Dynamic Behavior in Customers' Switching and Market Share Analysis: The Markov Model Perspectives

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Abstract

Customer?s loyalty results in long-run market share of a firm, which is a base for retaining loyal customers. Marketing strategies pertaining to customer retention and customer acquisition are examined for five major global mobile service providers in Nigeria. Here we proposed a mathematical model to explore firm market share analysis, customer retention and switching rate. The customer retention rate and switching rate would be assumed in the model to be constant from time to time because of our underlying assumption that our Markov models have a finite chain and with stationary transition probabilities. How these probability values will be used to compute each firm?s market share is demonstrated. Finally, we used the Markov model to design marketing strategy to raise the customer retention rate and the rate of gaining competitor?s customers.

Index terms— Customers acquisition, customer retention, customer loyalty, switching rate, market share.

1 Introduction

ince the publication of the Markov model in marketing literature, research on the modeling of customer loyalty, customer switching and market share analysis has resulted in a body of literature consisting of several articles, books and other publications. Attempt have been made to reexamine the conceptual assumptions and estimated issues underlying the Markov models that evolves repeated trails or in sequential time periods in which the state of the system changes from one period or stage to the other in the next succeeding time period or stage. The authors evaluate these developments and conclude with an agenda to make Markov models theoretically more sound and practically effective and realistic. The Markov model has been defined as an analytical tool that uses the probability matrix of the current period's state n, together with the transition probability matrix to describe and predict the future movement of the same variables.

Since publication of the Markov model in 1905, research on the modeling of the probabilities of future occurrence in marketing has resulted in an extensive literature. However, a plethora of studies has contribution to our understanding of the conceptual assumptions underlying Markov models. Modeling of predicting future movement of the same variable has been highly applicable to the problems from a wide range of areas like account receivable analysis queuing problem analysis, inventory analysis etc.

Model proposed to deal with this phenomenon, can be studied at any level of depth and sophistication. Fortunately, the major mathematical requirements are just that you know how to perform basic matrix manipulations. In this paper we present some modification in the model. We also advance the model to design marketing strategy.

2 II.

3 The Mathematical Model

To facilitate the application of Markov model to market share analysis, each firm's market share in the current period, which would be represented as ??, (n) and is often defined as the percentage or probability of all the

customers in the whole GSM market buying from each service provider, must first be obtained from historical record information in the form of relative frequency data. Also, each service providers customer retention rate together with each firm's customer switching rate are to be estimated from a survey of the past buying behavior of the customers. Each firm's customer switching in rate which is defined as the tendency or probability of a competing firm's customer in the present period to start purchase from a particular new service provider in the next period. The customer retention rate and switching rate would be assumed in the mathematical model to be constant from period to period because of our underlying assumption that our Markov models have a finite chain and with stationary transition probabilities.

In Nigeria, there are five GSM service providers -MTN, Globalcom, Airtel, Etisalat and M-tel. a market survey in year one revealed that the five service providers has a customer base of 500,000, 400,000, 300,000, 200,000 and 100,000 respectively. After one year (i.e. in year 2) a second market survey showed that MTN retained 400,000 of its customers, lost 40,000 to Globalcom, 30,000 to Airtel, 20,000 to Etisalat and 10,000 to M-tel; Globalcom retained 200,000 of its customers, lost 100,000 to MTN, lost 50,000 to Airtel, 30,000 to Etisalst and 20,000 to M-tel; Airtel retained 200,000 of its customers, lost 40,000 to MTN, lost 30,000 to Globalcom, lost 20,000 to Etisalat and 10,000 to M-tel; M-tel retained 60,000 of its customers, lost 10,000 to MTN, 10,000 to Globalcom, 10,000 to Airtel and 10,000 to Etisalat. From this market survey, we can predict the market share for each GSM service providers in the successive years (i.e. year 2).

