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An Empirical Study on Consumers Preference for Mobile Telecommunication Attributes in Nigeria

Emmanuel O. Oyatoye[1*], Sulaimon O. Adebiyi[2] and Bilqis B. Amole[2]

[1]Department of Business Administration, University of Lagos, Akoka, Lagos, Nigeria.
[2]Department of Economics and Financial Studies, Fountain University Osogbo, Nigeria.

Authors' contributions

This work was carried out in collaboration among authors. Author EOO designed the study and wrote the first draft of the manuscript. Author SOA performed the statistical analysis and reviewed the entire study for quality and contribution to knowledge. Author BBA performed the preliminary interview that was used for the orthogonal array and conducted significant part of the interview with respondents. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Aims: The study empirically analyzed consumers' preference for mobile telecommunication attributes in Nigeria, using conjoint analysis.
Study Design: Survey design, through 200 dedicated mobile phone users, were conveniently sampled in Yaba and Akoka environs of Lagos State for the conjoint study. They ranked telecommunication services profiles with 18 eighteen combinations, using 1 and 18 to indicate highest and lowest preference, respectively, and different combinations of attributes for their preferences.
Place and Duration of Study: Phone users in Yaba and Akoka environs were interviewed within three months (October 2012 to December 2012).
Methodology: Orthogonal methods were used to design 18 cards that were used for the interview and which were ranked by respondents (phone users). They were then analyzed with the use of ordinary least squares (OLS) regression, with the aid of statistical package for social sciences (SPSS).
Results: The result shows cost attribute, the adjusted part-worths for the low, moderately and high levels, respectively, as follows: -2.396 - 10.204 = -12.600; 12.99 - 10.204 = 2.785; and 10.205 -10.205 = 0 which was consistent with economic theory.

**Corresponding author: Email: eoyatoye@unilag.edu.ng;*

The mobile telecom users in the study area prefer a mobile service with a lower cost to one with a higher cost.
Conclusion: The study concluded that telecom service providers in Nigeria should strive harder to improve services where the customers' preferences lie: affordable service, wide coverage, followed by clarity of call, being the most desirable attributes by consumers, rather than undirected promotional strategies that hardly aid loyalty of customers to their network only while also involving huge costs.

Keywords: Conjoint; preference; telecommunication; products; attributes; part-worths.

1. INTRODUCTION

Telecommunication in Nigeria received a boost in 2001 with the deregulation of the sector, which allowed for private Global System of Mobile communication (GSM) service providers to come into the country to support the existing national operator NITEL. Two private companies, MTN of South Africa and ECONET of Zimbabwe, were licensed by NCC to operate GSM in addition to NITEL, the country's own Telecom Company. These two companies alone increased the mobile telephone line from 300,000 in 2001 to 1,660,000 in 2002. In 2003, another private provider, GLOBACOM, entered the market with its mobile service Glo-mobile [1,2]. Thus, it is fair to say that mobile telecommunication, popularly called GSM, has come to stay after Nigeria had battled with the inefficiency of the only service provider, NITEL, prior to year 2001 consequently, consumers can now choose among multiple service providers, due to the successful deregulation and globalization of the Nigerian telecommunication industry. Nigeria now has five major service providers; Airtel, MTN, Globalcom, Etisalat and the less functional M-tel.

However, in order to meet organizational goals, a firm must determine the needs and wants of its consumers and then deliver products and services that satisfy those needs and wants more efficiently than its competitors [3]. In today's telecommunication industry, with its advances in communication technology, delivering services that appeal to consumers should be easier than in the past. An important task, therefore, is to determine, with some reasonable degree of precision, what consumers want or prefer from telecom service providers' attributes.

The deregulation and expansion of telecommunication products and service offerings have prompted many changes in mobile telecommunication service delivery and have impacted the competition for the hitherto inefficient telecommunication markets in Nigeria. The increased menu of products and services, offered by emerging telecommunication firms, as well as the stiff competition have forced the market participants to evaluate how to differentiate their products and services from those of their competitors. If a telecom firm can determine what is important and what is not important to a customer, such an operator will have the potential to become more competitive by segmenting the market and providing the desired products and services to the segmented customers.

Understanding exactly what modern telecom mobile users require or desire from their service providers is a challenge for many operators. Currently, there is a dearth of literature on the importance which telecom mobile users place on the various attributes involved in the provision of telecommunication services and conjoint analysis can be used to measure such importance, especially in Nigeria.

