Global Journal of Management and Business Research
Volume 12 Issue 4 Version 1.0 March 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

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GJMBR-A Classification : *FOR Code: 150505, 150501 JEL Code: M31*

Strictly as per the compliance and regulations of:

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I. Introduction

Nigerians formally joined the users of mobile telephone, popularly known as GSM in 1999 when MTN, the first mobile telephone service provider was licensed by the Obasanjo led civilian government to operate business in the country. Soon after, the market witnessed many Nigerian consumers subscribing into the few services being offered, which consisted mainly of communication via voice and text mail messages. At that time, the price of the few available services was very high. Despite that, many Nigerians subscribed into the services. With the favorable acceptance and high rate of adoption, more telephone service providers obtained their operation licenses and joined the market. This led to the expansion in the range of services available. Competition among service providers increased, and the Nigerian mobile telephone services market witnessed varieties of service packages with different attributes designed and offered by the different networks of service providers to the consumer population as bait to attract them.

The decision about which service or service provider to choose among few was very simple at the initial stage. However, with increased number of service options being made available to the consumers as more companies were licensed to operate in the market, their decisions regarding their choice became complex, requiring serious evaluations based on many criteria and considerations.

There is need therefore to know the criteria upon which Lagosian consumer makes their choices of mobile telephone services and how they decide which service or service provider is better for them given the array of conflicting attributes associated with different sevice options available to them. This is the thrust of this research work.

Paul E. Green et al (2001) reported in their work on the thirty years history of Conjoint Analysis that Conjoint Analysis evolved from the seminal research of Luce and Tukey (1964) and that their theoretical contributions were put to use by a number of Psychometricians, including Carroll (1969) and Young (1969). These researchers developed a variety of nonmetric models for computing part-worths (attribute level values) from respondents' preference orderings across multiattributed stimuli, such as descriptions of products or services.

In the mid 80's, Johnson (1987) introduced his adaptive conjoint analysis programme that used graded paired comparisons as one set of input to the model. Hermen (1988) introduced a PC-based packaged that used full-profile stimuli based on orthogonal designs. The advent of PC-based conjoint packages opened a large and eager market for applying the methodology.

Conjoint analysis is one of the many techniques for handling situations in which a decision has to deal

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with options that simultaneously vary across two or more attributes.

This study considered the following networks: MTN, Glo-mobile, Zain, Etisalat, Multilinks, Visafone, Starcomms. The different mobile telephone service providers in Nigeria today have provided varieties of mobile telephone service plans for the Nigerian consumers to make their choice(s). Two important plans are the personal/private user plan(PPP) and the business/commercial plan(BCP). The personal/private plan in meant for subscribers to meet their personal needs while the business/commercial plan is used for business by people who retail or resell the services to other users for profit. These services have a number of attributes upon which the consumers make their choices based on the attractiveness of the attributes to them. There is need to know how Lagosian consumers make their choice between these mobile telephone services especially how they trade-off the different, mostly conflicting, service attributes before they finally arrive at their choice(s).

Some of the mobile telephone service attributes attached to the service plans mentioned above which are offered to the Lagos state subscribers are:

Name of company: This refers to the organization which provides the wireless plan.

Number of anytime minutes: This is the number of monthly minutes covered by each plan that can be used at any time.

Night minutes/free night calls: This describes an opportunity to make free calls to other users of the same network without any extra charges.

Weekend minutes: This is the number of monthly minutes covered during weekend. All weekend minutes are additional minutes that do not count against anytime minutes

The geographical area that you can access: The network coverage in terms of number of states and countries covered by the network.

Mobile to mobile minutes: This is the number of monthly free minutes on calls placed to another mobile phone served by the same provider (that is, free minutes on calls between two users of the same provider).

Additional lines above two: This is the number of additional lines (above two) that a subscriber wish to include

Price per month of additional lines: This is the cost of each additional line over the base of two wireless phones.

Control over credit usage: This is the opportunity to use the credit purchased by a subscriber at any time without any penalty.

Common charges for intra and inter network calls: This is the opportunity to pay the same tariffs for calling different networks.

Per second billings: This in the opportunity to pay for only the number of seconds used for calling.

For the marketing research work conducted for T-Mobile of the United States (Abba and Paul, 2003) applied conjoint analysis to analyze United States subscriber's trade-offs of mobile telephone service attributes. They evaluated two service plans namely single plan and family plan. Adamu et al (2009) applied conjoint analysis in the study of consumer preferences for choosing Nigerian GSM network provider services in Nigeria. The results of the conjoint analysis indicated that GSM network in Nigeria should focus more on how to improve their connectivity.