4 III. Application of Markov Model to

Market Share Analysis of the Five Gsm Service Providers in Nigeria

A table that shows the movement or switching of customers among the five GSM service providers will be constructed as a prelude to computing both each service provider's state probability for the current month "n" which will be designated as ??; (n), and the transition probabilities.

Note that the year which the sales of the service toke place triggers the transition in the Markov system and hence they are the trials of the Markov process (Bergous, 2008 The total number of the customers retained, lost and gained will be calculated as a percentage or proportion of the total number of customers who originally patronized each service providers from the beginning (i.e. from year 1). We can interpret table 2 using the MTN's row, it is found out that of the 500,000 customers that originally patronized MTN service in the beginning (in year one), by year 2, 80% of them were retained, 8% of them were lost to Globalcom service, 6% to Airtel, 4% were lost to Etisalat and 2% of them were lost to M-tel. Also, using MTN's column to interprets table 2, it can be explained that by year 2, 80% of the total customers that MTN had in year1, were retained, 25% of the total customers that Globalcom had in year 1, were gained by MTN, 13% of the total customers that Airtel had in year 1, were gained by MTN; 5% and 10% of the total customers that Etisalat and M-tel had respectively in year 1, were gained by MTN.

This interpretation can be generalized that for each firm in a column, the probabilities appearing under it, show either the percentage of that firm's initial customer retained or the percentage of other firms' initial ear customers gained by it. Whereas for each firm in the row, the probabilities appearing against it show either the percentage of that firm's initial customers retained or the percentage of that firm's initial.

Recall that the customer base of five service providers at the end of 2011 stand at:

The state probability vector will be expressed as:

With the information provided in table 1 and 2 Therefore the market share for MTN, GLO, Airtel, Etisalat and M-tel at the end of 2013 will be 39.15%, 17.25%, 21.75% 11.40% and 10.45% respectively.

From the mathematical model, we observed that by 2013, the market share of MTN increased from 33.3% to 39.15%, the market share of GLO decreased from 26.7 to 17.25%, the market share of Airtel slightly increased from 20% to 21.75% that of Etisalat decreased from 13.3% to 11.40%. Again, if the market share calculation is repeatedly done for subsequent future years, this trend, which depends principally on the nature of the matrix of transition probabilities, will continue until at steady state (or equilibrium) condition when the relative market shares will no more change from year to year. At equilibrium, consecutive steps possess identical characteristics, for any step of the Markov chain, the state probability vector is given bySV(k) = Q(k) =

Where q 1 + q 2 + q 3 + q 4 + q 5 = 1

At equilibrium, we have PmQ = Q and Pm x Q = Q that is q 1 q 2 q 3 q 4 q 5

Dynamic Behavior in Customers' Switching and Market Share Analysis: The Markov Model Perspectives Global Journal of Management and Business Research Volume XII Issue XVII Version I 2 2012 ear Multiplying and expressing in the algebraic form, we have 0.80q 1 + 0.25q 2 + 0.13q 3 + 0.05q 4 + 0.10q 5 = q 1 0.08q 1 + 0.50q 2 + 0.10 q 3 + 0.10q 4 + 0.10q 5 = q 2 0.06q 1 + 0.125q 2 + 0.670q 3 + 0.15q 4 + 0.10q 5 = q 3 0.04q 1 + 0.075q 2 + 0.067q 3 + 0.5q 4 + 0.10q 5 = q 4 0.02 q 1 + 0.05 q 2 + 0.033q 3 + 0.2 q 4 + 0.60q 5 = q 5

