DETERMINANTS OF CUSTOMERS` CHURN DECISION IN THE NIGERIA TELECOMMUNICATION INDUSTRY: AN ANALYTIC HIERARCHY PROCESS APPROACH

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Abstract

This paper describes the application of Analytic Hierarchy Process (AHP) for unraveling customers' motivation for churn of telecommunication network in Nigeria. By identifying, modeling and measuring of customers` churn motivations across four mobile telecommunication service providers in Nigeria. AHP was used to design a hierarchical model of seven criteria for customers` churning of network and investigates the relative priorities of the criteria through a pairwise comparison. The questionnaire were administered through convenient sampling to 480 mobile telecommunication customers and was completed and returned by 438 mobile phone subscribers in Lagos state, Nigeria, but only 408 copies were useful for the analysis of this study. The result shows that six out of the seven criteria have weight above 10% in their individual contribution to motivating customer churn behavior in the Nigeria telecommunication industry. The inefficient data/ internet plan criterion has the highest weight of 18.81% relative to the churn decision. Thus, AHP effectively supported modeling and analyzing subscribers` motivation toward good marketing decision for both the individual and the organization. It helps in developing an analytic and intelligible framework of decision-making on complex problem of customer churn in an emerging market like Nigeria.

Keywords: Customers` Churn; AHP; churn decision; telecommunication; motivation; marketing strategies.

1. Introduction

Telecommunication is one of the prime support services needed for rapid growth of any developing economy (Arora, 2013). In Nigeria, the telecommunication industry received a boost in 2001 with the deregulation (removal of monopoly rights, especially enjoyed by state-owned telecommunication networks) of the sector. The deregulation allows for private Global System of Mobile communication (GSM) service providers to come into the country to support the state owned telecommunication company popularly known as Nigeria Telecommunication (NITEL). Consequently, two private companies ECONET of Zimbabwe and MTN of South Africa were licensed by the National Communications Commission (NCC) to operate GSM in Nigeria. These two companies alone increased the mobile telephone lines from 300,000 in 2001 to 1,660,000 in 2002. In 2003, another private-owned service provider, GLOBACOM, entered the market with its mobile service called the Glo-mobile (OECD report, 2003/2004). For this therefore, the number of mobile-phone subscriptions increased from less than one million in 2001 to over 133 million by November 2014 (NCC reports, 2014).

Thus, mobile telecommunication popularly called GSM was well received by most Nigerians who have been battling with inefficiency of the only one service provider (NITEL) prior to the year 2001. After thirteen years of deregulation and globalisation of Nigeria telecommunication industry, Nigeria currently has five major GSM service providers namely: Airtel, MTN, Globalcom, Etisalat and the less functioning M-tel. Therefore, there are currently options for customers to choose from among multiple service providers and actively exercise their rights of switching from one service provider to another. This right possessed by customer to switch from service provider to another is known as churn. As it applies to this study, churn is explicitly defined as the act of leaving or abandoning a service provider for another. As a result, it become a constant practice among customers/subscribers of mobile telecommunication service providers in Nigeria. Furthermore, Mobile Number Portability (MNP) implementation in April 2013 lends credence to subscribers' right to churn by switching their network providers at will on an average of every six months without losing their original number.

The advent of cheap "china phones" that combine two to three or even up to four subscribers` identity module or subscriber identification module (SIM) cards in a phone, made it possible for most Nigerians to keep an average of two to three SIM cards of different service providers for various reasons that can be best described by each subscriber. As mobile telecommunication service now becomes essential to our daily life, it is observed that subscribers have learnt to keep their mobile phone (s) at arm's length at all times, thus, predicting the reasons why mobile churn seems essential from the perspective of mobile service providers. Since, unguided movement of mobile phone subscribers from one service provider to another is one of the major phenomenon that can make or mar the survival and the profitability of any Mobile telecommunication firm. Thus, the need for research driven policy and strategies on customers` churn decision in the growing Nigeria mobile telecommunication industry cannot be over emphasised.

Although, previous studies appear to have focused on churn prediction itself, using different statistical tools like data mining (Kolajo and Adeyemo, 2012), survival analysis (Van den Poel and Larivie`re, 2004), logistic regression (Kim and Yoon, 2004; Burez and Van den Poel, 2007), most of these seem to have failed to capture churn motivations, which may serve as good indicator for real churn forecasting. This is a major gap that this study intends to fill with Analytic Hierarchy process method.

This study is important because, the annual churn rate of Nigeria mobile telecommunication according to NCC reports, have grown exponentially from 2 percent in

2001 to 48.4 percent in 2007 (Pyramid Research, 2010). This became worrisome, considering the consequences of customers` churn on mobile service providers` profit, cost of operations, loss of revenue, problem of referral, survival in the light fierce competition, and the MNP implementation in April 2013. These and other worrisome statistics trend to make a research on customer churn issues worthwhile.

Moreover, most prior studies used the data or information available in the internal database of the firms (service providers) which mask detailed information about customers switching behaviour and their causes. While data, through Analytical Hierarchy Process (AHP), based questionnaire could provide more information on the reasons for customers` termination of contract with service provider and help to make a better distinction between customers who churn for various reasons that will be supplied through primary source of data collection, it will help stakeholders to link service attributes to subscribers' decisions and make necessary inference. This in a considerable way, formed the basis for data used in AHP analysis. It should also be noted that customer churn is a notorious problem for most industries, since customers are the lifeblood of any organization.

2. Literature Review

AHP is a popular tool for decision-making developed by Saaty (1977, 1980). Since it was released, many individuals and groups in various fields have used the AHP because of its user-friendly interface for multi-criteria decision-making (Vargas, 1990). In the AHP, data from a decision-maker's judgments, known as pairwise comparisons, are aggregated, and the degree of importance of each alternative is quantified in the AHP. This procedure identifies not only the most important alternative, but also the preference for all alternatives for each decision-maker (Oyatoye, Adebiyi and Amole, 2015; Crawford and Williams, 1985). Using the AHP to analyse the decision-making process, therefore, results in a precise clarification of respondents' preferences/motivation for the alternatives (Sato, 2007). Thus, the decision to use it in this study.

The Analytic Hierarchy Process (AHP) is arguably the most well known and widely used multi-criteria method. It has firm theoretical underpinnings and has been used successfully to help people make better decisions in a wide variety of complex circumstances (Golden, Wasli and Harker, 1989; Vaidya and Kumar 2006). A main strength of the AHP is that it is both methodologically sound and user-friendly. Its ease of use is due to a unique combination of design characteristics.

The AHP frames a decision as a hierarchy, an organisational framework many people are already familiar with and easy to explain to those who are not. All inputs consist of comparisons between just two decision elements at a time; pairwise comparisons like these are generally considered to be one of the best ways to elicit judgments from people (Reynolds and Jolly, 1980). The output is easy to understand because it is based on simple scales derived from the pairwise comparisons. Besides, there is in-built measure of consistency in the judgments being made which both checks the reliability of the analysis and reduces the chance of making a procedural mistake. According to Saaty and Kearns (1991), the strength of this approach is that it organizes tangible and intangible factors in systematic way, and provides a structured relatively simple solution to the decision-making problems. In addition, by breaking a problem down into a logical fashion from the larger, descending in gradual steps, to the smaller and smaller, one is able to connect, through simple paired comparison judgments, the small to the large (Lu, Madu, Kuei and Winokur, 1994; Stephen, 1984).

