

An Experimental Comparison of Predicting Customer Behaviour in Internet and Mobile Marketing

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Abstract: Currently, the internet and mobile technology platforms have gained a lot of popularity in the Nigerian context. Many businesses are seizing the opportunity provided by these platforms to market their goods and services in what is termed 'E-marketing'. E-marketing opportunities on these platforms include Facebook, Twitter, Google, Whatsapp and Youtube marketing, marketing through personal blogs, SMS and Email marketing, among others. Although, these marketing avenues have been engaged by many businesses even with scarce financial resources, the result has been that of little or no corresponding effect on their profit margins. There is therefore; the need to predict customer behaviour as regards these marketing avenues so that businesses can know which ones to engage for their marketing activities. This study is therefore; aimed at understanding and predicting customer behaviour through correlation analysis and classification techniques in data mining, respectively. The results obtained will enable the business community gain an understanding of customer behaviours and engagements on these platforms. Furthermore, the loss on marketing investments by businesses will be minimized leading to increase in business profit margins as businesses make target marketing through the stated channels efficiently.

Key words: Data mining, classification, marketing, E-marketing, M-marketing, correlation analysis

INTRODUCTION

According to Heinonen and Strandvik (2003), the marketing communication point of view reveals that Internet and mobile phones are considered to be powerful opportunities to reach consumers. This is because they allow interactivity and personalisation of the content and context of the message.

"Electronic marketing (E-marketing) can be viewed as a new philosophy and a modern business practice involved with the marketing of goods, services, information and ideas via the Internet and other electronic means" (El-Gohary, 2010). Devi and Anitha defined E-marketing as using digital technologies to help sell your goods or services.

The advantages of E-marketing includes but not limited to the following, global reach, lower cost of reaching targeted customers, trackable, measurable results, 24 h marketing, Personalization, One-to-one marketing, more interesting campaigns and better conversion rate. Internet marketing is therefore, the most economical and faster way to reach out to buyer directly and the ideal way for business to advertise locally and internationally (Salehi *et al.*, 2012). In this study, the E-marketing mediums that we are interested in include Youtube marketing, Yahoo marketing, Twitter marketing, Google marketing, Facebook marketing, Personal Blogs and Email marketing.

Mobile marketing (M-marketing) on the other hand is a new marketing channel which was brought about by the evolution of E-commerce. According to Leppaniemi *et al.* (2006), M-marketing is the use of the mobile medium as a means of marketing communications. Those who want the most return for their money are being advised to focus on mobile advertising because of its enormous potential as one of the fastest growing new advertising tactics (Car and Liskarin, 2013). The M-marketing mediums that we are interested in in this study includes the whatsapp mobile application and SMS (Short Message Service) marketing.

In Nigeria, the Central Bank of Nigeria (CBN) defined Small and Medium Enterprises (SMEs) as an enterprise whose annual turnover ranges between N25,000-50,000 while the Nigerian Industrial Development Bank (NIDB) defined a business as Small Scale Enterprises (SSEs) with project cost (investment and working capital) not exceeding N750,000. It also defined as medium scale those enterprises whose projects costs falls within the range of N750,000-3 million (Ogbadu, 2012).

Small business marketing is considered more intuitive, competency based, revolving around networking and operating under financial and human resource/time constraints compared to larger business. (Carson *et al.*, 1995; Gilmore *et al.*, 2007).

According to Ogundele *et al.* (2013), several combinations of marketing practice such as product

innovation, process improvement, trademark, trade name, patent, quality, package, colour, design, conditions of sales, drumming etc. are being employed by small business operators in Nigeria to gain differential advantage. Presently, due to the emergence of E-marketing and M-marketing, the above marketing practise is being done through mediums such as Whatsapp mobile application and SMS (Short Message Service) marketing, Youtube marketing, Yahoo marketing, Twitter marketing, Google marketing, Facebook marketing, Blogs and Email marketing, etc.

Given these numerous e-marketing mediums, there is need to know which one is most appropriate to target a particular customer so as to minimize wasting of resources for marketing through these marketing channels. This will also help the adoption of E-marketing by these SMEs because according to Gilmore *et al.* (2007), it is still very much in its infancy but has generally continued to increase since 2000.