The remaining parts of the paper are as follows: section 2 presents the methodology. Section 3 involves the analysis of data and results. Discussion of the results is presented in section 4 and finally, section 5 concludes the study.

II. Methodology

In line with the methods applied by Abba and Paul (2003), several models of conjoint were used in this research work. The full Profile Conjoint was used, in which respondents receive a set of full profiles (based on orthogonal designs) and asked to respond by ranking and/or rating each profile on a likelihood of purchase scale. Also hybrid conjoint was used in which respondents were asked to carry out the following tasks. They were asked to evaluate the desirability of each attribute level on a (typically) 0 to 10, degree of desirability scale and then to rate the importance of each attribute on a 0-100 constant sum scale, and also to indicate their likelihood of purchasing a full profile on a 0-100 purchase scale. The hybrid model utilizes all three aspects of the rating process, individual level desirability, attribute importance and full profile evaluations. Each step contributes to the resultant set of part worth-one set of part worth for each respondent. Part worth is obtained by multiplying the importance weights with the associated attribute level's desirability rating. Choice-based Conjoint was equally used when the respondents were asked to choose their most favored profile out of the offered set of full profiles. Lastly, constant sum conjoint was used where respondents assigned 100 points across the full set of profiles to reflect their relative desirability of the profiles.

This study attempts to look at how the Lagosian mobile telephone service subscribers make trade-offs among the various service providers in the Lagos market. The study consists of two different telephone calling plans; these are the private/personal plan(PPP) and the business/commercial plan(BCP).The study population for this work consisted of telephone users in Lagos state. They are made up of both male and female users from across different parts of the state who are at least 18years old and above. They were randomly selected from the local government areas in Lagos State.

The sample used in this study consisted of a total of 200 respondents randomly selected from the population of mobile telephone users in the Lagos state mobile telephone market. These 200 respondents were divided into two groups. The first group which is made up of 160 respondents was for the private/personal plan and the rest 40 respondents are for the business/commercial plan. There were two different set of questionnaires used for data collection; one was the questionnaire for the private/personal plan and the other was for the business/commercial plan. The questionnaires were administered on the respondents in a face to face interview. First, the researcher read and explained the questions on the questionnaires to the respondents after which they were allowed to answer the questions.

The research instruments used in this study consisted of two set of questionnaires. These are the questionnaire for the private/personal plan (QPPP) and the questionnaire for the business/commercial plan (QBCP). Each of the questionnaire consisted of sections for collecting information from respondents. Section one consisted of six questions for collecting information on respondents' background. Section two consisted of five parts. The first part which is made up of twelve questions was for collecting information on respondents' desirability of the calling plan's attributes. Each question under this part was structured after the method applied by professors Abba and Paul (2003) in their study of United states subscribers' trade-offs regarding mobile telephone providers in their analysis of service attributes evaluations in 2003, in which each mobile telephone service attribute was made to range from level zero which stands for completely unacceptable to level ten which stands for highly desirable.

The second part was for rating the attributes' importance. It consisted of a list of all the mobile telephone service attributes in this study. First, respondents were asked to look through the list of attributes and give a rating of zero to anyone that had no importance to them at all. Then they were asked to rate each attribute according to how important each attribute was to them. The higher the rating of an attribute, the more important the attribute was to the respondent. Respondents were to make sure that the ratings sum up to a total of 100, thus the ratings give the relative importance of each attribute to the respondents. The third part was for rating the importance of other mobile phone features thought to be equally of interest to the respondents. The fourth part was for evaluating alternate mobile phone calling plans and the fifth and concluding part was made up of further questions which probed into the mobile telephone carrier used by the respondents and their usage characteristics. In between the first and second sections, a portion titled **"glossary of terms"** was used to provide a detailed description of each of the calling plan features that appeared in this study to the respondents for their consultation.