In sum, there are three major concepts behind the AHP, namely: *The AHP is analytic:* Mathematical and logical reasoning for arriving at the decision is the strength of the AHP. It helps to analyse the decision problem on a logical footing and assists on converting decision-

makers' intuition and gut feelings into numbers which can be openly questioned and be explained by others.

The AHP structures the problem as a hierarchy: Hierarchic decomposition comes naturally to human beings. Reducing the complex problem into sub-problems to be tackled one at a time is the fundamental way that human decision-making have worked. Evidence from psychological studies suggests that human beings can compare 7 ± 2 things at a time. Hence, to deal with a large and complex decision making problem such as customer churn motivation, it is essential to break it down as a hierarchy. The AHP allows that.

The AHP defines a process for decision-making: Formal processes for decision-making are the need of the hour. Decisions, especially collective ones, need to evolve. A process is required that will incorporate the decision-maker's inputs, revisions and learning, and communicate them to others so as to reach a collective decision. The AHP has been created to formalize the process and place it on a scientific footing. It also helps in aiding the natural decision-making process. AHP approach is selected in this research to provide an effective tool to the stakeholders for unraveling the motivation for customer churn and measuring the churn drivers in service industry, which in turn, will make insightful contributions to the business world, marketing and operations research literature. Therefore, the AHP should be applied to churn decisions of subscribers.

3. Methodology

Churning network provider in order to choose the most proffered telecommunication network provider is a complex problem requiring a multi-criteria decision analysis technique, so as to consider the factors holistically (criteria and alternatives) that motive customer churning behaviour. The Analytical hierarchy process was employed in this study in order to structure and simplify the complex problem, bring it to a condition, which is more easily understood. More importantly, the criteria weights and scores are based on pairwise comparisons of criteria and alternatives, respectively, using a ratio scale of measurement. In order to achieve the objectives of this study, survey research designed was found most appropriate and suitable due to the fact that surveys inquiry is about people`s attitude, lifestyles, behaviour, perception and problems (Leary, 2001). The survey is in two stages, first is the observation experiment through focus group discussion (FGD), consisting of fifteen subscribers in four groups who discussed extensively on the drivers of customer` churn in the telecommunication industry. The result of the FGD was used in the second stage for building the hierarchical model and drawing an AHP based questionnaires. The questionnaires were designed to enable each subscribers` to compare the relative importance of each driver to subscribers` decision to churn a network provider for the criteria, while the alternatives at the third level were equally pairwise to determine the relative importance of sub-criteria to each driver (criteria) of churn in the Nigeria telecommunication market. Eighty (80) copies of the questionnaires were administered using convenient sample in each of the six locations within Lagos state, corresponding to the administrative division of Lagos. The area includes Yaba, Ikorodu, Epe Badagry and Ikeja. Out of the total of 480 questionnaire administered, four hundred and eight (408) were properly filled and found suitable for the AHP analysis.

The AHP analysis was done using Microsoft Excel software by calculating the weight of the criteria and alternatives. The process of analysis using AHP method involved two stages as follows (Taylor III, 2002):

i. First Stage: build hierarchical model for Motivation for customer churn decision in the Nigerian telecommunication industry: (a) Establishing the pair-wise comparison matrix for each decision alternative for each criterion; (b) Synthesization; (c)

Establishing the pair-wise comparison matrix for each criteria; (d) Establishing the normalized matrix; (e) Establishing the preference vector; (f) Calculating overall values for each decision alternative; and (g) Determining the rank of alternatives according to the values that have been acquired in the previous stage.

ii. Second Stage: Test of Consistency: After analyzing the data by using the AHP method, the result of the selection process must be tested for consistency. The test of consistency was carried out using the following formulas and the table 1.

$$CI = [\lambda_{max} - n]/(n - 1) \quad (3.1)$$

where $\lambda_{max}=\Sigma w_i c_i$

After acquiring Consistency Index (CI), the next step is calculating Consistency Ratio (CR) by using the formula

$$CR = CI/RI \quad (3.2)$$

where n is the number of items compared; W_i is the weight; C_i is the sum along the column; CR is the consistency ratio; CI is the consistency index; and RI is the random consistency index.

The Random Consistency Index (RI) can be observed in Table 1 as follows:

Table1 – Random Index

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R.I.	0	0	0.58	0.90	1.12	1.25	1.32	1.41	1.45	1.49	1.54	1.48	1.56	1.57	1.59

Adapted from Saaty, (2000)

If CR ≥ 10%, the data acquired is inconsistent, otherwise (CR < 10%) the data acquired is consistent. The results obtained from the above procedure were reported under results and discussion section of this paper.

AHP Customer Churn model

Level 1 The Goal: Determinant of customer churn decision in Nigerian telecommunication industry.

Level 2 The Criteria: Unwanted calls/SMS; dispute in billing; mobile number portability (MNP); frequency of promotions/bonuses by competitors; poor inter/intra connectivity; inefficient data plan; and poor complaint management.

Level 3 The Alternatives: The components of each customer churn drivers formed the alternatives, the alternative of unwanted calls/SMS are frequently receiving irrelevant texts and irrelevant calls from the network operator. For dispute in tariff; short-change in service charge and charges for service(s) not rendered by network operator are the alternatives. Easiness of MNP and competition brought by MNP are the alternatives of MNP as a driver for customer churn while frequency of promotion has competitors' frequent promos, bonuses on calls/SMS/data plan by competitor and poor/dubious promos of present operator as its alternatives. Poor intra/inter connectivity has its alternatives as difficulties in making calls/sending SMS to same network and that of other network while inefficient data plan has

sufficient with high cost and insufficient with low cost data plan as its alternatives. The last driver (poor complaint management), has the following as its alternative; service agent non-willing to resolve customer challenges, non-response and service agent being elusive. Thus, the hierarchical model is presented in Figure 1.

4. Results and discussion

4.1 Respondents reduced matrices for customer churn decision

The values found in the last column of table 2 denoted by weight, also known as eigenvector, have a direct physical meaning in AHP. They determine the participation or weight of those criteria relative to the total results of the goal. Considering the criteria stated for the determinant of customer churn in the Nigeria telecommunication industry, inefficient data/ internet plan criterion has a weight of 18.81% relative to the total goal, which states the determinant of customer churn. A positive evaluation on this factor contributes approximately twice more than a positive evaluation on the mobile number portability implementation criterion (9.73%). Following the procedure of AHP, there is need to check for data inconsistencies. The main objective is to capture enough information that will help to determine whether the customers have been consistent in their choices. The inconsistency index is based on maximum lambda, which is calculated by summing the product of each element in the eigenvector (weight), by the respective column total of the original comparison matrix. Table 4.2 demonstrates the calculation of the maximum eigenvalue also called maximum lambda (λ_{Max}).

In order to verify that the consistency index (CI) is adequate, Saaty (2000) suggests what is called consistency ratio (CR) which is determined by the ratio between the consistency index and random consistency index (RI). The matrix will be considered consistent if the result of the ratio is less than 10%. The random index value is fixed and is based on the number of evaluated criteria as shown in table 1.