Recall that: q 1 + q 2 + q 3 + q 4 + q 5 = 1 Therefore, q 1 = 1 -q 2 -q 3 -q 4 -q 5 q 2 = 1 -q 1 q 3 -q 4 -q 5 q 3 = 1 -q 1 -q 2 -q 4 -q 5 q 4 = 1 -q 1 -q 2 -q 3 -q 5 q 5 = 1 -q 1 -q 2 -q 3 -q 4 0.80q 1 + 0.25q 2 + 0.13q 3 + 0.05q 4 + 0.10q 5 = 1q 2 -q 3 -q 4 -q 5 ———Equation 1 0.08q 1 + 0.50q 2 + 0.10 q 3 + 0.10q 4 + 0.10q 5 = 1 -q 1 -q 3 -q 4 -q 5 ———Equation **??**0.06q 1 + 0.125q 2 + 0.670q 3 + 0.15q 4 + 0.10q 5 = 1q 1 -q 2 -q 4 -q 5 ———Equation 3 0.04q 1 + 0.075q 2 + 0.067q 3 + 0.5q 4 + 0.10q 5 = 1q 1 -q 2 -q 3 -q 5 ——-Equation 4 0.02 q 1 + 0.05 q 2 + 0.033q 3 + 0.2 q 4 + 0.60q 5 = 1 -q 1 -q 2 -q 3 -q 4 ———Equation **??**Collecting like terms together we have; 0.80q 1 + 0.25q 2 + 0.13q 3 + 0.05q 4 + 0.10q 5 = 1 0.08q 1 + 0.50q 2 + 0.10 q 3 + 0.10q

4 + 0.10q 5 = 1 0.06q 1 + 0.125q 2 + 0.670q 3 + 0.15q 4 + 0.10q 5 = 1 0.04q 1 + 0.075q 2 + 0.067q 3 + 0.5q 4 + 0.10q 5 = 1 0.02 q 1 + 0.05 q 2 + 0.033q 3 + 0.2 q 4 + 0.60q 5 = 1 Solving for q1, q2, q3, q4, and q5, by row operations, we have: q 2 q 3 q 4 q 5 q 1 q 2 q 3 q 4 q 5 = 0.80 1.25 At the final tableau, we can calculate the market share for q 5. Therefore; 0.01q 5 = 0.001 q 5 = 0.01 0.001 q 5 = 0.1

We can as well compute the market share at q 4 0.05q 4 + -0.03q5 = 0.001 0.05q 4 + -0.03(0.1) = 0.001 0.05q 4 -0.003 = 0.001 0.05q 4 = 0.001 + 0.003 0.05q 4 = 0.004 q 4 = 0.004 0.05R 5 -0.1R 4 q 1 q 2 q 3 q 4 q 5 0. At q 3 = 0.42q 3 + (-063q 4) + 0.03q 3 = 0.03 0.42q 3 -0.0504 + 0.003 = 0.03 0.42q 3 = 0.0774 q 3 = 0.42 0.0774 = 0.1840 At q 2 = -0.95q 2 + -0.34q 3 + -0.25q 4 + -0.30q 5 = -0.28 -0.95q 3 -0.0626 + 0.02 -0.03 = -0.28 -0.95q 2 = -0.28 + 0.0626 + 0.03 + 0.03 -0.95q 2 = -0.28 + 0.1126 -0.95q 2 = -0.28 + 0.1674 q 2 = -0.95 -0.1674 q 2 = 0.1762

Recall that; q 1 + q 2 + q 3 + q 4 + q 5 =1 q1 + 0.1762 + 0.1840 + 0.08 + 0.1 = 1 q1 + 0.5402 = 1 q1 = 0.4598.

Therefore, at equilibrium or steady state condition, the market share of the five GSM service providers in Nigeria at the long-run are 46%, 18%, 18%, 8%, and 10% respectively. Note that the steady state, state probability (market share) for all service providers depend solely on the nature of the transition probabilities and not on initial state probabilities (market share) for each of the five service providers.

Clearly, MTN is still leading the GSM market in Nigeria and their greatest challengers is Globalcom but there is a high rate of customer deflections in Airtel, Etisalat and M-tel, which is affecting their market shares. We now discuss appropriate marketing strategies that will reduce customers switching and retention through Markov model in the next section.

IV.

