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Modelling telecom customer attrition using logistic regression

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The Nigeria telecom sector has experienced a major transformation in terms of growth, technological content, and market structure over the last decade as a result of policy and institutional reforms culminating to the liberalization of the sector and consequently, resulting in significant rise in competition. With the industry's experience of an average of 41% annual churn rate and couple with the view that the cost of acquiring new customer is five times higher than maintaining an existing customer, customers retention is now seen to be even more important than customer acquisition. Therefore retaining customer has become a priority for most enterprise and there are compelling arguments for managers to carefully consider the factors that might increase customer's retention rate. This study using logistic regression, therefore examine the effect of socio-economic factors on customer attrition by investigating the factors that influence subscribers churning one service provider for another.

Key words: Teledensity, customers' retention, telecom, socio-economic factors.

INTRODUCTION

Nigeria, with a teledensity of 64.70 as at April 2011, is one of the fastest growing telecommunications market in Africa, with subscriber lines of less than 266, 461 mobile (GSM) lines in 2001 and growing exponentially to about 103, 347, 158 million digital mobile lines by end of April 2011 as evidenced in Figure 1 (NCC, 2011). The impetus of these changes is expected to continue, and even at a much faster pace.

The telecom sector has experienced a major transformation in terms of growth, technological content, and market structure over the last decade as a result of policy and institutional reforms in the sector. This reform has led to the liberalization of the telecom sector and consequently, the sector has witnessed significant rise in competition.

In this strongly competitive telecommunication industry, customers are continually faced with decision of choosing a service provider. They become more demanding and

frequently churn from one service provider to another based on cost comparison and better service benefits, thereby giving rise to the concept of churn or attrition.

An additional multifaceted dimension according to Oyeniyi and Abiodun (2008) to the competitive trend in the Nigerian telecommunication industry is the ease and rate of products and services duplication in the industry and multi dimension nature of communication.

With the telecommunications industry's experience of an average of 41% annual churn rate (NCC, 2011) and keeping in view that the cost of acquiring new customer is five times higher than maintaining an existing customer (Khan et al., 2010). Customer retention is now seen to be even more important than customer acquisition.

For many existing service providers, retaining highly profitable customers is the number one business pain. So, maintaining long-term relationship with customers becomes an imperative strategy for telecom service providers in order to pursue more predictable source of revenues and successive income streams. This study examines the effect of socio-economic factors on customer attrition by investigating the factors that influence

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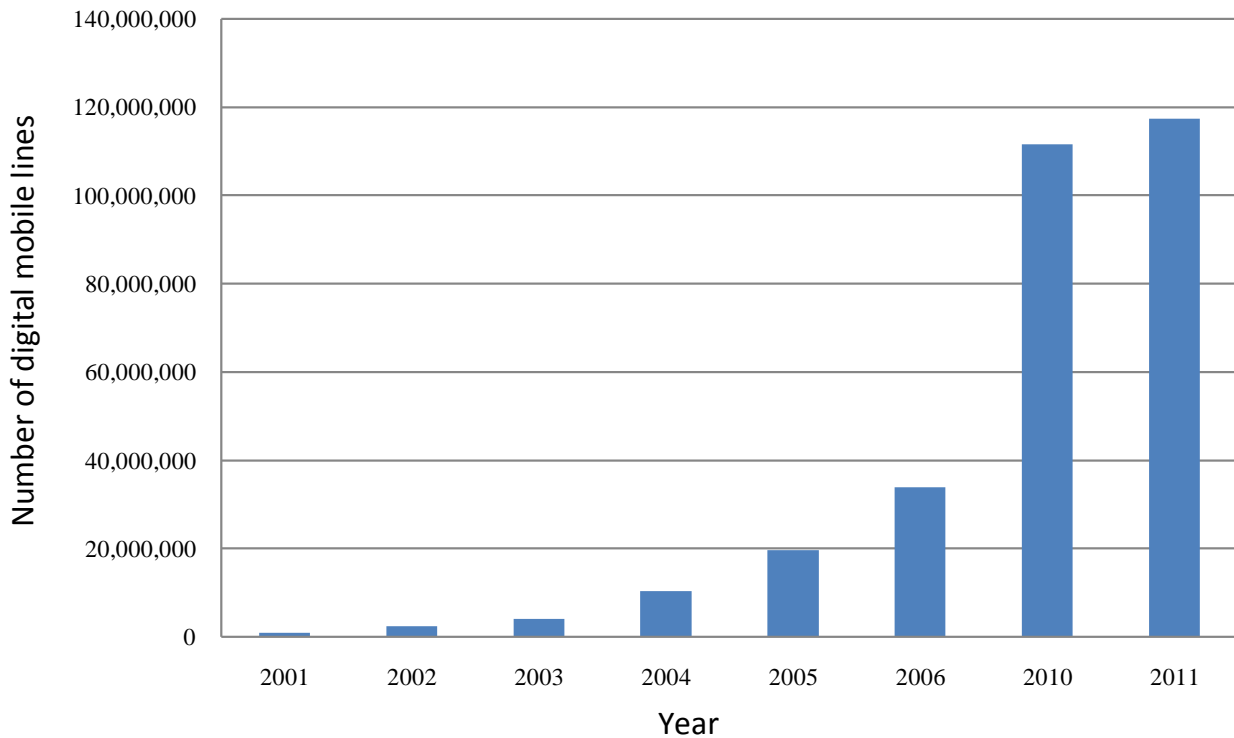