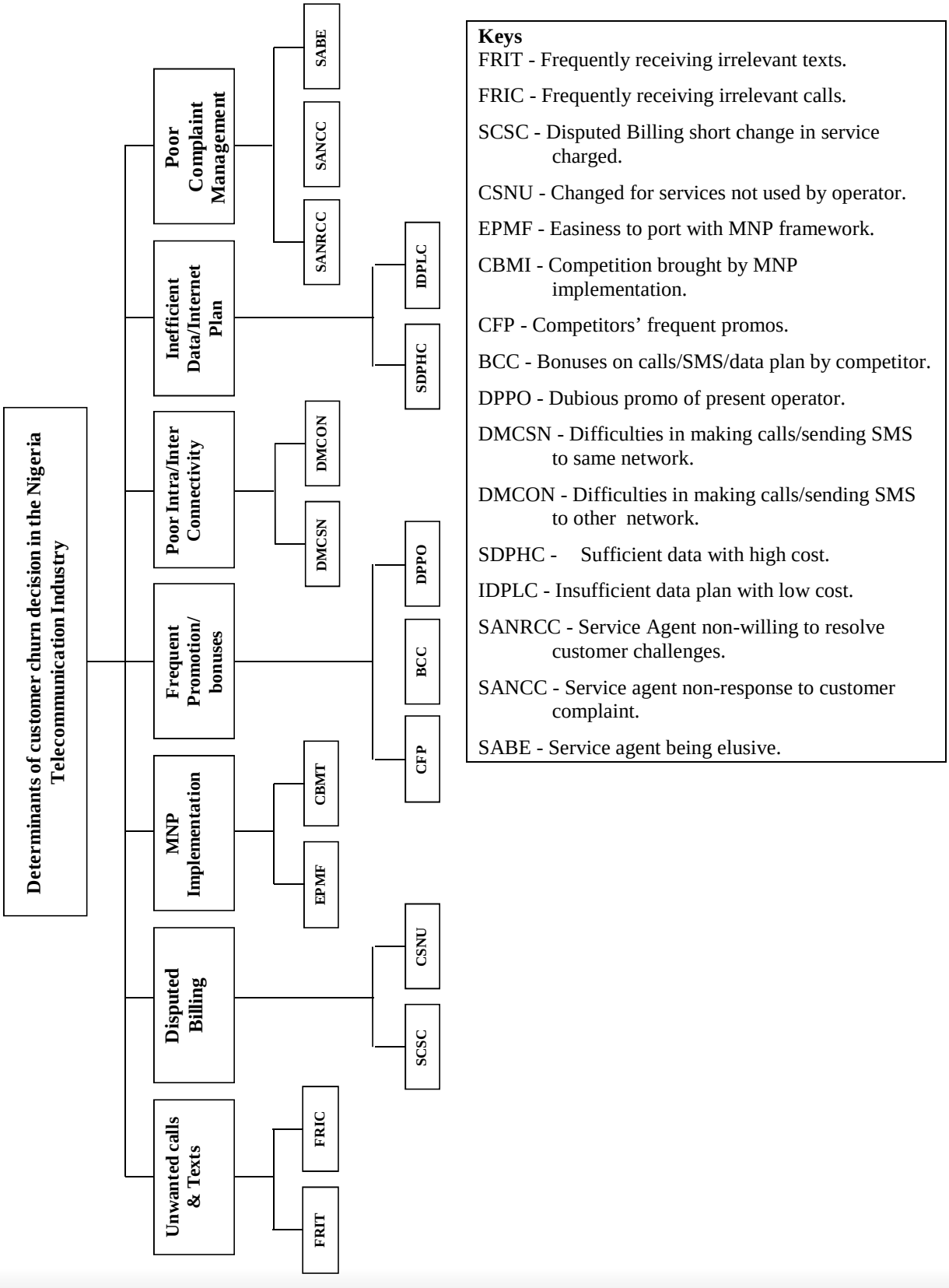
In the case of the determinant of customers` churn decision criteria, the consistency rate for the initial group criteria is:

$$CR = \frac{CI}{RI} = 0.0320/\ 1.32 = 0.0242 < 3\%$$

Since its value is less than 10%, the matrix is considered to be consistent.

Therefore, considering the eigen vector values / priority weight of determinant of customers churn decision criteria, it is evident that inefficient data/ internet plan criteria have contributed 18.81% to the goal, while mobile number portability implementation criterion contributes (9.73%) to the goal (determinant of customers` churn decision in the Nigeria telecommunication industry).

Figure 1 – Proposed hierarchical model for customers` churn decision in the Nigeria mobile telecommunication



Source: AHP model developed by Researchers (2014)

Table 2 – Reduced matrix for determinant of customers churn criteria in the Nigeria Telecommunication Industry

Decision Criteria	Unwanted calls & Texts	Disputed Billing	MNP Implementation	Frequent Promotion / bonuses	Poor Intra/Inter Connectivity	Inefficient Data/Internet Plan	Poor Complaint Management	Weight		
Unwanted calls & Texts	1.0000	1.1723	1.9663	1.0900	0.5000	0.5391	1.0217	0.1338	λ_{max}	**7.1919**
Disputed Billing	0.8530	1.0000	1.9593	1.3549	1.1181	0.7115	1.5191	0.1596	CI	0.0320
MNP Implementation	0.5086	0.5104	1.0000	0.9532	0.6151	0.7162	0.6938	0.0973	CR	0.0238
Frequency of Promotion/Bonuses	0.9174	0.7380	1.0491	1.0000	1.0766	0.8944	1.5675	0.1397		
Poor Intra/Inter Connectivity	2.0000	0.8944	1.6258	0.9288	1.0000	1.1277	2.0693	0.1799		
Inefficient Data/Internet Plan	1.8549	1.4055	1.3962	1.1181	0.8868	1.0000	2.4151	0.1881		
Poor Complaint Management	0.9788	0.6583	1.4414	0.6379	0.4833	0.4141	1.0000	0.1016		

Table 3 – Calculation of the maximum eigenvalue of the seven criteria about determinant of customer churn in Nigeria telecommunication industry

Criteria	Unwanted calls & Texts	Dispute billing	MNP Implementation	Frequency of promotion and bonuses	Poor Inter/Intra connectivity	Inefficient data/internet plan	Poor complaint Management
Eigen vector/priority weight	0.1338	0.1596	0.0973	0.1397	0.1799	0.1881	0.1016
Column sum	8.1127	6.3789	10.4381	7.0829	5.6799	5.403	10.2865

Maximum eigenvalue/(λ_{Max}): (0.1338*8.1127) + (0.1596*6.3789) + (0.0973*10.4381) + (0.1397*7.0829) + (0.1799*5.6799) + (0.1881*5.403) + (0.1016*10.2865) = 7.1919

The test for consistency of churn decision criteria is calculated using the formula below:

$CI = (\lambda_{Max}-n)/(n-1)$

CI = (7.1919-7) / 7-1

= 0.1919/6 = 0.0320

Table 4 – Reduced matrix for unwanted calls & texts alternatives

Unwanted calls and Texts	Frequently receiving irrelevant texts	Frequently receiving irrelevant calls	Weight	λ_{max} =	2.0000
Frequently receiving irrelevant texts	1.0000	4.3282	0.8123	CI =	0.0000
Frequently receiving irrelevant calls	0.2310	1.0000	0.1877	CR =	0.0000

Table 5 – The calculation of the maximum eigenvalue for unwanted calls and texts alternatives

