconnectivity are lesser compared to the aggregate number of lines.

163 Also, condition such as congestion on the linking networks when a subscriber  
164 from a network A is calling from a network that is less congested to Network B,  
165 which is occupied to capacity. Considering situation of such, the call will not  
166 definitely pass through the network.

167 **Marketing Strategies and Pricing Schemes:** The pricing schemes put in place  
168 by individual network providers also affect traffic behavior since this  
169 consequently increased the number of subscribers on the network.

## 170 **FACTORS THAT FAVOR INCREASES IN THE SUBSCRIBER BASE IN** 171 **OFFA**

172 Study shows that the following factors drastically contribute towards increase in  
173 the subscriber base of each network in Offa, Kwara State.

174 **The Ease of Communication Offered by Mobile Phones:** Sizable number of  
175 people in Offa cheered the usage of GSM because it has solved the challenge of  
176 fading or attenuation during calls. Moreover, mobile phones are light and can be  
177 easily carried about form one place to another. In this regard, the noise and  
178 distortions caused by wired telephone are eradicated.

179 **Elimination of Wired Connection:** The graduation from wired connection to  
180 wireless one allowed communication to be established in as much as the  
181 individual subscriber is within the cell area of his/her operator.

182 **Voice Quality Service:** Observation also shows that the quality of voice service  
183 experienced in Offa is far better than the analog wired service as a result of the  
184 fact that it is not as vulnerable to distortion and interference as that of wired  
185 telephones.

186 **The Additional Data Service:** The additional data services available on GSM,  
187 such as SMS, browsing make communication easier for people and offer a  
188 wider array of options for network subscriber in Offa.

189 **The competitive reduction in the tariff:** There are competitions among  
 190 network providers in Offa and the service rate for service remains the same,  
 191 even with that of international service also remains the same, without increased  
 192 tariff charges.

193 **The Low Acquisition Rate:** It is noted that the actual amount of money  
 194 required for procuring a network line and phone is considerably lower than the  
 195 one user(s) have to pay to have a wired NITEL telephone. Hence, this really  
 196 attracted many new communication network GSM subscribers in the area.

### 197 **COMPLAINTS BY THE SUBSCRIBERS THAT ARE EVIDENT IN** 198 **OFFA**

199 Study shows that complaints from subscribers in Nigeria which that of Offa is  
 200 not excepted include “If I try calling during the day, I often get the same  
 201 message - ‘Network Busy’ or ‘Error in Network’ - even if the mobile phone at  
 202 the other end is not being used” (Jonnes, 2005). However, research exposed the  
 203 following messages as being regularly declared or displayed to the users by the  
 204 GSM operators in Offa.

#### 205 **From Etisalat Platform:**

206 “Error in connection”  
 207 “The number you are calling is not available now”

#### 208 **From MTEL Platform:**

209 “Number not responding”  
 210 “Network temporary busy”

#### 211 **From MTN Platform:**

212 “Error in connection”  
 213 “Network busy”  
 214 “The number you are calling is unavailable  
 215 “No network

#### 216 **From AIRTEL Platform:**

217 “Error in connection”  
 218 “Network busy”

#### 219 **From Globalcom Platform:**

220 “Network busy”  
 221 “The number you have dialed is not on the Globalcom Network”  
 222 “Error in connection”  
 223 “No answer”



224 "Number busy"  
225 "Not reachable at the moment; please try again later"

226 The above messages show the lack of support of our network operators to their  
227 individual subscribers. Those messages observed to have been programmed into  
228 their equipment and it is guessed that they are selected probably randomly and  
229 declared to the users.

### 230 **AN OVER VIEW OF OFFA, KWARA STATE, NIGERIA:**

231 Offa is an ancient town and at the same time, the Headquarters of Offa Local  
232 Government Area of Kwara State, Nigeria. It is the second largest town in the  
233 state, and it is located in central Nigeria with geographic coordinates of 8°9'N  
234 4°43'E.

235 The city of Offa was founded by Olalomi Olofa-gangan; a crown prince from  
236 Oyo, and a direct descendant of king Oranmiyan in Ile-Ife, around 1395.  
237 Olalomi was a renowned hunter reputed for his skill as an archer. Offa is known  
238 as the traditional headquarters of Ibolo dialect of the Yoruba speaking people of  
239 Kwara and Osun States. Offa Local Government Area in its entirety has 5  
240 wards, namely; Essa, Ojomu, Balogun, Shawo and Igbo-Idun. Offa is the home  
241 of the legendary Moremi, the one who was said to be responsible for the defeat  
242 of the frequent marauders who stormed Ife, an ancient town and cradle of  
243 Yoruba race.