Figure 1. Total telecoms subscribers (2001 to 2011).

influence subscribers churning one service provider for another.

Customer attrition has become an important issue for many organisations particularly in subscription based businesses, where customers have a formal, contractual relationship which must be ended (Khan et al., 2010). In an attempt to identify the determinants of subscriber churn and customer loyalty in Korean mobile telephony market, Kim and Yoon (2004) employed a binomial logit model while Wei and Chiu (2002) developed a data mining based churn prediction technique using call pattern changes and contractual data for mobile telecommunication in Taiwan.

In earlier study, Kandampully (1998) discoursed that service organization's long-term success in a market is actually determined by its ability to expand and maintain a large and loyal customer base. Chen and Ching (2007) investigated the effect of customer relationship management practices on customer loyalty and the moderating effects of brand image in telecom industry. Gan et al. (2006) in Oyeniyi and Abiodun (2008) also noted that retaining customer has becomes a priority for most enterprise and there are compelling arguments for manager to carefully consider the factors that might increase customer's retention rate.

Farn and Huang (2009) investigated and compared the influences of economic and psychological factors on customer loyalty. Their finding shows that psychological

factors are relative importance to loyalty formation compared to economic factors. They asserted that service quality directly and indirectly affects customer loyalty.

In their study, Rahman et al. (2010) identified call rate, service quality, service availability and promotion as significant factors influencing customer retention in telecom sector (Wong and Sohal, 2003; Lee and Murphy, 2008; Kim and Park, 2010; Sathish et al., 2011).

The remainder of this article is organized as follows: Subsequently, the study discusses the method of analysis, data collection, sampling technique and sample characteristics. Followed by results and discussion and finally the study was concluded.

METHODOLOGY

For the purpose of this study, a sample survey was conducted between January and April 2011 and was directed at major areas in Lagos State. Lagos State was chosen as the study area because of its heterogeneous concentrations of people with many linguistic and cultural groups living together. Well structured and compliant questionnaires comprising a cover letter which states that the research objective were used to collect information from various telecom subscribers about their perceptions, service satisfaction and customer attrition of telecom service-providers.

A two stage sampling technique was used in the study because sample is taken in two steps. The first step is to select a sample of units, called primary units, and the second is to select a sample of

Table 1. Effect of call expenditure and gender on willingness to churn.