III. Analysis Of Data And Results

a) Description of the private/personal plan and business/commercial plan

The number of respondents for the private/personal plan questionnaire was 160 while the number of respondents for the business/commercial plan was 40. For each of these two plans, the results for the following were shown: average desirabilities, average importances and average part worths. Average desirability for each level of attribute was obtained by adding all the ratings together and divided by the total number of respondents (160 for private/personal calling plan and 40 for business/commercial calling plan). Average importance for each attribute was obtained by adding all the ratings for that attribute together and divided by the total number of respondents under each calling plan. Average part worth for each level of attribute was obtained by finding the product of importance weight and the associated level's desirability score. That is,

$$\text{AVG PARTWORTH} = \frac{\text{AVG IMPORTANCE}}{1OO} \times \frac{\text{AVG DESIRABILITY}}{10}$$

The above was derived from the method applied by Fishbein in 1967 when he defined part worth as the product of importance weight and the associated level's desirability score.

i. *Results for the private/personal plan*

Number of respondents: 160
Attribute: The calling plan provider
Average importance: 4.7500

Level	Avg Desirability	Avg Part Worth
MTN	7.5625	0.035922
Zain	7.0000	0.033250
Glo	6.8125	0.032359
Etisalat	6.2500	0.029688
Starcoms	4.6875	0.022266
Visafone	5.1250	0.024344
Multilinks	5.7500	0.027313

Attribute: Anytime minutes availability
Average importance: 8.8125

Level	Avg Desirability	Avg Part Worth
Unlimited	9.8125	0.086473
3000 mins	7.9375	0.069949
2000 mins	7.2500	0.063891
1000 mins	6.5625	0.057832
600 mins	4.9375	0.043512
100 mins	3.7500	0.033047
60 mins	2.9375	0.025887
10 mins	2.1875	0.019277

Attribute: Night minutes (free night calls)
Average importance: 8.1250

Level	Avg Desirability	Avg Part Worth
Umlimited	9.2500	0.075156
5000 mins	7.1878	0.058401
3000 mins	5.6875	0.046211
1000 mins	4.4375	0.036055
None	1.6875	0.013711

Attribute: Weekend minutes (free weekend calls)
Average importance: 9.0625

Level	Avg Desirability	Avg Part Worth
Unlimited	9.6875	0.087793
5000 mins	7.7500	0.070234
3000 mins	6.0000	0.054375
1000 mins	3.6250	0.032852
None	0.6875	0.006231

Attribute: Geographical coverage
Average importance: 17.0625

Level	Avg Desirability	Avg Part Worth
International	9.5625	0.163160
Nationwide	7.7500	0.132234
Regional	6.7500	0.115172
State	5.6875	0.097043
Local Govt.	3.4375	0.058652

Attribute: Mobile to mobile minute (within the same network)
Average importance: 7.5625

Level	Avg Desirability	Avg Part Worth
Unlimited	9.8125	0.074207
5000 mins	7.7500	0.058609
1000 mins	6.0000	0.045375
500 mins	3.50000	0.026468
None	0.1250	0.000945

Attribute: control over credit usage
Average importance: 13.3125

Level	Avg Desirability	Avg Part Worth
Complete	9.8125	0.130629
Partial	3.8125	0.050754
No control	0.4375	0.005824

Attribute: per second billings
Average importance: 7.3750

Level	Avg Desirability	Avg Part Worth
Yes	9.8125	0.072367
No	0.2500	0.001844

Attribute: Per minute billings
Average importance: 6.1250

Level	Avg Desirability	Avg Part Worth
Yes	0.1875	0.001148
No	9.6875	0.059336

Attribute: Innovations
Average importance: 8.3125

Level	Avg Desirability	Avg Part Worth
Family & friends	8.8750	0.073773
Please call me	7.8125	0.064941
Call waiting	5.3125	0.044160
Roaming	4.6250	0.038445

Attribute: Monthly cost of calling plan
Average importance: 4.3750

Level	Avg Desirability	Avg Part Worth
N500	9.6875	0.042383
N1000	7.9375	0.034727
N1500	5.8750	0.025703
N2000	5.0000	0.021875
N2500	3.8125	0.016680
N3000	2.9375	0.012852
N4000	2.1250	0.009297

Attribute: Types of credit purchase
Average importance: 5.1250

Level	Avg Desirability	Avg Part Worth
Wholesale	6.7500	0.034594
Retail	4.8125	0.02466

ii. *Results for the business/commercial plan*

Number of respondents: 40
Attribute: The calling plan provider
Average importance: 6.2500

Level	Avg Desirability	Avg Part Worth
MTN	8.2500	0.051563
Zain	6.5000	0.040625
Glo	6.5001	0.040625
Etisalat	7.2506	0.045316
Starcoms	6.2507	0.039067
Visafone	6.5004	0.040628
Multilinks	5.2520	0.032825