Literature review: According to Durmaz and Diyarbakirlioglu (2011), it is very important for marketers to predict consumer behaviour outcomes. This has been done from different research perspective which includes using theoretical approach to predict customer behaviour through strength of motivation, attitudes, motives, personality traits and learning styles. Examination of current research practice by Holdershaw and Gendall concludes that a cognitive-based questionnaire framework, designed to attempt to understand ‘what is going on inside people’s head’s is the basis for predicting future behaviour. Yang *et al.* (2012) used statistical analyses including Pearson correlation, structural equation modelling and backward regression with SPSS and AMOS to predict young Chinese consumer’s mobile viral attitudes, intents and behaviour.

Baumann *et al.* (2006) predicted customer loyalty in retail banking using regression models. Their finding reveals a willingness to recommend is best predicted by affective attitude, overall satisfaction and empathy. Moghadam *et al.* (2015) reviewed the psychological aspect of customer’s behaviour prediction. Furajji *et al.* (2012) used statistical Analyses (ANOVA) to determine the factors affecting consumer preferences and behaviour in the electric appliances market.

Ibrahim and Vignali (2005) used reliability analysis; descriptive statistics; factor analysis; Pearson correlation, and multiple regression analysis in Statistical Package for the Social Sciences (SPSS) to predict Consumer Patronage Behaviour in the Egyptian Fast Food Business.

Banerjee and Pawar (2013) was able to predicting consumer purchase intention by drawing statistical inference using statistical analysis like discriminant analysis.

Data mining has been introduced in recent years as a more efficient alternative to discover hidden patterns and predict future trends and behaviors of customer. Rajagopal was able to identify the high-profit, high-value and low-risk customers by using data mining technique called customer-clustering. Kim and Street (2004) proposed a data mining approach for customer targeting using Artificial Neural Networks (ANNs) guided by Genetic Algorithms (GAs). Their model is able to predict an optimal target point where expected profit from direct mailing is maximized. IBM I-Miner was used to develop the algorithm. Rossi *et al.* (1996) used purchase history data for target marketing using random effects choice model to measure household preferences and sensitivities. Their technique was based on Bayesian method of inference. Finally, Gloven combined existing target selection such as linear and logistic regression, a feed forward back propagation neural network and a fuzzy modelling algorithm to analyse data for direct marketing. The strength of the approach is that the structure and specific characteristics of each feature subset are maintained and scored individually.

Xiao-Hong developed a behaviour predicting model based on perceived value using Bayesian network which can be used not only in behaviour modeling but also in predicting field. Zhang and Zhao (2014), adopted the method of user interest concept tree based on domain ontology and a multi-agent based consumer behaviour forecasting model to overcome the limitations of traditional consumer behaviour forecasting method. Zheng predicted customer restaurant preference using Artificial Neural Networks (ANN) and Support Vector Machine (SVM). Their method revealed that ANN provides 93.13% average accuracy across investigated customers, compared to only 54% for SVM with a sigmoid kernel function.

Eichinger combined sequence mining with decision tree analysis in order to predict the behaviour of customers’ tree analysis. They validated their method by applying it to real customer data and obtained promising results.

Finally, Zhang and Zhao (2014) adopted the method of user interest concept tree based on domain ontology, and a multi-agent based consumer behaviour forecasting model to overcome the limitations of traditional consumer behaviour forecasting method.

This study uses both correlation analysis and classification technique to richly predict customer behaviour from questionnaire data.

MATERIALS AND METHODS

The methodology for carrying out this research is in two phases as captured by the diagram in Fig. 1. The first

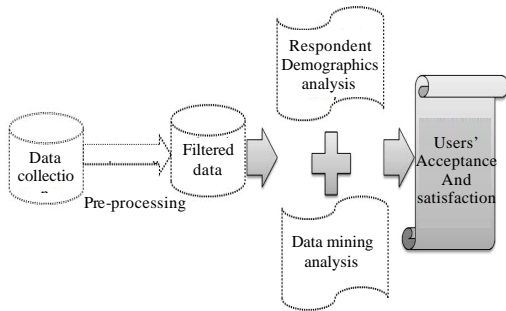


Fig. 1: The Methodology framework

phase is concerned with data collection and filtering. The second phase is the analysis of the data mining as well as the demographic data.