Gender	Expenditure	Would you like to change your current service provider in the future?		Total	χ^2	p-value
		Yes	No			
Male	Below 1,000	6.8	19.5	26.2	52.899	0.00
	1000 – 5000	14.5	45.7	60.2		
	5000 - 10,000	10.4	0.5	10.9		
	10,000 - 20,000	0.0	2.7	2.7		
Female	Below 1,000	5.0	15.5	20.4	63.586	0.000
	1000 – 5000	12.7	49.2	61.9		
	5000 - 10,000	13.3	0.0	13.3		
	10,000 - 20,000	0.0	4.4	4.4		

Table 2. Effect of call expenditure and marital status on willingness to churn.

Marital status	Expenditure	Would you like to change your current service provider in the future?		Total	χ^2	p-value
		Yes	No			
Single	Below 1,000	7.1	18.6	25.8	78.165 ^a	0.000
	10 00 – 5000	13.6	46.1	59.7		
	5000 - 10,000	11.2	0.3	11.5		
	10,000 - 20,000	0.0	3.1	3.1		
Married	Below 1,000	2.8	15.0	17.8	38.948 ^c	0.000
	1000 – 5000	14.0	50.5	64.5		
	5000 - 10,000	13.1	0.0	13.1		
	10,000 - 20,000	0.0	4.7	4.7		

subunits from each chosen primary unit. The major advantage of this sampling method is that it is more flexible than one-stage sampling as it gives us the possibility of taking smaller units that produce high efficiency (Cochran, 1977).

A random sample of 14 local government areas were selected for our study and 6000 randomly selected subscribers in these local government areas were examined for customer loyalty and attrition of telecom service providers. The questionnaire captured information on the income of the respondents, their age, educational level and employment status in addition to availability of service provider and readiness to switch from one service provider to another. Our instruments also attempt to capture accessibility and satisfaction of telecom service providers.

Sample characteristic

Table 1 provides a cross tabulation of call expenditure of the respondents with gender and willingness to change service provider. The result indicates a statistically significant influence of this factor on subscribers' preference to switch to other service provider. The income range expenditure on call shows that, of the 60 and 62% of male and female subscribers who spend between N1000 and N5000 monthly on telecom recharge, 15 and 13% are willing to change service provider, respectively. Further the table shows that the readiness to change service provider is tilted

towards the male subscribers as 32% indicated their readiness to change service provider. The percentage of the female subscribers willing to change their service provider is lower going by the 31% recorded for the question.

Another cross tabulation carried out was that of call expenditure of respondent with marital status and willingness to change service provider (Table 2). The call expenditure figures suggest that willingness to change service provider is likely to be more dominant among married subscribers who spends between ₦1000 and ₦5000 monthly. However, it was observed that subscribers who are single with monthly call expenditure between N1000 and ₦5000 are more willing to change service provider followed by those with call expenditure range between ₦5000 and ₦10000. Overall, about 62% are willing to change service provider with subscribers who are single accounting for over 52% of this figures.

A third cross tabulation carried out was that of call expenditure with age and willingness to change service provider. This is to check whether there is particular age bracket when the willingness to change service provider is keen. The outcome is presented in Table 3. The result shows a statistically significant influence of this factor on subscribers' willingness to change service provider. The table reveals that older subscribers tend to change service provider than those in the age range less than 18 years.

Lastly, the fourth and fifth cross tabulation carried out was that of advertising medium with gender and age and willingness to change service provider, respectively. The result is presented in Tables 4

Table 3. Effect of call expenditure and age on willingness to churn.

Age (Years)	Exp	Would you like to change your current service provider in the future?		Total	χ^2	p-value
		Yes	No			
<18	Below 1,000	0.0	19.4	19.4	20.049 ^a	0.000
	1000 – 5000	11.1	44.4	55.6		
	5000 - 10,000	16.7	0.0	16.7		
	10,000 - 20,000	0.0	8.3	8.3		
18 - 25	Below 1,000	7.7	19.9	27.6	55.754 ^c	0.000
	1000 – 5000	14.9	41.6	56.6		
	5000 - 10,000	12.2	0.5	12.7		
	10,000 - 20,000	0.0	3.2	3.2		
26 - 33	Below 1,000	5.0	14.2	19.1	49.132	0.000
	1000 – 5000	9.9	58.2	68.1		
	5000 - 10,000	9.9	0.0	9.9		
	10,000 - 20,000	0.0	2.8	2.8		

Table 4. Advertising medium, gender and willingness to change service provider in percentage.