Conjoint analysis has been found to be useful in estimating the importance of attributes and attribute levels through decomposition of consumers' ranking of alternative attribute combinations. Thus, the main objective of this study is to fill the research gap and, hence, contribute to the literature on consumer preference for telecom attributes and to investigate the attributes that telecom users look for when they desire telecom mobile service, using conjoint analysis.

1.1 Statement of the Problem

In utilizing the vast telecom market available in Nigeria, service providers ventured into promotional activities of several related services, rather than focusing on a specific service targeted at a particular segment of customers. However, in order to justify such a service provision strategy, it is imperative to ascertain that the service, being provided is preferred and desirable by consumers of mobile telecom service. Besides, Kim and others [4] found that consumers' preference is the most important factor in determining business success and the direction of government policy because a fairly large part of the development of IT products has been dominated by the pull of demand, rather than the push of technology.

Therefore, market strategies and policies for promoting the telecommunications industry have to be mapped out, based on consumers' needs and preferences. OECD [2], in their report, emphasize the need for studies that analyze consumers' demands and usage patterns of mobile phones and contents. These have motivated the present research on the subject.

1.2 Brief Literature Review

From the literature, Green and Srinivasan [5,6] opine that conjoint analysis is one of the most popular statistical techniques used in marketing to elicit preference functions at both individual and aggregate levels. Conjoint analysis (CA) is a methodology based on several steps, starting from designing the experiment, collecting data, estimating the model to, finally, using the results for market segmentation or product positioning. The technique has known a wider diffusion in different applicative fields, ranging from trading to health, from agriculture to food industry, among others, since the 1970s.

CA addresses the question of which attributes are important to consumers and how important they really are. When taken in combinations, it is possible to use individual product attributes to describe an entire product line. CA determines the combination of product attributes that consumers most prefer. Conjoint analysis, when applied to product, service, and communications projects, identifies which product and service attributes, or which communications messages are most preferred and are best combined to produce maximum success.

The research into the mathematics of the psychology of conjoint measurement brought about the idea of conjoint analysis. Green and Wind [7] stated that conjoint measurement is "concerned with measuring the joint effect of two or more independent variables on the ordering of a dependent variable. The output of conjoint measurement comprises the simultaneous measurement of the joint effect and separate independent variable contributions to that joint effect, all at the level (asymptotically) of interval scales with common unit."

Green and others [8] opine that "from the standpoint of multi-attribute choice making, conjoint measurement can sometimes be used to decompose overall evaluation into implicit utilities for components of the multi component alternatives". Simply put, conjoint analysis:

I. Identifies the attributes important in a 115 choice decision,
II. Identifies the way the attributes are combined to make the decision, and
III. Determines the utility value, to each of the levels, of each of the attributes considered in the decision.

Green, Wind and Jain [9] further point out that the method of conjoint analysis used represents the different theories of how people choose between multi-attribute alternatives. Conjoint analysis may jointly identify the composition model for decision choices and at the same time estimate the utility value of the attributes that are important in the choice decision. The analysis of choices enables the researcher to predict choice share for different product configurations that may be introduced into the competitive marketplace.

However, in today's rapidly changing market, demand for a product, which determines an enterprise's strategy, is often influenced by customer preferences [10]. Since products and services are closely related to their providers, the product preference can be regarded as the enterprise preference, that is, when a customer decides to consume a given product or service he/she actually has preferred the producer or provider of that specific product or service. In other words, the preference of a product by a customer can be defined along with the concept of brand preference. According to Hellier and others [11], brand preference is the extent to which the customer favours the designated service provided by his or her present company, in comparison to the designated service provided by other companies in his or her consideration set. As Cao and Ramani [12] opined, 'a customers' preferences for a product can be viewed as a reflection of his or her inner world'. Hence, it is the customers' attitudes and perceptions toward a product or company which determine their preferences. Thus, the subject of concern for many business establishments is customers' demands and preferences of different products and services.