Data mining (classification and prediction technique): By Definition, a classification algorithm builds a model of classes from a set of records that contain class labels. Decision Tree Algorithm is a classification algorithm that finds out how the attributes-vector behaves for a number of instances (Nadali *et al.*, 2011). The J48 is an extension of ID3 which has additional features of accounting for missing values, decision trees pruning, continuous attribute value ranges, derivation of rules, etc. In the WEKA, J48 is an open source Java implementation of the C4.5 algorithm. The following is the three steps involved in the algorithm:

- In case, the instances belong to the same class the tree represents a leaf so the leaf is returned by labelling with the same class
- The potential information is calculated for every attribute, given by a test on the attribute. Then, the gain in information is calculated that would result from a test on the attribute

Then the best attribute is found on the basis of the present selection criterion and that attribute selected for branching (Kaur and Chhabra, 2014).

In this research, Waikato environment for knowledge analysis (Weka) data mining tool (Hall *et al.*, 2009) was used to pre-process the data and implement the classification algorithm. The particular algorithm used was the j48 classification algorithm. The data gathered was divided into two. The first contained two thirds of the data which was used to develop the classifier and the set of data remaining was used to test and evaluate the classifier model developed. Table 1 depicts the result obtained when the models were evaluated.

To deploy and make predications with the model, fresh data was gathered from 10 respondents, so as to

Table 1: Model evaluated results

Models	Evaluated results (correctly classified instances %)
Email prediction model	77.1429
Facebook prediction model	85.7143
Google prediction model	93.5484
Personal blogs prediction model	72.8261
SMS prediction model	91.8919
Twitter prediction model	73.913
Whatsapp	84.7826
Youtube	70.3297

Table 2 Demographic profile of sample

Groups	Frequencies	Percentage
Gender		
Male	237	43.25
Female	311	56.75
Total	548	100.00
Age		
18-24	142	25.91
25-39	164	29.93
40-59	184	33.58
>60	58	10.58
Total	548	100.00
Education		
Uneducated	32	5.84
Primary school	49	8.94
Secondary school	158	10.58
NCEND	131	23.91
HNCBSC	98	17.88
MSC	104	18.98
Phd	76	13.87
Total	548	100.00

make predictions of their behaviour as regards these marketing channels. The predicted result was now compared with the true decisions on of these respondents on the marketing avenues.

Data analysis: The survey instrument was employed to collect data by administering 500 questionnaires while 448 (that is 89.6%) questionnaires were harvested back from the respondents. Following the design model, the data collection for this research was carried out on a paper-based questionnaire as the survey instrument. The questionnaire consists of two sections, so as to bring out complete characteristics of the respondent demographic analysis. The first section gathers information about the respondent’s personal information like gender; age and educational background (Table 2 for the demographic profile of the sample). The second section gathers information about the respondent’s perception about mobile and internet marketing as guided by the framework for designing the questionnaire shown in Fig. 2.

The questionnaires were filled in different places; at banks among some customers, at schools among teachers, at hospitals among some employees and at shopping malls, for a period of five working days. The seven likert scale was adopted for the statements of the