Gender	Medium	Would you like to change your current service provider in the future?		Total	χ^2	p-value
		Yes	No			
Male	TV	8.1	8.6	16.7	72.245 ^a	0.000
	Magazine	11.8	9.0	20.8		
	Radio	0.5	32.6	33.0		
	Internet	5.9	17.6	23.5		
	Newspaper	0.9	0.0	0.9		
	Others	4.5	0.5	5.0		
Female	TV	6.6	8.8	15.5	58.268 ^c	0.000
	Magazine	12.2	6.6	18.8		
	Radio	0.6	29.3	29.8		
	Internet	7.7	24.3	32.0		
	Others	3.9	0.0	3.9		

and 5, respectively. The chi-square and the p-value show a statistically significant influence of these factors on subscribers' decision to change service provider.

Among the methods that have been used to investigate the effect of socio-economic factors on customer attrition is logit model regression (Kim and Yoon, 2004). In this study, logistic regression, a sub-class of statistical models known as generalized linear models (Menard, 1995) was applied to examine the effect of socio-economic factors that influence subscribers switching from one service provider for another. Logistic regression being a predictive model for analyzing survey data (Hosmer and Lomeshow, 2004) present a way for modeling the dependence of a binary response variable on one or more explanatory variables which may be categorical or continuous (Bewick et al., 2005). It describes the relationship between a dichotomous response variable and asset of explanatory variables (Friendly, 1995; Riley, 2006; Garson, 2006).

In this study, "Intention to drop current service provider" is taken

as the categorical response variables. The objective is to assess the impact of certain demographic and socio-economic factors like age, sex, marital status, education, income, occupational type, occupation and advertising medium on willingness to switch current service provider for another. Thus, these factors are regarded as the explanatory variables.

We constructed two models, one using call expenses, type of service, no of mobile connection and advertising medium as explanatory variables, while the second, in addition to these, also includes age, gender, marital status, education, income, occupational type, occupation and place of residence.

RESULTS AND DISCUSSION

We examine how socio-economic factors affect subscribers'

Table 5. Advertising medium, gender and willingness to change service provider in percentage.

Age (Years)	Medium	Would you like to change your current service provider in the future?		Total	χ^2	p-value
		Yes	No			
<18	TV	8.3	8.3	16.7	18.269 ^a	0.001
	Magazine	8.3	5.6	13.9		
	Radio	0.0	41.7	41.7		
	Internet	2.8	16.7	19.4		
	Others	8.3	0.0	8.3		
18 - 25	TV	9.0	9.0	18.1	59.924 ^c	0.000
	Magazine	13.6	9.0	22.6		
	Radio	0.9	26.7	27.6		
	Internet	7.2	19.9	27.1		
	Others	4.1	0.5	4.5		
26 - 33	TV	5.0	8.5	13.5	44.031 ^d	0.000
	Magazine	10.6	7.1	17.7		
	Radio	0.0	36.2	36.2		
	Internet	7.1	23.4	30.5		
	Others	2.1	0.0	2.1		

Table 6. Logistic models for telecoms subscribers.

	Model 1				Model 2			
	Odd ratio	S.E.	95% C.I. for EXP(B)		Odd ratio	S.E.	95% C.I. for EXP(B)	
			Lower	Upper			Lower	Upper
Gender	1.066	0.292	0.601	1.890				
Marital status	0.725	0.345	0.369	1.427				
Age	0.959	0.223	0.620	1.483				
Place of residence	0.950	0.123	0.746	1.209				
Occupation	1.369	0.244	0.849	2.206				
Income	1.085	0.232	0.689	1.709				
Call expenses	6.523	0.307	3.577	11.895	5.149	0.249	3.163	8.381
Employment description	0.797	0.350	0.402	1.582				
Educational level	0.879	0.143	0.665	1.163				
Advertisement medium	0.588	0.204	0.394	.877	0.580	0.138	0.442	0.760
No of mobile connection	1.597	0.214	1.051	2.427	1.469	0.158	1.077	2.004
Type of service	2.806	0.547	0.961	8.190	2.279	0.363	1.119	4.643
Type of mobile connection	7.029	0.428	3.041	16.249				
Which facility attracts you the most?					5.553	0.288	3.156	9.770
Constant	0.000	1.815			0.000			
R ²	0.354				0.340			
-2 Log likelihood	327.705 ^a				332.455			
χ^2	12.553				59.102			