244 The new Olofa of Offa, a renowned king is Oba Alhaji Mufutau Mohammed  
245 Gbadamosi Okikiola Esuwoye II. The prominent knighted chiefs of Offa  
246 include Esa, Ojomu, Sawo and Balogun. The popular eulogy of Offa is "Ijakadi  
247 Loro Offa", a Yoruba phrase meaning "wrestling is our game". The city's  
248 mascot is the peacock bird which is one of the most prominent exotic avian  
249 species in the region.

250 The provincial figure for the population of Offa Local Government Area by the  
251 National population Commission (FRN official Gazette no24 of May, 2007  
252 Government Notice) is 89,674 comprising of 46,266 males and 43,428 females.  
253 Going by reputation, Offa is known as the home of sweet potatoes.

254 Education is the main industry of Offa people. Tertiary institutions in the town  
255 include the Federal Polytechnic, Kwara State College of Health Technology and  
256 Nigeria Navy School of Health Science, School of Basic Studies, and National  
257 teachers Institute. Two private Universities are also springing up from Offa city.

### 258 **OBJECTIVES OF THE STUDY**

259 The main aim of this research is to evaluate the congestion of mobile network in  
260 Offa, Kwara State, Nigeria.

261 Hence, the following objectives as enumerated below are the major areas of  
262 focus throughout this study

- 263 i. To analyze the various causes of network congestion in Offa;
- 264 ii. To examine the factors that causes increase in the number of subscribers  
265 in the area under study;

## 266 **RESEARCH QUESTIONS**

267 The study would examine the following questions:

- 268 i. What have been the causes of network congestion in Offa?
- 269 ii. What do you think are the factors responsible for increase in the  
270 subscribers in Offa?

## 271 **FORMULATION OF HYPOTHESES**

272 Based on the objective of this study, following hypotheses were formulated.

273 **HA**= Alternative Hypothesis

274 **HN** = Null Hypothesis

### 275 **Hypothesis One**

276 HA: In Offa, there is network congestion

277 HN: In Offa, there is no network congestion

### 278 **Hypothesis Two**

279 HA: There is ease of communication offered by mobile phones to people in  
280 Offa.

281 HN: There is no ease of communication offered by mobile phones to people in  
282 Offa.

### 283 **Hypothesis Three**

284 HA: There is no enough Base Stations in Offa

285 HN: There is enough Base Stations in Offa

### 286 **Hypothesis Four**

287 HA: The available network channels are not sufficient

288 HN: The available network channels are sufficient



289 **Hypothesis Five**

290 HA: There is competition for subscribers among the network operators:

291 HN: There is no competition for subscribers among the network operators:

292 **Hypothesis Six**

293 HA: There is no enough End-to-End System

294 HN: There is enough End-to-End System

295 **Hypothesis Seven**

296 HA: There are no good communication terms between different networks in

297 Offa.

298 HN: There are good communication terms between different networks in Offa.

299 **Hypothesis Eight**

300 HA: The elimination of wired connection has increased the number of

301 subscribers per network

302 HN: The elimination of wired connection has not increased the number of

303 subscribers per network

304 **Hypothesis Nine**

305 HA: The voice Quality Service rendered by network providers has increased

306 subscriptions.

307 HN: The voice Quality Service rendered by network providers has not

308 increased subscriptions.

309 **Hypothesis Ten**

310 HA: The competitive reduction in the tariff plan of each network provider

311 contributed to increase in subscriptions experienced recently.

312 HN: The competitive reduction in the tariff plan of each network provider has

313 not contributed to increase in subscriptions experienced recently

314 **SIGNIFICANCE OF THE STUDY**

315 This study shall be found useful in the following ways:

- 316 i. One of the significances of this study is that it would use a market  
317 structure conduct performance context to evaluate the network congestion  
318 in Offa, Kwara State.

- 319 ii. This study will help network providers to proffer salient solutions to  
320 those causes of congestion in the area under study and the entire country  
321 as a whole.
- 322 iii. It will be a valuable tool for scholars, institutions and individual that  
323 wants to research into the congestion of network in a named city. It will  
324 also serve as a point of reference for further studies.