2. MATERIALS AND METHODS

This study was carried out in the Yaba and Akoka environs of Lagos State, located in South Western Nigeria. Convenient samples of 200 dedicated mobile phone users were asked to rank 18 attributes according to their own preferences. They were asked to provide demographic information and responses to several survey questions and participate in a conjoint analysis study. For the survey, respondents were asked to assess the importance of the following attributes: cost, customer service delivery, SMS delivery, call quality, and coverage. A preliminary interview of several telecom users revealed that the respondents consider these attributes in their mobile technology usage decision. In the survey, each attribute was rated as: important; not important; and moderately important.

The frequency distribution of responses (Table 1), obtained from respondents, indicate that mobile technology users consider call quality, coverage, cost and customer service as very important attributes and SMS delivery as not important. This finding, however, does not imply the relative importance of attributes of the mobile technology. For example, is coverage the most important attribute because the greatest number of the mobile telecom users said it was very important? If so, how significant is coverage relative to cost or to call quality? If the mobile technology has the desired coverage, will users not mind so much if the call quality is obscure? It might be contended that, if the required information is relative

importance of attributes, then the sampled respondents should have been asked to rank the attributes according to importance. Even though such an approach could produce an ordinal ordering of the attributes, it still could not offer a measure of how important an attribute is, relative to others. Such a measure is valuable because it will allow telecom providers to make strategic decisions related to mobile technology service delivery. Thus, the issue confronting telecom providers who aspire to provide maximum satisfaction to customers is whether to increase coverage and sacrifice call quality, or ensure call quality first and foremost. Will telecom users prefer a telecom provider that has wide coverage to one that has a narrow coverage but clarity of call? The response depends upon knowing how much more important coverage is relative to call quality. This type of information may be obtained with the use of conjoint analysis.

Table 1. Users' rating of importance of telecom service attributes

	Degree of importance			
Attribute	**Important**	**Moderately important**	**Not important**	**Total**
Call quality	156	21	23	200
Coverage	142	39	19	200
Cost	139	44	17	200
Customer service	58	106	36	200
SMS delivery	13	24	163	200

Source: Data Analysis, 2012

2.1 Estimates of Conjoint Analysis

Mobile telecom was described in the conjoint study as having the five attributes that users assessed in the survey: call quality, coverage, cost, customer service, and SMS delivery. Each of these attributes has either two or three levels, as shown in Table 2.

Table 2. Attributes and levels used in mobile technology conjoint study

Attributes	**Levels**
Call quality	Clarity
	Obscurity
Coverage	Wide
	Narrow
	High
Cost	Moderate
	Low
Customer service	Good
	Fair
	Bad
SMS delivery	Fast
	Slow
	Poor

Sources: Authors compiled, 2012

With two attributes, each with two levels, and three attributes, each with three levels, there are 108 possible attribute combinations—a number that may be too large for respondents to evaluate and rank. This constraint was solved by using an experimental design, called an orthogonal array, in which only a subset of the total number of combinations is chosen.

Addelman [13] developed several basic plans for generating orthogonal arrays for different numbers of attributes and their levels. The plan that is suitable to this particular study contains 18 combinations, which are shown in Table 3.

Table 3. Orthogonal array of combinations of telecom attributes

Attributes					
Number	**Call quality**	**Coverage**	**Cost**	**Customer service**	**SMS delivery**
1	Clarity	Wide	High	Good	Fast
2	Clarity	Narrow	High	Good	Slow
3	Obscurity	Wide	High	Good	Poor
4	Obscurity	Narrow	Moderate	Fair	Slow
5	Clarity	Wide	Moderate	Fair	Poor
6	Clarity	Wide	Moderate	Fair	Fast
7	Clarity	Narrow	Low	Bad	Poor
8	Obscurity	Wide	Low	Bad	Fast
9	Clarity	Wide	Low	Bad	Slow
10	Obscurity	Wide	High	Good	Poor
11	Clarity	Narrow	High	Good	Fast
12	Clarity	Wide	High	Good	Slow
13	Clarity	Wide	Moderate	Fair	Fast
14	Obscurity	Wide	Moderate	Fair	Slow
15	Clarity	Narrow	Moderate	Fair	Poor
16	Clarity	Wide	Large	Bad	Slow
17	Clarity	Wide	Large	Bad	Poor
18	Obscurity	Narrow	Large	Bad	Fast