subscribers' decision to switch service provider and how they help to predict how these factors influence or hinder subscribers changing provider by fitting a logistic model

to the data. Table 6 report the result of the two logistic models at the 95% significant level. The significance of the variables was checked through the Wald's statistics.

Table 7. Stepwise logistic regression for telecoms subscribers.

Step	Factor	B	S.E.	Wald	df	Sig.	Exp(B)
1	Service facilities	1.092	0.219	24.984	1	0.000	2.982
	Constant	-3.657	0.580	39.768	1	0.000	0.026
2	Call expenses	1.258	0.211	35.461	1	0.000	3.519
	Service facilities	1.518	0.243	38.992	1	0.000	4.564
	Constant	-7.337	0.929	62.401	1	0.000	0.001
3	Call expenses	1.261	0.208	36.948	1	0.000	3.531
	No of mobile connection	0.446	0.147	9.202	1	0.002	1.563
	Service facilities	1.290	0.245	27.83	1	0.000	3.633
	Constant	-7.802	0.940	68.866	1	0.000	0.000
4	Call expenses	1.605	0.243	43.497	1	0.000	4.978
	Advertisement medium	-0.448	0.135	10.944	1	0.001	0.639
	No of mobile connection	0.505	0.148	11.686	1	0.001	1.657
	Service facilities	1.549	0.267	33.657	1	0.000	4.708
	Constant	-7.980	0.968	67.927	1	0.000	0.000
5	Call expenses	1.639	0.249	43.465	1	0.000	5.149
	Advertisement medium	-0.545	0.138	15.602	1	0.000	0.580
	No of mobile connection	0.385	0.158	5.887	1	0.015	1.469
	Type of service	0.824	0.363	5.147	1	0.023	2.279
	Service facilities	1.714	0.288	35.364	1	0.000	5.553
	Constant	-8.921	1.090	67.009	1	0.000	0.000

It provides estimates for the odd ratios for each of the independent variables in the model. It is particularly instructive to note that for (Model 2), except for type of service all the factors are highly significant at the 99% level.

This is an indication of strong relationship between the independent variables and the explanatory variable. This implies that call expenditure, no of mobile connection, type of service, advertisement medium and network facilities all have an influence on the likelihood of churning service provider. Although, these characteristic are true for both Model 1 and Model 2, however not all the variables considered in Model 1 were significant. The odds ratio for call expenses, type of service offered, no of mobile connection and type of mobile connection are all greater than 1. Model 1 shows that the likelihood to churn service provider is very high for subscribers with alternative service provider and those that consider call rate as a reason to churn. This is also true for Model 2. Subscribers with alternative service provider are 2.5 times likely to churn than those with type of service. The likelihood to churn for subscribers who consider call rate is 11.9 times higher than those who consider medium of advertisement.

A comparison of the likelihood value for the two models shows that Model 1 has a lower magnitude for the log likelihood. It is therefore a better fit. Furthermore, a

stepwise logistic regression was conducted as a model selection technique in order to obtain the best factors that determine telecoms churn. The result is presented in Table 7.

Table 7 displays results of the stepwise logistic regression for telecoms subscribers to obtain the best factors that determine telecoms churn. At the fifth step of the stepwise regression, five variables (factors) are found to be the major churn determinants in the telecoms sector; they are call expenses, providers' advertisement medium, type of service plan, number of mobile connections and providers' service facilities. The odd that a telecoms subscriber that considers call expenses important will churn his provider is 5.149, while the odd of subscriber with alternative providers churning is 1.469.