Decision Alternative of Unwanted calls and Texts	Frequently receiving irrelevant texts	Frequently receiving irrelevant calls
Eigen vector/priority weight	0.8123	0.1877
Column sum	1.2310	5.3282
Maximum Eigen Value (λmax)	λ_{max} = { (0.8123*1.2310)+(0.1877*5.3282)}= = 1.0000 +1.0001 = 2.0000	

In considering the decision alternatives of unwanted calls/text criteria, the eigenvector priority weight was computed and shows the contribution of each decision alternatives in relation to unwanted calls/texts criteria. Based on the decision alternatives of unwanted calls/text, frequently receiving irrelevant text (FRIT) has a weight of 81.23% relative to unwanted calls/text criteria. A positive evaluation on this factor contributes approximately 4 (four) times more than a positive evaluation on frequently receiving irrelevant calls alternative (18.77%). Following the procedure of AHP, there is need to check for data inconsistencies. The main objective is to capture enough information to determine whether the customers have been consistent in their choices. The inconsistency index is based on maximum lambda, which is calculated by summing the product of each element in the eigenvector (weight), by the respective column total of the original comparison matrix. Table 5 demonstrates the calculation of the maximum eigenvalue also called maximum lambda (λ_{Max}).

The test of consistency is done using the formula below

$$CI = (\lambda_{Max}-n)/(n-1)$$
$$CI = (2.000-2)/2 -1$$
$$= 0/1 = 0.0000.$$

In verifying that the consistency index is adequate, Saaty (2000) suggests what is called consistency ratio (CR) which is determined by the ratio between the consistency index and random consistency index (RI). The matrix is considered consistent if the ratio is less than 10%. The random index value is fixed and is based on the number of evaluated criteria as shown in table 1 in chapter three. In the case of the decision alternative of unwanted calls and texts, the consistency rate for the initial group criteria is

$$CR = \frac{CI}{RI} = 0.00$$

Since its value is less than 10% the matrix is considered to be consistent.

Therefore, considering the eigen vector values / priority weight of decision alternatives of unwanted calls/text, it is evident that frequently receiving irrelevant texts alternative have contributed 81.23% to the unwanted calls/text criteria, while frequently receiving irrelevant calls alternative contributes 18.77% in customers decision to churn a network provider. Thus, frequently receiving unsolicited texts messages from network provider can influence customers' decision to churn more than irrelevant calls. Subscribers are more uncomfortable with frequent irrelevant text messages from services provider.

Table 6 – Reduced matrix of dispute billing alternatives

Dispute Billing	Short-change in service charged	Charged for services not used by operator	Weight	λ_{max} =	2.0000
Short-change in service charged	1.0000	1.1861	0.5426	CI =	0.0000
Charged for services not used by operator	0.8431	1.0000	0.4574	CR =	0.0000

Considering the decision alternatives of dispute billing criteria, the eigenvector / priority, weight was calculated, and shows the contribution of each decision alternatives in relation to dispute billing criteria. Based on the decision alternatives of dispute billing, short change in service charged (SCSC) has a weight of 54.26% on disputed billing criteria. A positive evaluation of this factor contributes approximately one (1) more than a positive evaluation on charge for services not used by operator alternative (45.74%). Following the procedure of AHP, there is need to check for data inconsistencies. Checking for data inconsistencies as before, Table 7 presents the computation of the maximum eigen value (λ_{Max}), after which the consistency ratio is calculated as usual.

Table 7 – The calculation of the maximum eigenvalue for disputed billing alternatives

Disputed Billing criteria	Short-change in service charged (SCSC)	Charged for services not used by operator
Eigen vector/ priority weight	0.5426	0.4574
Total sum	1.8431	2.1861
Maximum Eigenvalue/(λ_{Max})	(0.5426*1.8431) + (0.4574*2.1861) = 2.0000	

The test of consistency is calculated using the formula below:

$CI = (\lambda_{Max}-n)/(n-1)$
$CI = (2.000-2)/2 -1$
$= 0/1 = 0.0000$

As shown in earlier computations, the consistency ratio of disputed billing criteria, using the initial group criteria is:

$$CR = \frac{CI}{RI} = 0.00$$

Since the CR value is less than 10%, the matrix is considered to be consistent.

Therefore, in considering the eigen vector values / priority weight of decision alternatives of disputed billing, it is evident that short-change in service charged (SCSC) alternative have

contributed 54.26% to the disputed billing criteria, while charging customers for services not used by operator alternative, contributes 45.74% to disputed billing criterion.

Table 8 – Reduced matrix for mobile number portability alternatives

Mobile Number Portability (MNP)	Easiness to port with MNP framework	Competition brought by MNP implementation	Weight	λ_{max} = 2.0000
Easiness to port with MNP framework	1.0000	1.6542	0.6232	CI = 0.0000
Competition brought by MNP implementation	0.6045	1.0000	0.3768	CR = 0.0000

Considering the decision alternatives of MNP implementation criteria, the eigenvector / priority weight was calculated, and shows the contribution of each decision alternatives in relation to MNP implementation criteria. Based on the decision alternatives of mobile number portability implementation, easiness to port with MNP framework has a weight of 62.32% with regards to MNP implementation criteria. A positive evaluation of this factor contributes approximately twice more than a positive evaluation of competition brought by MNP implementation alternative, which has a weight of 37.68%. Following the procedure of AHP, there is need to check for data inconsistencies. As has been done in previous analyses, the inconsistency index is computed as shown in Table 9.

Table 9 – The calculation of the maximum eigenvalue for MNP alternatives

Mobile Number Portability Implementation criteria	Easiness to port with MNP framework	Competition brought by MNP implementation
Eigen vector/ priority weight	0.6232	0.3768
Total sum	1.6045	2.6542
Maximum Eigenvalue/(λ_{Max})	(0.6232*1.6045) + (0.3768*2.6542) = 2.0000	

The test of consistency is calculated by using the formula below:

$CI = (\lambda_{Max}-n)/(n-1)$
$CI = (2.000-2)/2 -1$
$= 0/1 = 0.0000$

Thus, in the case of the mobile number portability implementation criteria, the consistency rate for the initial group criteria is

$$CR = \frac{CI}{RI} = 0.00$$

CR which is less than 10%, indicates that the matrix is consistent.

Therefore, in considering eigen vector values / priority weight of decision alternatives of mobile number portability implementation, it is evident that easiness to port with MNP framework alternative have contributed 62.32% to the mobile number portability

implementation criteria. However, competition brought by MNP implementation alternative contributes 37.68% to the mobile number portability implementation criterion.

Table 10 – Reduced matrix for frequent promotions/ bonuses alternatives

Frequent Promotion/ bonuses	Competitor' frequent promos	Bonuses on calls/SMS/data plan by competitor	Dubious promo of present operator	Weight			
Competitors' frequent promos	1.0000	1.1397	1.0582	0.3518	λ_{max}	=	3.0347
Bonuses on calls/SMS/data plan by competitor	0.8774	1.0000	1.6149	0.3710	CI	=	0.0174
Dubious promo of present operator	0.9450	0.6192	1.0000	0.2772	CR	=	0.0299

Considering the decision alternatives of frequent promotions/ bonuses criteria, the eigenvector priority weight was calculated and shows the contribution of each of the decision alternatives in relation to frequent promotions/ bonuses criteria. Based on the decision alternatives of frequent promotions/ bonuses, bonuses on calls/SMS/data plan by competitor has a weight of 37.10% of frequent promotions /bonuses criteria. A positive evaluation of these factors contributes approximately twice more than a positive evaluation of dubious promo of present operator alternative (27.72%).