Attribute: Anytime minutes availability
Average importance: 8.7500

Level	Avg Desirability	Avg Part Worth
Unlimited	9.7509	0.085320
3000 mins	8.7500	0.076563
2000 mins	6.5002	0.056877
1000 mins	5.5004	0.048129
600 mins	4.7510	0.041571
100 mins	3.7502	0.032814
60 mins	3.0005	0.026254
10 mins	1.7510	0.015321

Attribute: Night minutes (free night calls)
Average importance: 3.7500

Level	Avg Desirability	Avg Part Worth
Umlimited	6.0240	0.022590
5000 mins	5.7500	0.021563
3000 mins	6.2500	0.023438
1000 mins	7.0030	0.026261
None	5.7511	0.021567

Attribute: Weekend minutes (free weekend calls)
Average importance: 10.0000

Level	Avg Desirability	Avg Part Worth
Unlimited	8.7508	0.087508
5000 mins	6.2510	0.062510
3000 mins	4.0008	0.040008
1000 mins	3.0040	0.030040
None	1.5009	0.015009

Attribute: Geographical coverage
Average importance: 12.5000

Level	Avg Desirability	Avg Part Worth
International	9.5080	0.11885
Nationwide	7.5070	0.093838
Regional	6.2504	0.078130
State	5.2510	0.065638
Local Govt.	4.2503	0.053129

Attribute: Mobile to mobile minute (within the same network)
Average importance: 7.5000

Level	Avg Desirability	Avg Part Worth
Unlimited	9.2504	0.069378
5000 mins	6.5009	0.048757
1000 mins	5.0130	0.037598
500 mins	4.0021	0.030016
None	0.7511	0.005633

Attribute: control over credit usage
Average importance: 17.5000

Level	Avg Desirability	Avg Part Worth
Complete	9.7503	0.170630
Partial	3.7510	0.065643
No control	0.2502	0.0004379

Attribute: per second billings
Average importance: 8.7500

Level	Avg Desirability	Avg Part Worth
Yes	9.7560	0.085365
No	0.2504	0.00219

Attribute: Per minute billings
Average importance: 5.0000

Level	Avg Desirability	Avg Part Worth
Yes	2.7500	0.013750
No	7.0200	0.035100

Attribute: Innovations
Average importance: 6.2500

Level	Avg Desirability	Avg Part Worth
Family & friends	9.5111	0.059444
Please call me	6.1021	0.038138
Call waiting	5.2503	0.032814
Roaming	3.5001	0.021876

Attribute: Monthly cost of calling plan
Average importance: 7.5000

Level	Avg Desirability	Avg Part Worth
N500	9.2500	0.069375
N1000	7.0271	0.052703
N1500	5.2521	0.039391
N2000	4.0112	0.030084
N2500	2.7533	0.1043
N3000	1.7514	0.0803
N4000	0.7500	0.0581

Attribute: Types of credit purchase
Average importance: 6.2500

Level	Avg Desirability	Avg Part Worth
Wholesale	8.7532	0.2162
Retail	2.7490	0.1542

Table 1: Summary of the Average Importance for Cluster 1 (private/personal calling plan)

The calling plan provider	4.7500
Anytime minutes availability	8.8125
Night Minutes(free night calls)	8.1250
Weekend minutes(free weekend calls)	9.0625
Geographical coverage	17.0625
Mobile-mobile minutes(within the same network)	7.5625
Control over credit usage	13.3125
Per second billings	7.3750
Per minute billings	6.1250
Innovations	8.3125
Monthly cost of calling plan	4.3750
Types of credit purchase	5.1250

Table 2 : Summary of the Average Importance for Cluster 2 (business/commercial calling plan)

The calling plan provider	6.2500
Anytime minutes availability	8.7500
Night Minutes(free night calls)	3.7500
Weekend minutes(free weekend calls)	10.0000
Geographical coverage	12.5000

Mobile-mobile minutes(within the same network)	7.5000
Control over credit usage	17.5000
Per second billings	8.7500
Per minute billings	5.0000
Innovations	6.2500
Monthly cost of calling plan	7.5000
Types of credit purchase	6.2500

b) Clustering of the Respondents' Attributes Importance Data

The respondents were examined with conjoint analysis to find out if they form some market segments using clustering procedure. A market segment is a group within which respondents are similar to each other in their responses to various survey tasks and questions but are different from other segments. The results are shown for the segments whose members are similar within and different across segments with respect to their judgments of attributes importance. The groups, private/personal calling plan and the business/commercial calling plan were analyzed separated.

i. *Results of the clustering for the private/personal calling plan*

This group was made up of 160 respondents and the attributes of interest are: calling plan provider, anytime minute availability, night minutes (free night calls), Weekend minutes (free weekend calls), geographical coverage, mobile to mobile minutes (within network), control over credit usage, per second billings, per minute billings, innovations, Monthly cost of calling plan and type of credit purchase.