5 Markov Model for Designing Marketing Strategy

For us to use Markov model to design marketing strategy, there must be an evidence of customer switching and reduction in market share. Recall in the last paragraph that the market share of Airtel at the beginning was 20% at the second year, it increased slightly to 21.75% but at equilibrium, it reduced to 18%, in a worst case scenario, if the nature of the transition probabilities is such that a particular competitor loses customers to others and gain no customers from other competitors, at equilibrium, that competitor could be driven out of business. For the above, no matter the control a firm has in the industry regarding market share, the nature of the matrix of transition probabilities can make the firm to be driven out of business in the long run (at equilibrium).

Under this situation, the two options available to use are either to use the retention strategy or the both strategy simultaneously. For instance, Airtel succeeds in its use of retention strategy to raise its customer's retention rate from 67% to 80% while its rate of gaining its competitor's customers remain constant at 10%, the new matrix of transition probabilities will be; 0.80q 1 0.20q 2 = q 1 0.10q 1 0.90q 2 = q 2 0.80q 1 + 0.20q 2 = 1-q 2 0.10q 1 + 0.90q 2 = 1-q 1 0.80q 1 + 1.2q 2 = 1 1.1q 1 + 0.90q 2 = 1 0.80 0.20 0.10 0.90q 1 q 2 = q 1 q 2 0.80 1.2 1 1.1 0.90 1 0.8R 2 -1.1R 1 0.80 1.2 1 0 -0.6 -0.3

The steady state market share for Airtel from this new matrix transition probabilities is 50% which implies that the increase Airtel's customer retention rate from 67% to 80% alone, increased its equilibrium market share from 18% to 50%.

On the other hand, if Airtel successfully utilizes an acquisition strategy to raise its rate of gaining its competitor's customers from 10% to 20% while its customer retention rate remains constant at 67%, the new matrix of transition probabilities will be;

The steady state market share for Airtel from this new matrix is 56% which implies that only an increase of Airtel rate of gaining its competitor customers from 10% to 20% increased it equilibrium market share from 18% to 56%.

Finally, if both retention strategy and customer acquisition strategy are put in place for the organization simultaneously in a form that Airtel's retention rate increase from 67% to 80% and its rate of gaining its competitor's customer increased from 10% to 20% the new matrix of transition probability will be;

This new matrix of transitional probability from the combined marketing strategy results in a steady state market share of 100% for Airtel compared to 18% when neither strategy was used.

V.

6 Conclusion

In this paper, we attempted to offer some understanding of strategies to be uses in raising customer retention and customer acquisition strategy. We advanced the appropriate marketing strategy using the Markov model to design the needed strategy when firm, has decreasing market share and high customer switching. However, not all the firms has a decreasing market share but what we are saying is that, firm's which has control of the market share of the industry will also need an appropriate marketing strategy to remain in business. Firms required retention strategy in which attempts are made to retain a large percentage of old customers. For example, MTN, GLO, Airtel, Etisalat and M-tel. The five GSM service providers need retention strategy by providing superior service quality, by giving a rebate and by giving discount to customers who purchase in repeated periods. Another type of marketing strategy needed to increase market share is the acquisition strategy in which attempts

are made to take customers way from other competitors. The most appropriate way to do this is through all forms of effective advertising. When firms successfully utilizes an acquisition strategy to raise its rate of gaining its competitor's customers while its customers retention rate remains constant, then new matrix of transition probability will increase its equilibrium market share.