Table 11 – The calculation of the maximum eigenvalue for frequent promotions/ bonuses by competitors' alternatives

Frequent promotion /bonuses	Competitors' frequent promos	Bonuses on calls/SMS/data plan by competitor	Dubious promo of present operator
Eigenvector/ priority weight	0.3518	0.3710	0.2772
Total sum	2.8224	2.7589	3.6731
Maximum Eigenvalue/(λ_{Max})	(0.3518*2.8224) + (0.3710*2.7589) + (0.2772*3.6731) = 3.0347		

The test of consistency was calculated as follows:

$CI = (\lambda_{Max}-n)/(n-1)$
$CI = (3.0347-3) / 3 - 1$
$= 0.0347 / 2 = 0.0174$

In the case of the frequent promotion/bonuses criteria, the consistency rate for the initial group criteria is

$$CR = \frac{CI}{RI} = 0.0174/ 0.58$$
$$= 0.0299 < 3\%$$

Since CR value is less than 10%, the matrix is consistent.

Therefore, in considering the eigen values / priority weight of decision alternatives of frequent promotion/bonuses, it is evident that bonuses on calls/SMS/data plan by competitor alternative have contributed 37.10% to the frequent promotion/bonuses criteria, while dubious promo of present operator alternative contributes 27.72% to frequent promotion/bonuses criterion.

Table 12 – Reduced matrix of poor inter/intra connectivity alternatives

Poor Intra/Inter Connectivity	Difficulties in making calls/sending SMS to same network	Difficulties in making calls/sending SMS to other network	Weight	λ_{max} = 2.0000
Difficulties in making calls/sending SMS to same network	1.0000	2.8338	0.7392	CI = 0.0000
Difficulties in making calls/sending SMS to other network	0.3529	1.0000	0.2608	CR = 0.0000

Considering the decision alternatives of poor inter/intra connectivity criteria, the eigenvector priority weight was computed and shows the contribution of each of the decision alternatives in relation to poor inter/intra connectivity criteria. Based on the decision alternatives of poor inter/intra connectivity, difficulties in making calls/sending SMS to same network have a weight of 73.92% on poor inter/intra connectivity criteria. A positive evaluation of this factor contributes approximately thrice more than a positive evaluation of difficulties in making calls/sending SMS to other network alternative (26.08%).

Table 13 – The calculation of the maximum eigenvalue for poor inter/intra connectivity alternatives

Poor inter/intra connectivity criteria	Difficulties in making calls/sending SMS to same network	Difficulties in making calls/sending SMS to other network
Eigenvector/ priority weight	0.7392	0.2608
Total sum	1.3529	3.8338
Maximum Eigenvalue/(λ_{Max})	(0.7392*1.3529)+(0.2608*3.8338) = 2.0000	

The test of consistency was calculated as follows:

$CI = (\lambda_{Max}-n)/(n-1)$

$CI = (2.000 - 2)/2 - 1$

$= 0/1 = 0.0000$

In the case of the poor inter/intra connectivity criteria, the consistency rate for the initial group criteria is:

$$CR = \frac{CI}{RI} = 0.00$$

Since CR value is less than 10%, the matrix is considered to be consistent. Thus, in considering the eigen values/priority weight of decision alternatives of poor inter/ intra connectivity, it is evident that difficulties in making calls/sending SMS to same network alternative have contributed 73.92% to the mobile number portability implementation criterion, while, difficulties in making calls/sending SMS to other network alternative contribute 26.08% to the poor inter/intra connectivity criterion.

Table 14 – Reduced matrix of inefficient data/ internet plan criteria

Inefficient Data/Internet Plan	Sufficient data with high cost	Insufficient data plan with low cost	Weight	λ_{max} = 2.0000
Sufficient data with high cost	1.0000	2.7231	0.7314	CI = 0.0000
Insufficient data plan with low cost	0.3672	1.0000	0.2686	CR = 0.0000

Considering the decision alternatives of inefficient data/ internet plan criteria, the eigenvector priority weight was calculated and shows the contribution of each decision alternative in relation to inefficient data/ internet plan criteria. Based on the decision alternatives of inefficient data/ internet plan, sufficient data with high cost have a weight of 73.14% of inefficient data/internet plan criteria. A positive evaluation of this factor contributes approximately thrice (3 times) more than a positive evaluation of insufficient data plan with low cost alternative (26.86%).

Table 15 – The calculation of the maximum eigenvalue for inefficient data/ internet plan alternatives

Inefficient data/internet plan	Sufficient data with high cost	Insufficient data plan with low cost
Eigen vector/ priority weight	0.7314	0.2686
Total sum	1.3672	3.7231
Maximum Eigenvalue/(λ_{Max})	(0.7314*1.3672) + (0.2686*3.7231) = 2.0000	

The test of consistency is done using the formula below:

$CI = (\lambda_{Max}-n)/(n-1)$
$CI = (2.000-2)/2 -1$
$= 0/1 = 0.0000$

In the case of the inefficient data/internet plan criteria, the consistency rate for the initial group criteria is:

$$CR = \frac{CI}{RI} = 0.00$$

Since the value of the CR is less than 10%, the matrix is considered to be consistent. Therefore, in considering the eigen values / priority weight of decision alternatives of inefficient data/internet plan, it is evident that sufficient data plan with high cost alternative have contributed 73.14% to the inefficient data/ internet plan criteria, while inefficient data plan with low cost alternative contributes 26.86% to the inefficient data/internet plan criteria.

Table 16 – Reduced matrix of Poor Complaint Management

Poor Complaint Management	Service Agent non-willing to resolve customer challenges	Service agent non-response to customer complaint	Service agent being elusive	Weight		
Service Agent non-willing to resolve customer challenges	1.0000	2.2423	2.0880	0.5146	λ_{max} =	3.0394
Service agent non-response to customer complaint	0.4460	1.0000	1.6229	0.2784	CI =	0.0197
Service agent being elusive	0.4789	0.6162	1.0000	0.2069	CR =	0.0339

Considering the decision alternatives of poor complaint management criteria, the eigenvector priority weight was calculated and shows the contribution of each decision alternative in relation to poor complaint management criteria. Based on this decision alternatives of poor complaint management, service agent non-willingness to resolve customer challenges have a weight of 51.46% with regards to poor complaint management criteria. A positive evaluation on this factor contributes approximately thrice more than a positive evaluation of service agent being elusive alternative (20.69%).

Table 17 – The calculation of the maximum eigenvalue for poor complaint management alternatives

Poor complaint management	Service Agent non-willing to resolve customer challenges	Service agent non-response to customer complaint	Service agent being elusive
Eigen vector/ priority weight	0.5146	0.2784	0.2069
Total sum	1.9249	3.8585	4.7109
Maximum Eigenvalue/(λ_{Max})	(0.5146*1.9249) + (0.2784*3.8585) + (0.2069*4.7109) = 3.0394		

The test of consistency is calculated below:

$CI = (\lambda_{Max}-n)/(n-1)$
$CI = (3.0394-3)/3 -1$
$= 0.0394/2 = 0.0197$

In the case of the poor complaint management criteria, the consistency rate for the initial group criteria is

$$CR = \frac{CI}{RI} = 0.0197/0.58$$
$$= 0.0339 < 4\%$$

Again since the CR value is less than 10%, the matrix is considered to be consistent. Therefore, in considering eigen vector values / priority weight of decision alternatives of poor complaint management, it is evident that service agent non-willingness to resolve customer challenges alternative contributed 51.46% to the poor complaint management criteria, while service agent being elusive alternative contributes 20.69% to poor complaint management criteria.