Comparatively, subscribers with alternative mobile providers are 2.53 times more likely to churn than those considering off-beam advertisement medium as a reason to churn. The odds that subscribers would churn as a result of unattractive service plan is 2.279 while the odds that subscribers will churn as a result of poor service facilities is 5.553

Conclusion

Customer satisfaction has been hitherto revealed to be a

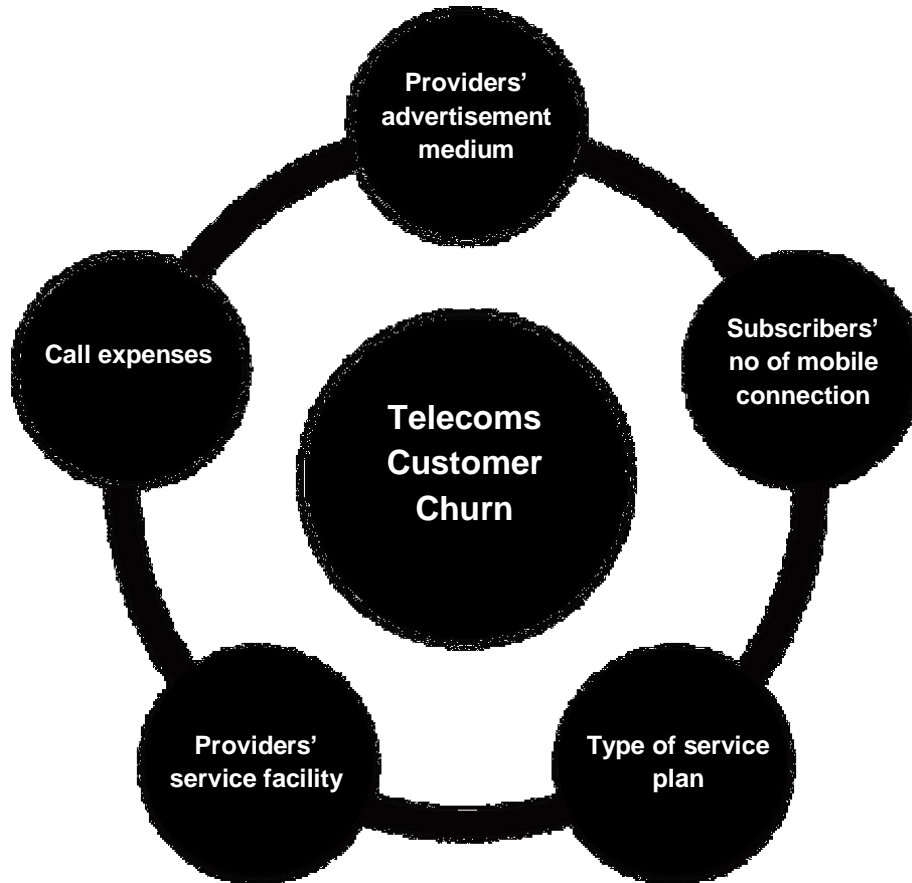


Figure 2. Telecom subscribers' attrition model.

consistent antecedent of customer loyalty and retention in a service framework. This study was undertaken to examine and understand the effect of socio-economic factors on customer attrition by investigating the factors influencing the propensity to churn service provider for another using stepwise logistic regression. Call expenses, providers' advertisement medium, type of service plan, number of mobile connections and providers' service facilities developed in the survey scale of this study are reliable indicators of likelihood of customers' attrition and can be a training guideline for telecom service providers in Nigeria. The model in Figure 2 depicts this assertion.

The nature of competition and the sophistication of the consumer in terms of their awareness to higher quality of services will demand service providers to develop a more pragmatic strategy to ensure customers are retained and promotional activities to increase their preference for the product as well as remain loyal disregarding what competitor's activities are. High call rates and poor service facilities are salient among the identified churn determinants. To gain the competitive edge, service providers should deploy marketing retention strategies

harmonized in programs and processes with the identified churn determinants to keep customers.

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