#### 325 **LIMITATIONS OF THE STUDY:**

326 The limitations of this study therefore includes, the short duration given by the  
327 institution authority to cover this research work which does not allow for an in-  
328 depth coverage of all the issue associated with the topic under study, and  
329 gathering of useful correlated information. Self-reliant information required in  
330 order to highlight and analyze some statement are not readily available, such as,  
331 the actual number of subscriber per network provider in the area under study.  
332 Also, funding is additional excruciating limitation to an in-depth study of this  
333 topic.

#### 334 **SCOPE OF THE STUDY**

335 The study only covers analysis of congestion of mobile network in Offa, Kwara  
336 State.

337 It specifically analyzes the location of congestion areas on GSM network in the  
338 city under study.

#### 339 **DEFINITION OF TERMS**

340 **Congestion:** “Congestion, in the context of networks, refers to a network state  
341 where a node or link carries so much data that it may deteriorate network  
342 service quality, resulting in queuing delay, frame or data packet loss and the  
343 blocking of new connections. In a congested network, response time slows with  
344 reduced network throughput. Congestion occurs when bandwidth is insufficient  
345 and network data traffic exceeds capacity” Techopedia  
346 ([www.techopedia.com/definition/18506/congestion-networks](http://www.techopedia.com/definition/18506/congestion-networks)).

347 Also, congestion is the unobtainability of the network to the subscriber at the  
348 time of making a call (Ani and Ogbuabor, 2015).

349 **Network:** “A network is a collection of computers, servers, mainframes,  
350 network devices, peripherals, or other devices connected to one another to allow  
351 the sharing of data. An excellent example of a network is the internet, which  
352 connects millions of people all over the world. Below is an example image of a  
353 home network with multiple computers and other network devices all connected

354 to each other and the Internet” Computer Hope  
355 (<http://www.computerhope.com/jargon/n/network.htm>).

356 **Network Congestion:** “Network congestion in data networking and queuing  
357 theory is the reduced quality of service that occurs when a network node is  
358 carrying more data than it can handle. Typical effects include queuing delay,  
359 packet loss or the blocking of new connections. A consequence of congestion is  
360 that an incremental increase in offered load leads either only to a small increase  
361 or even a decrease in network throughput” Wikipedia  
362 ([en.wikipedia.org/wiki/Network\\_congestion](http://en.wikipedia.org/wiki/Network_congestion))

### 363 **RESEARCH METHODOLOGY**

364 This research work involves the study of wireless network communications  
365 including analog and digital system. Special attention was given to GSM as a  
366 digital communication system. A careful study of congestion in GSM was done.  
367 The points where congestion occurred on the GSM network were identified  
368 through observation of GSM stations such as MTN, Globacom, Airtel Etisalat  
369 and Mtel; and through the administering of questionnaires. During the survey of  
370 this study, the survey research design was adopted in collecting data. The tool  
371 used for data collection was a Five Point Likert attitude scale questionnaire. The  
372 Data collected for this study were analyzed using frequency counts, simple  
373 percentage (%) and mean score (x). However, a mean score of three (3) and  
374 above was used as a basis for successful outcome and regarded as an accepted  
375 mean to test research question, while a mean score of 2.99 and below was used  
376 as a basis for unsuccessful outcome and regarded as rejection to test the research  
377 question.

### 378 **PRESENTATION AND ANALYSIS OF DATA**

379 For the sake of this study, questionnaires were distributed. The total number of  
380 questionnaires randomly distributed to respondents across five network  
381 providers in Offa was 1000, using the simple random sampling method. The  
382 network providers that the questionnaires cut across are MTEL, MTN,  
383 GLOBACOM, ETISALAT and AIRTEL. The questionnaires were ensured to  
384 be evenly distributed among the five network providers. Out of the 1000  
385 questionnaires distributed, 960 were filled and returned which represent 96.0%  
386 while 40 questionnaires were not returned, and represent 4.0% of the total  
387 administered questionnaires. However, the total working figure for this study is  
388 960.

389 The total population for this study consists of educational institutions like  
390 Federal Polytechnic Offa, Offa, Kwara State, satellite campuses; and members  
391 of the general public in Offa.