Source: SPSS 20.0 Output

Eighteen stimulus cards were prepared. Each card contained a combination of attributes from the orthogonal array. The 200 respondents were also asked to rank the eighteen combinations, using 1 and 18 to indicate highest and lowest preference, respectively. Ranked data provided by the respondents were analyzed with the use of ordinary least squares (OLS) regression. Several researchers (see Bard, Craig and Boehlje [14]; Wittink and Cattin, [15]) found that OLS is an appropriate estimation method in conjoint analysis. According to Bard et al. [14] conjoint analysis is based on the decomposition approach where respondents react to a set of "total" profile descriptions, and the part-worths for the individual attributes, given some type of composition rule (e.g., an additive one). In other words, an individual's utility for a product or service is decomposed into some combination of part-worth utilities, defined for the relevant characteristics, or attributes, of the product. For a choice alternative, described in terms of a set of characteristics, $Z_K = (Z_1 \ldots Z_k)$, the utility function for an individual is specified in terms of a combination rule, W, and a set of functional forms, w_k (one for each of the attributes) as:

$$W\,(w_1, (z_1) \ldots w_k\,(z_k))$$

According to Bard and others [14], "the combination rule, W for the utility function is generally a choice between additive and quadratic models. While an additive model captures only the main effects of the attributes, the quadratic form additionally captures two-way interaction effects between attributes". The mathematical expression of the utility of the individual product characteristics may take a linear vector form, a quadratic form or a piecewise linear form. The original form of the part-worth model, as earlier established by

previous researchers' is $w_k (z_k) = w_{zk}$. This form appears to be the most flexible for the estimation of a particular utility level for each attribute level.

However, the choice of functional form depends on the relationship between those of a particular attribute at different levels, as a mixture of models across a product's attributes may sometimes be required. Adapting the methodology for conducting conjoint analysis, stated in Green and others [5], there are three basic steps:

- Selection of the preference model (the combination rule or underlying functional form).
- Design of the experiment – this includes identifying the data collection method, and determining the attributes and attribute levels to analyze, the manner in which the product profiles are presented, and the measurement scale of the dependent variable.
- Selection of the estimation method for the part-worth utilities and thus the overall utility.

For this study, the Ordinary Least Square model, used to estimate the part-worths, is specified explicitly as;

$$Y_{im} = \beta_0 + \beta_1 X_{1im} + \beta_2 X_{2im} + \beta_3 X_{3im} + \beta_4 X_{4im} + \beta_5 X_{5im} + \beta_6 X_{6im} + \beta_7 X_{7im} + \beta_8 X_{8im} + \varepsilon_{im}$$

Where

Y_i = rank assigned by the m^{th} respondents
β_0 = intercept

$\beta_{1....}\ \beta_8$ are the parameters to be estimated

X_1 = Call quality
X_2 = Coverage
X_3, X_4 = Cost
X_5, X_6 = Customer service
X_7, X_8 = SMS delivery

The Xs are expressed as dummy variables with the use of effects coding. For the three-level attributes (cost, customer service, and SMS delivery), the coding is (1, - 1) for the first level, (1, 0) for the second level, and (0, 1) for the third level. For the two-level attributes (call quality and coverage), the first and second attributes are coded (- 1) and (1), respectively. For example, for the first combination shown in Table 3 (i.e., clarity, wide, high, good and fast), the predictor variables were specified as follows:

$X_1 = -1$, $X_2 = 1$, $X_3 = -1$, $X_4 = -1$, $X_5 = -1$, $X_6 = 0$, $X_7 = 1$, and $X_8 = 0$.

The specification of the model indicates that average part-worths are to be estimated. This method allows for easy explanation of the basic method of estimating part-worths and interpretation of the conjoint analysis results. Conjoint utilities, or part-worths, are scaled to an arbitrary additive constant within each attribute and are interval data. The arbitrary origin of the scaling within each attribute results from dummy coding in the design matrix. We could add a constant to the part-worths for all levels of an attribute or to all attribute levels in the study, and it would not change our interpretation of the findings. When using a specific kind

of dummy coding, called effects coding, utilities are scaled to sum to zero within each attribute.

3. RESULTS AND DISCUSSION

The results of regression coefficients are shown in Table 4. The part-worths are estimated from the coefficients of the regression results. The derivation of the part-worth for each attribute level is presented in Table 5. Because respondents were asked to rank the various combinations of attributes from 1 to 18, with 1 representing the most preferred combination, the raw part-worth that has the lowest value indicates the most important level of an attribute to the consumer. To make interpretation of the values more intuitively appealing, the estimated part-worths for each attribute were adjusted so that the least-desired level has a part-worth equal to zero, and the most-preferred level has the highest adjusted part-worth.