Table 18 shows the priorities of the criteria with respect to the main goal which is to determine reasons for customers leaving a particular network provider to another network provider in the Nigeria telecommunication industry. Based on the views of the customers, the most critical determinant factor for leaving a network provider to another network provider is inefficient data/internet plan with priority 0.1881, followed by poor inter/intra connectivity with priority 0.1799, dispute in billing with priority 0.1569, frequent promotion/ bonuses with priority 0.1397, unwanted calls/ texts with priority 0.1338, and poor complaint management with priority 0.1016, while the least determinant factor is the MNP implementation with priority 0.0973.

Table 18 – Composite priorities of the criteria about Goal

Goal: determinants of customer churn in Nigeria Telecommunication industry	Unwanted calls/ texts	Dispute billing	MNP Implementation	Frequent promotion/ bonuses	Poor inter/intra connectivity	Inefficient data/ internet plan	Poor complaint management
Pooled Average Composite Priority	0.1338	0.1569	0.0973	0.1397	0.1799	0.1881	0.1016
Relative Preference Ranking	5th	3rd	7th	4th	2nd	1st	6th

The horizontal bar chart in figure 2 represents the pictorial diagram of decision criteria where the horizontal bar length is the priority of each criterion. From the chart, inefficient data plan/ internet plan has the longest bar with priority of 0.1881, followed by poor inter/ intra connectivity with priority of 0.1799, dispute billing with priority of 0.1596, frequent promotion and bonuses with priority of 0.1397, unwanted calls and texts with priority of 0.1338 and poor complaints management with priority of 0.1016 while the MNP implementation has the shortest bar with priority of 0.0973.

Figure 2 – Bar chart showing decision criteria with their corresponding priority.

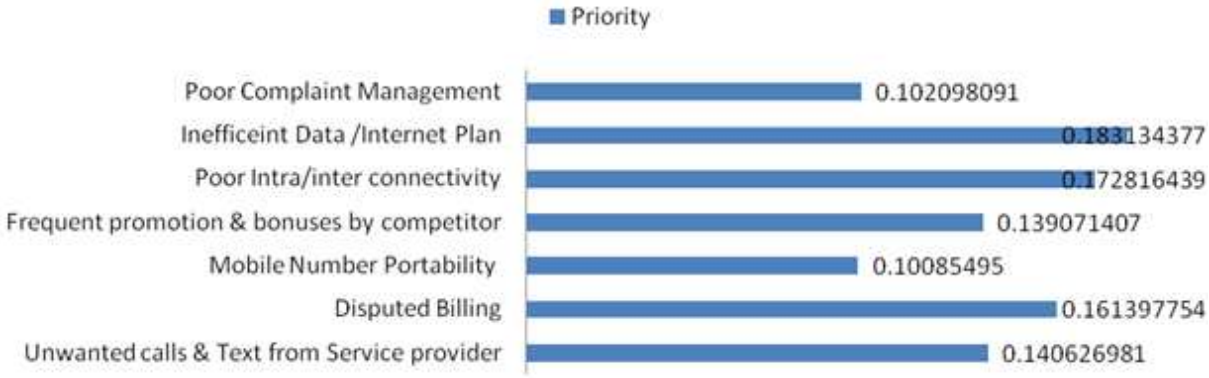


Table 19 reveals the customers perception with regards to the decision alternatives of unwanted calls/texts using the composite priorities. This criterion has only two alternatives in this study. Customers` mostly detest frequently receiving irrelevant texts (FRIT) with priority 0.8123 than frequently receiving irrelevant calls (FRIC) with priority of 0.1877.

Table 19 – Composite priorities of the decision alternative about unwanted calls/ texts

Decision alternative with regards to unwanted calls/ texts	Frequently receiving irrelevant text (FRIT)	Frequently receiving irrelevant calls (FRIC)
Pooled Average Composite priority	0.8123	0.1877
Relative preference ranking	1	2

The horizontal bar chart in figure 3 represents the pictorial diagram of decision alternatives of unwanted calls/text where the horizontal bar length is the priority of each criterion. From the chart, frequently receiving irrelevant texts has the longest bar with priority of 0.8123, compared to frequently receiving irrelevant calls with priority of 0.1877.

Figure 3 – Bar chart showing decision alternatives of unwanted calls/texts

Table 20 reveals subscribers` perception about the decision alternatives of dispute billing using the composite priorities. Subscribers mostly preferred disputed billing short change in service charge with priority of 0.5426 compared to charged for services not used by the operators with priority of 0.4574.

Table 20 – Composite priorities of the decision alternative about dispute in billing

Decision alternative with regards to dispute billing	Disputed billing short change on service charge	Charged for services not used by operator
Pooled Average Composite priority	0.5426	0.4574
Relative preference ranking	1	2

The horizontal bar chart in figure 4 represent the pictorial diagram of decision alternatives of dispute billing where the horizontal bar length is the priority of each criterion. From the bar chart, one observes that disputed billing in short change of service charged has the longest bar with priority 0.5426 compared to charge for services not used by operator with priority 0.4574.

Figure 4 – Bar chart showing decision alternatives of disputed billing

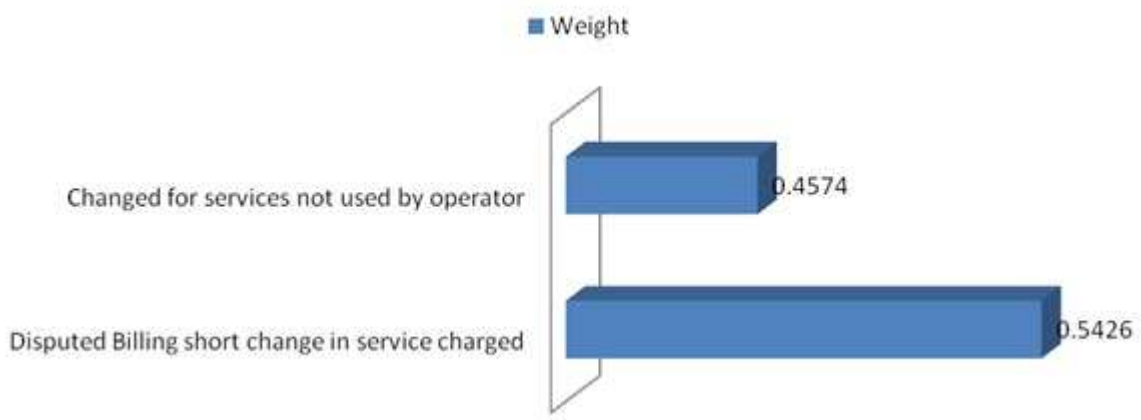


Table 21 reveals the customers perception about the decision alternatives of MNP implementation using the composite priorities. The customers mostly preferred easiness to port with MNP framework, with a priority of 0.6232, compared to competition brought by MNP framework with priority of 0.3768.