392

393 The outcomes of data collected are as tabulated below:

394 **TABLE 2: Respondents’ Response to Questionnaire**

<b>Variables</b>	<b>SA</b>	<b>A</b>	<b>SD</b>	<b>D</b>	<b>U</b>	<b>Total</b>	<b>Mean (X)</b>
In Offa, there is network congestion	250 26.0%	582 60.6%	62 6.5%	48 5.0%	18 1.9%	3878 100%	4.04
There is ease of communication offered by mobile phones to people in Offa	191 20.0%	658 68.5%	10 1.0%	101 10.5%	-	3819 100%	3.98
There is enough base stations in Offa	-	485 50.5%	-	293 30.5%	182 19.0%	2708 100%	2.82
The available network channels are not sufficient	170 17.7%	652 67.9%	70 7.3%	18 1.9%	50 5.2%	3754 100%	3.91
There is competition for subscribers among the network operators	357 37.2%	562 58.5%	-	25 2.6%	16 1.7%	4099 100%	4.27
There is enough End-to-End System	-	487 50.7%	-	262 27.3%	211 22.0%	2683 100%	2.79
There are good communication terms between different networks in Offa.	72 7.5%	155 16.1%	468 48.8%	169 17.6%	96 10.0%	2818 100%	2.94
The elimination of wired connection has increase the number of subscribers per network	196 20.4%	502 52.3%	140 14.6%	119 12.4%	3 0.3%	3649 100%	3.80
The voice Quality Service rendered by network providers has increased subscriptions.	203 21.1%	590 61.5%	156 16.3%	11 1.1%	-	3865 100%	4.03
The competitive reduction in the tariff plan of each network provider contributed to increase in subscriptions experienced recently	177 18.4%	596 62.1%	118 12.3%	49 5.1%	20 2.1%	3741 100%	3.90

395

396 **SUMMARY OF FINDINGS**

397 Technically, congestion within network is referred to as intra- congestion, while  
398 congestion between different networks is referred to as inter- congestion.

399 The incomplete calls are referred to as call-drop or call-break within networks.  
400 Call-drop means the two parties in dialogue were unable to end-up their

401 discussion. This means that the call was brusquely terminated. However, study  
402 shows that:

- 403 1. In Offa, there is network congestion.
- 404 2. There is ease of communication offered by mobile phones to people in  
405 Offa.
- 406 3. There are no enough base stations in Offa;
- 407 4. The available network channels are not sufficient.
- 408 5. There is competition for subscribers among the network operators
- 409 6. There is no enough End-to-End System
- 410 7. There are no good communication terms between different networks in  
411 Offa
- 412 8. The elimination of wired connection has increase the number of  
413 subscribers per network.
- 414 9. The voice Quality Service rendered by network providers has increased  
415 subscriptions.
- 416 10. The competitive reduction in the tariff plan of each network provider  
417 contributed to increase in subscriptions experienced recently.

## 418 **CONCLUSION**

419 Base on this research work, congestion is a menace that has devastated GSM  
420 network in Offa, Kwara State, Nigeria. Scholars have been trying their best to  
421 ensure that it is brought under control. Mobile Service Switching Center (MSC),  
422 Base Station Controller and base station site in order to minimize congestion is  
423 needed in Offa. The bench mark created by the international telecommunication  
424 union has not been achieved even in the developed nations, a reason being that  
425 service providers are bent on making fabulous gains instead of satisfying their  
426 customers. Sequel to this, GSM service provider in the country should ensure  
427 they stop pursuing excess money at the detriment of their subscribers. This will  
428 go a long way to stabilize good communication system in the area under study  
429 and by extension to the entire country

## 430 **RECOMMENDATION**

431 It is necessary that network providers have reliable goals for the attainment of  
432 good quality and high performance network in Offa, Kwara State, Nigeria.  
433 There is need for integrated network architecture design that will show how the  
434 different services will be implemented as well as what equipment will be

435 needed at each point. Also, a preliminary roll out plan should be included. There  
436 should be provision of more Mobile Service Switching Center (MSC), Base  
437 Station Controller and base station site in order to minimize congestion.  
438 Logistics such as detailed network planning, computer aided design system and  
439 tools are to be made available for coverage prediction, interference analysis,  
440 frequency planning, microwave link planning and documentation.

441 Furthermore, there is need for government to be moderate in the area of tax  
442 levying network providers in the country in order to enjoy congestion free and  
443 good communication system across the country. On this note, the Nigerian  
444 government should involve stakeholders, such as, Nigerian Labour Congress  
445 and Civil Society Organization officials in matters of importance regarding  
446 policy making, design, development and implementation in all areas of  
447 governance, most especially, the policy of taxation on foreign investors such as  
448 network providers.

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