Finally, the model can be used to design both retention strategy and customer acquisition strategy simultaneously in a form that retention rate increase and its rate of gaining its competitor's customer increases. The new matrix of transitional probabilities from the combined marketing strategy will result in a stead state market share which will lead to reduction in customer switching. [1]

Figure 1: Dynamic

[1]

1

Firms	Year one customer standing		Year two customer standing				
	Customers numbers	percentage %	MTN	GLO	Airtel	Etisalat	M-tel
MTN	500,000	33.3	400,000	40,000	30,000	20,000	10,000
GLO	400,000	26.7	100,000	200,000	50,000	30,000	20,000
Airtel	300,000	20.0	40,000	30,000	200,000	20,000	10,000
Etisalat	200,000	13.3	10,000	20,000	30,000	100,000	40,000
M-tel	100,000	6.7	10,000	10,000	10,000	10,000	60,000
	1,500,000	100	560,000	300,000	320,000	180,000	140,000

[Note: Customer's switching in each service firm in year 2]

Figure 2: Table 1 :

2

	Proportion of Customers Retained, Gained and Lost				
Firms	MTN	GLO	Airtel	Etisalat	M-tel
MTN	400,000/500,000 = 0.8	40,000/500,000 = 0.08	30,000/500,000 = 0.06	20,000/500,000 = 0.04	10,000/500,000 = 0.02
GLO	100,000/400,000 = 0.25	200,000/400,000 = 0.50	50,000/400,000 = 0.125	30,000/400,000 = 0.075	20,000/400,000 = 0.05
Airtel	40,000/300,000 = 0.13	30,000/300,000 = 0.1	200,000/300,000 = 0.67	20,000/300,000 = 0.067	10,000/300,000 = 0.033
Etisalat	10,000/400,000 = 0.05	20,000/200,000 = 0.1	30,000/200,000 = 0.15	100,000/200,000 = 0.5	40,000/200,000 = 0.2
M-tel	10,000/100,000 = 0.1	10,000/100,000 = 0.1	10,000/400,000 = 0.1	10,000/100,000 = 0.1	60,000/100,000 = 0.6

Figure 3: Table 2 :

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Figure 4:

Market share for MTN by 2013 will be:

37.3(0.8) + 20 (0.25) + 21.3(0.13) + 12.1 (0. 05) + 9.3(0.10)

500,000 29.84 + 5 + 2.769 + 0.609 + 0.93

Customer 2011 = 400,000 300,000 MTN Market share for GLO: = 39.15 Cus

200,000 37.3 (0.08) + 20 (0.50) + 21.3 (0.10) + 12.1 (0.10) + 9.3 (0.10) 720,000

400,000 2.984 + 10 + 2.13 + 1.21 + 0.93

GLO =

17.25

Market share for Airtel:

37.3 (0.06) + 20 (0.125) + 21.3 (0.670) + 12.1 (0.15) + 9.3 (0.10)

33.3 2.238 + 2.5 + 14.271 + 1.815 + 0.93 Airtel = 21.75

sv 2011 = 26.7 20.0 Market share for Etisalat: sv 2012 =

13.3 6.7 37.3 (0.04) + 20 (0.075) + 21.3 (0.067) + 12.1 (0.5) + 9.3 (0.10) 12.1 9.3 12.1 1.492 + 1.5 + 1.42

Market share for M-tel by 2013:

37.3 (0.02) + 20 (0.05) + 21.3 (0.033) + 12.1 (0.2) + 9.3 (0.60)

0.7609 + 1 + 0.7029 + 2.42 + 5.58

400,000 100,000 40,000 M-tel = 10.45 10,000

TM40,000 30,000 200,000 50,000 30,000 200,000 20,000

= 30,000

20,000 30,000 20,000 100,000

10,000 20,000 10,000 40,000

0.80 0.25 0.13 0.05

PM = 0.08 0.06 0.50 0.125 0.670 0.15 0.10 0.10

0.04 0.075 0.067 0.5

0.02 0.05 0.033 0.2

SV(2013) = PM x SV(2012)

0.80 0.25 0.13 0.05 0.10

0.08 0.50 0.10 0.10 0.10

= 0.06 0.125 0.670 0.15 0.10

0.04 0.075 0.067 0.5 0.10

0.02 0.05 0.033 0.2 0.60

Figure 5:

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