Table 21 – Composite priorities of the decision alternative about MNP Implementation

Decision alternative with regards to MNP implementation	Easiness to port with MNP framework	Competition brought by MNP implementation
Pooled Average Composite priority	0.6232	0.3768
Relative preference ranking	1	2

The horizontal bar chart in figure 5 represents the pictorial diagram of decision alternatives of MNP implementation where the horizontal bar length is the priority of each criterion. From the chart, easiness to port using MNP framework has the longest bar with priority of 0.6232, compared to competition brought by MNP implementation with priority of 0.3768.

Figure 5 – Bar chart showing decision alternatives of MNP implementation

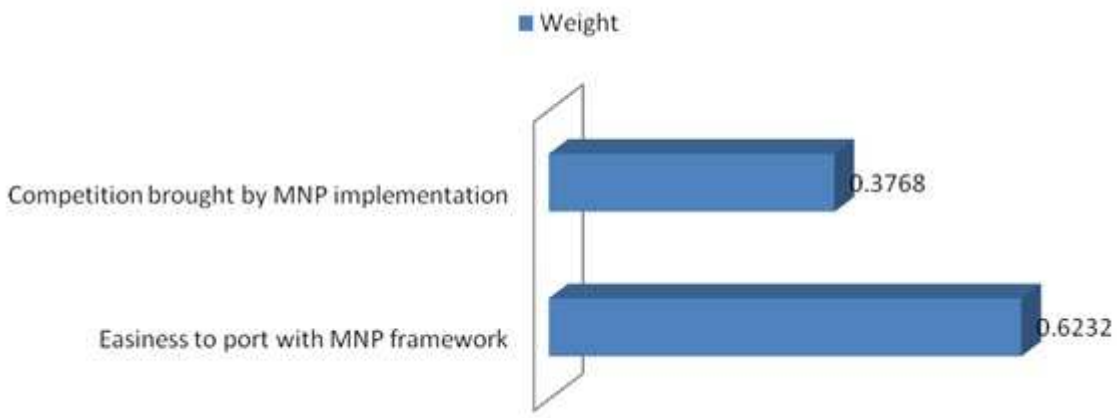


Table 22 reveals the customers perception about the decision alternatives of frequent promotions/ bonuses using the composite priorities. This criterion has three alternatives in this study. The customers mostly preferred bonuses on calls/SMS/data plan by competitors with priority of 0.3710, followed by competitor's frequent promos with priority of 0.3518 and the least preferred is dubious promo of present operator with priority of 0.2772.

Table 22 – Composite priorities of the decision alternative about frequent promotions/ bonuses

Decision alternative with regards to frequent promotions/ bonuses	Competitors' frequent promos	Bonuses on calls/SMS/ data plan by competitors	Dubious promo of present operator
Pooled Average Composite priority	0.3518	0.3710	0.2772
Relative preference ranking	2	1	3

The horizontal bar chart in figure 6 represents the pictorial diagram of decision alternatives of frequent promotions and bonuses where the horizontal bar length is the priority of each criterion. As the chart indicates, bonuses on calls/SMS/data plan by competitors has the longest bar with priority of 0.3710 followed by competitors` frequent promotion with priority of 0.3518, while dubious promotion by present operators has the shortest bar length with priority of 0.2772.

Table 23 reveals the customers perception about the decision alternatives of poor inter/ intra connectivity using the composite priorities. The customers are mostly disturbed by difficulty in making calls/sending SMS to same network with priority of 0.7392 compared to difficulties in making calls/SMS to other network with priority of 0.2608.

The horizontal bar chart in figure 7 stand for the pictorial diagram of decision alternatives of poor inter/intra connectivity where the horizontal bar length is the priority of each criterion. As the chart shows, one observes that difficulties in making calls/sending SMS to the same network has the longest bar with priority of 0.7392, compared to difficulties in making calls/sending SMS to other network with priority of 0.2608.

Figure 6 – Bar chart showing decision `alternative of frequent promotions and bonuses

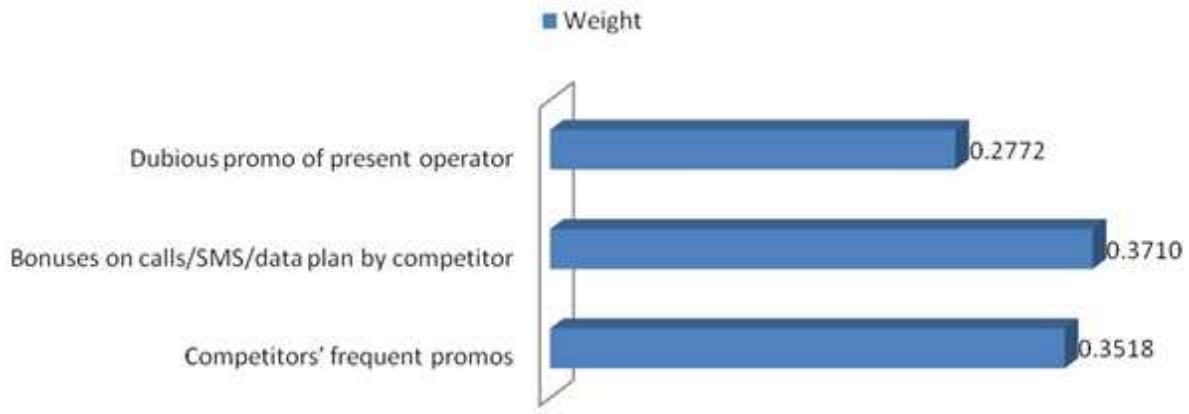


Table 23 – Composite priorities of the decision alternative about poor inter/intra connectivity

Decision alternative with regards to poor inter/ intra connectivity	Difficulties in making calls / sending SMS to same network	Difficulties in making calls/sending SMS to other network
Pooled Average Composite priority	0.7392	0.2608
Relative preference ranking	1	2

Figure 7 – Bar chart showing decision alternatives of poor inter/intra connectivity

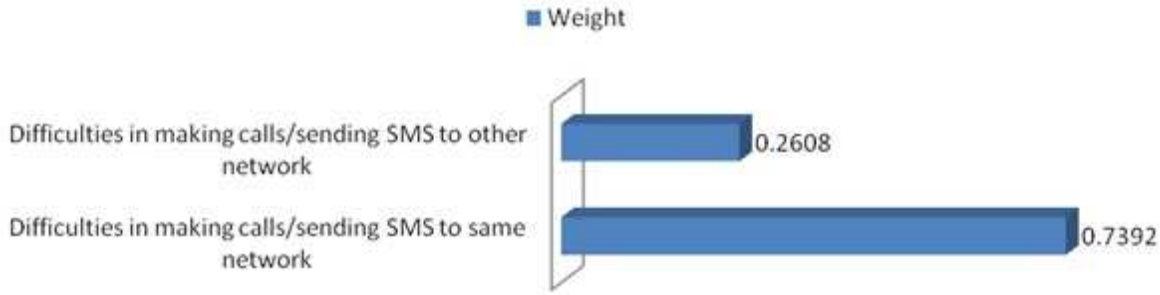


Table 24 reveals the customers` perception about the decision alternatives of inefficient data/ internet plan using the composite priorities. The customers mostly preferred sufficient data with high cost with priority of 0.7314, compared to insufficient data with low cost priority of 0.2686.