Each respondent's importance score for each attribute was extracted from the original questionnaires for the 160 respondents in this group and analyzed to isolate clusters or segments which are similar internally. The outcome of the analysis yielded the following nine clusters.

Table 3 : Private/personal calling clusters

Clusters	Cluster Size	Cluster description
1	N=8	The calling plan provider, monthly cost of calling plan
2	N=12	Any minute availability, mobile to mobile minute (same network), per second billings
3	N=13	Night minutes (free night calls)
4	N=15	Weekend minutes (free weekend calls)
5	N=26	Geographical coverage
6	N=21	Control over credit usage
7	N=10	Per minute billings
8	N=14	Innovations
9	N=9	Types of Credit purchase

The cluster sizes show that there are two large clusters which are clusters 5 and 6, geographical coverage and control over credit usage. The smallest cluster is cluster 1, the calling plan provider and monthly cost of calling plan. The result shows that while geographical coverage and control over credit usage are the two largest clusters, the calling plan provider and monthly cost of calling plan are the smallest, in terms of attribute importance.

ii. *Results of the clustering for the business/commercial calling plan*

This group was made up of 40 respondents and the attributes of interest are the same as those of the private/personal calling plan.

Table 4 : Business/commercial calling plan clusters

Clusters	Cluster Size	Cluster description
1	N=2	The calling plan provider, per minute billings, type of credit purchase
2	N=3	Any minute availability, mobile to mobile minute (same network), per second billings, innovations, monthly cost of calling plan
3	N=1	Night minutes (free night calls)
4	N=4	Weekend minutes (free weekend calls)
5	N=5	Geographical coverage
6	N=9	Control over credit usage

The cluster sizes show that the largest cluster is 6, control over credit usage while the smallest is cluster 3, night minutes (free night calls). This result shows that while control over credit usage is the largest cluster, night minutes (free night calls) is the smallest in terms of attributes importance.

IV. Discussion

This study analyzed the process by which Lagos state subscribers of mobile telephone services select their desired services among some available telephone services in the market to meet their personal or corporate needs. The results show that for both calling plans, the subscribers have preference for MTN and Zain among the calling plan providers. They also show preference for unlimited anytime minutes,

unlimited free night calls and free weekend calls, international geographical coverage and complete control over the way they use their credit. Preference was high for per second billings but low for per minute billings. Subscribers under the private /personal calling plan did not show preference for any of the two types of credit purchase namely wholesale and retail. However, the subscribers under the business/commercial calling plan preferred wholesale purchase of credit over purchasing on retail. Among the innovations, subscribers preferred family and friends above the rest. In terms of their relative importance, geographical coverage was the most important to the subscribers under the private /personal calling plan followed by control over credit usage, weekend minutes, anytime minutes, innovations, night minutes, mobile to mobile minutes and per second billings in that order. The calling plan provider had the least importance to this category of subscribers occupying the last position along with monthly cost of calling plan.

To Subscribers under the business/commercial calling plans, control over credit usage was the most important followed by geographical coverage and weekend minutes. Coming next are anytime minutes and per second billings with the same level of importance. After these are mobile to mobile minutes and monthly cost of calling plan also with the same level of importance. Innovations and calling plan providers are next in importance. The least important attribute to this category of subscribers is night minute, that is, free night calls. The result also aligns with Adamu et al (2009) that people are more concerned about the network coverage than other attributes. For the PPP plan the geographical coverage had the highest average importance while for the BCP plan, it was second behind the control over credit usage.

V. Conclusion

This work has considered Lagos State subscribers' trade-offs regarding telephone providers. The Lagos state subscribers show preferences for some mobile telephone services attributes in their choices among the available telephone services in the market. Mobile telephone services providers must include those subscribers' preferences in their service offerings which the results have shown for more satisfied subscribers and better profits. Also, emphasis must be placed on those attributes that are more important to the subscribers. This study should be replicated in the other states of Nigeria to be able to obtain a result that would show the preferences of Nigerian subscribers in terms of mobile telephone services attributes in the country.

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