This was accomplished by getting the absolute value of the difference between each raw part-worth and the part-worth of the least-desired level. To illustrate, for the cost attribute, the adjusted part-worths for the low, moderately and high levels were derived, respectively, as follows: -2.396 - 10.204 = -12.601; 12.99 -10.204 = 2.785; and 10.205 - 10.205 = 0. It may also be seen in Table 5 that, consistent with economic theory, the mobile telecom users in the study area prefer a mobile service with a lower cost to that with a higher cost.

Table 4. Estimated regression coefficients

Variables	Coefficients	Standard error
Constant	6.933*	.323
X1	3.754	2.259
X2	-7.185*	-0.970
X3	6.057*	0.410
X4	3.272	2.285
X5	-1.654*	-0.232
X6	0.012	3.050
X7	8.171*	1.339
X8	-4.185*	1.339

Source: Data Analysis, 2012.
**significant at 5% level.*

Table 5. Attribute-level part- worths

Attributes	Level	Expressed in terms coefficient and level	Estimated part-worths	Adjusted part-worth
Cost	Low	0-3-4	-2.396	12.601
	Moderately	0+3	12.99	2.785
	High	0+4	10.205	0
Customer	Good	0-5-6	8.575	0
service	Fair	0+5	5.279	3.296
	Bad	0+6	6.921	1.654
SMS delivery	Fast	0-7-8	2.947	12.157
	Slow	0+7	15.104	0
	Poor	0+8	2.748	12.356
Call quality	Clarity	0-1	3.179	7.508
	Obscurity	0+1	10.687	0
Coverage	Wide	0-2	14.118	13.866

Source: Data analysis, 2012

The conjoint analysis results confirm the survey findings that consumers do give importance to cost but not comparable to the call quality, at least when cost is within the range of telecom costs normally experienced in the study area at the time of the study. Conjoint analysis reveals, however, that call quality is not as important as may be inferred from the survey results that show call quality as the attribute most often rated as very important by respondents.

Knowledge of the relative importance of attributes and their levels will help telecom mobile service providers in managing their operations. The results show that cost is the critical attribute which reflect the level of economic sustainability of most residents of the study area. This suggests that the telecom mobile service providers' strategic priority in the study area should be to provide affordable service to the consumers in the study area. Ignoring other attributes but cost and coverage, telecom service with a low cost and wide coverage will have a total worth of 15.386 + 14.37 = 29.756. If the consumer is offered instead a service that is affordable but has a narrow coverage, the worth of that service to the consumer is 15.386. There is a loss of 14.37 because of the coverage changes from wide to narrow. If a widely covered, but costly, network service is presented to the consumer, the worth of that apple would be 14.37. There would be a 15.386 decline in worth, compared to the first service rendered because the consumer is getting a service that is widely covered but not affordable. Given these choices, (1) affordable cost and wide coverage, (2) affordable cost and narrow coverage, and (3) narrow coverage and high cost, the consumer would prefer most the first option, and the second option would be preferred over the third.

4. CONCLUSION AND RECOMMENDATIONS

This paper has demonstrated the application of conjoint analysis in assessing the mobile telecommunication service attributes that are important to consumers. Findings from conjoint analysis provide information that may not readily be obtained from sampled respondents on their attribute preferences. Conjoint analysis measures the relative importance of each attribute level. These measures are useful in making production and marketing decisions. The findings of this study show that affordable service, wide coverage, followed by clarity of call, are the most desirable attributes by consumers in the study area. The conjoint analyses results allow telecom firms to make trade-offs in rendering service to consumers and still offer services that provide consumer satisfaction.

Therefore, telecom service providers in Nigeria should focus effort on where customers' preferences lie, affordable service, wide coverage, followed by clarity of call, being the most desirable attributes by consumers, rather than undirected promotional strategies that hardly aid loyalty of customers to their network only while involving huge cost.

Also, service providers in the Nigerian telecom industry should use customers' preferences, as identified in this study, as important to the customer for segmenting the market and providing the desired products and services to the segmented customers in order to become more competitive.

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COMPETING INTERESTS

The authors declare that no competing interests exist.

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