The horizontal bar chart in figure 8 represents the pictorial diagram of decision alternatives of inefficient data/ internet plan where the horizontal bar length is the priority of each criterion. From the chart, sufficient data plan with high cost has the longest bar with priority of 0.7314 compared to insufficient data plan with low cost priority of 0.2686.

Table 24 – Composite priorities of the decision alternative about inefficient data/internet plan

Decision alternative with regards to inefficient data /internet plan	Insufficient data with low cost	Sufficient data with high cost
Pooled Average Composite priority	0.2686	0.7314
Relative preference ranking	2	1

Figure 8 – Bar chart showing decision alternatives of inefficient data/ internet plan

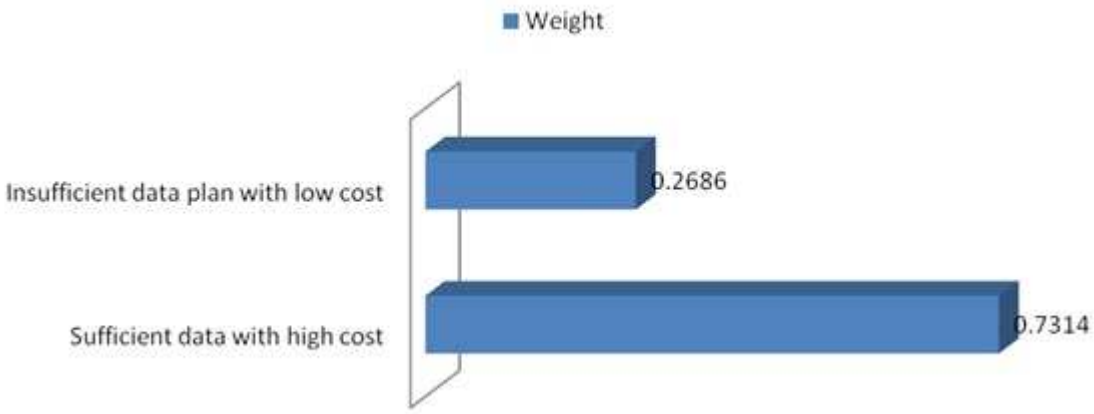


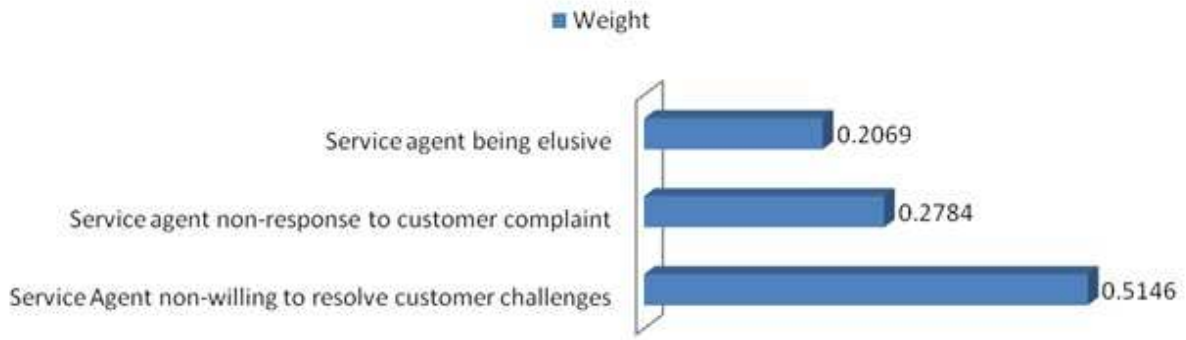
Table 25 shows the customers perception about the decision alternatives of poor complaint management using the composite priorities. In this study, this criterion has three alternatives. The customers most preferred service agent not willing to resolve customer challenges with priority of 0.5146, followed by service agent non-response to customer complaint with priority of 0.2784, while the least preferred is service agent being elusive with priority of 0.2069.

Table 25 – Composite priorities of the decision alternative about poor complaint management

Decision alternative with regards to poor complaint management	Service Agent non-willing to resolve customer challenges	Service agent non-response to customer complaint	Service agent being elusive
Pooled Average Composite priority	0.5146	0.2784	0.2069
Relative preference ranking	1	2	3

The horizontal bar chart in figure 9 represents the pictorial diagram of decision alternatives of poor complaint management where the horizontal bar length is the priority of each criterion. From the chart, one observes that service agent non-willingness to resolve customer challenges has the longest bar with a priority of 0.5146, followed by service agent non- response to customers` complaint with a priority of 0.2784 and service agent being elusive has the shortest bar length with a priority of 0.2069.

Figure 9 – Bar chart showing decision alternatives of poor complaint management



5. Conclusion

The study concluded that AHP is appropriate at modeling complex problem such as customer churn motivations in the service industry (such as telecommunication) by assigning priority to churn drivers in the business environment. The criteria and the alternatives in the AHP model are drivers of customers` churn decision in the Nigeria telecommunication industry. It also provided weight to each criteria as well as the alternatives as they motivates or influences an average subscriber in the study area to leave/abandon a network provider for competitor. The study also shows that MNP was not on the top priority list of factors that make customers to churn network in Nigeria, thereby suggesting that the factor (MNP) is less than effective regulatory policy for stimulating appropriate competition that can yield improved customer service delivery in the Nigeria telecommunication industry.

The study also concluded that certain promotional activities by telecommunication services providers are dubious and not complementary to attracting customers to their network but further enhances churning decision of subscriber, which may not be in the best interest of private firms whose primary motives to make profit.

6. Recommendations and Suggestions for future research

The following recommendations were drawn from the findings of this study:

(i) That GSM operator should improve the quality of their services through appropriate mix of churn drivers in order to increase their market share significantly.

(ii) Network operators should engage in the use Analytic hierarchy process model that can better unravel the motivations for customers churn through pairwise comparison of churn drivers by subscribers who have experienced the service for better decision rather than predicting churn from database.

(iii) Mobile telecommunication services provider should reverse the churn alternatives with high priority in order to sustain improved market share.

(iv) Service delivery of network operators in Nigeria should be geared towards reversing and correcting the criteria and alternatives that motivates customer(s) to churn network provider.

(v) Marketing effort should focus more on effective service recovery on criteria and the alternatives motivating subscribers churn in the Nigeria telecommunication industry.

(vi) Mobile network telecommunication service providers in Nigeria should avoid dubious promotional means as it trigger subscribers` churn decision, damage organisational reputation and long-term survival.

This study highlighted a number issues on which further research can be carried out in order to extend the frontiers of knowledge. For future studies:

(i) It will be necessary to collect data in all the geo-political zones and states of the federation to ascertain whether the preferences (weight) for the drivers of customers` churn decision will change significantly in order to overhaul the corporate strategies of the telecommunication firms.

(ii) The present research study was limited to GSM sub-sector of the Nigerian Telecommunication industry, further research may include Code-Division Multiple Access (CDMA) sub-sector, which has also been severely neglected by most subscribers.

(iii) The present study has discussed three levels AHP model, which aid evaluation of the determinant of customers` churn decision in the telecom industry. Future research may do well if it provides elaborate analysis of the forth level of the hierarchy, to allow for comparative analysis of the performance of the GSM operators to drivers of churn, if funded by GSM service providers in Nigeria.

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