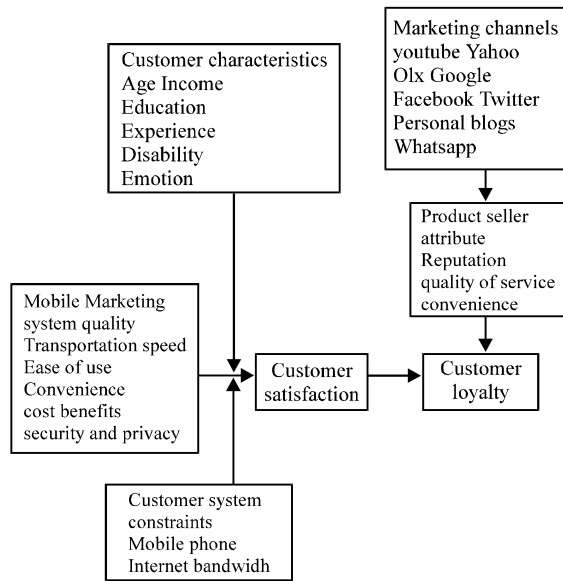


Fig. 2: Design framework for the questionnaire

second section of the questionnaire ranging from 1-7: 1 for strongly disagreed, 2 for disagreed, 3 for slightly disagreed, 4 for neutral, 5 for slightly agreed, 6 for agreed and 7 for strongly agreed. The data used for this research work was collected from customers in two states; Lagos and Ogun State. A total number of 500 questionnaires were administered; 250 copies in Ogun State and 250 in Lagos State. We ignored incomplete questionnaires and considered 448 questionnaires that contained all the information which represents 89.6% of the total respondents.

The harvested questionnaires were analysed based on correlation and regression analyses and independent sample t-test using the statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

The result of the prediction made on 10 fresh respondents is displayed in Table 3 and 4. The results reveal that facebook, google and whatsapp has the most very frequently visited predictions out of the 8 marketing avenues investigated. Apart from the fact that these values have been correctly predicted as shown in Table 5 and 6 when compared with the actual response given by the respondents, there is strong reason to believe that these marketing avenues are the best means of target marketing customers with the investigated characteristics. For example PersonID “3” who is a male, single, between the ages of 21 and 30 year has an OND, lives in Ondo State who is computer literate, income range is average is a Yoruba by origin, a Christian can afford to up to N5000 on internet subscription will visit very

frequently Facebook, Google and Whatsapp and there can be targeted through these mediums. The result also revealed that, even though mobile phone is quite ubiquitous, SMS marketing is not highly favoured by the respondents as on 60% has been convinced to do business through SMS marketing. Also, revealing is the email marketing which reveals that only 40% of the predicted respondents check their email often.

A correlation analysis was conducted on most variables for both the internet and mobile marketing system quality to explore the relationship between them. Table 7 shows all positive figures suggesting that correlations are positive and significant at the 0.01 level between customers’ behaviour towards Transaction Speed (TS), Ease of Use (EU) Convenience (C), Cost Benefits (CB) and Security and Privacy (SP) in internet/mobile marketing system. Furthermore, we carried out marketing channel modality evaluation so as to make comparison on the preferred medium of transaction (internet and mobile channels).

The result obtained from the correlation analysis showed that customers have found mobile marketing enjoyable, convenient and easy to use; however, there is low level of reliability in the security measure of mobile marketing technology. Again, the mobile marketing system is significantly influenced by customer behaviour. On the demographic variables which consist of gender, age and education, the result presented the importance of educational level of respondents on their behaviour by showing that those with less education use the mobile marketing services less than the educated people. Similarly, the findings indicate that there is no statistically significant difference between males and females at the 5% level in behavioural attitudes towards using mobile marketing services.

Marketing channel modality: In the marketing channel modality, the respondents were asked of the most suitable channel with which they make transaction. The respondents were informed that they would need to fill a questionnaire each for each input modality, so as to determine people’s satisfaction with medium of transaction and thereby give a qualitative analysis to the questionnaires that were administered.

In other to examine the impact of medium of transaction on the respondents, we gave two hypotheses (null and alternative) thus, the null hypothesis is such that $H_0: \mu_d \neq 0$ which means that the mean difference between medium modality users satisfaction is zero. On the other hand, the alternative hypothesis is $H_1: \mu_d \neq 0$, meaning that there is a mean difference between the two medium modalities. The medium modality evaluation indicates that the mobile marketing channel was more

Table 3: Prediction results (Email, Facebook, PersonalBlog, Youtube)

PersonID	Email classification output	Facebookclassification output	PersonalBlog classification output	Youtube classification output
1	None	Veryfreq	None	None
2	Never	Nevervis	Nevervis	Notfrequ
3	Never	Veryfreq	None	None
4	Often	Veryfreq	Frequent	Notfrequ
5	Often	Veryfreq	Veryfreq	Notfrequ
6	Never	Veryfreq	Nevervis	Nevervis
7	Not often	Veryfreq	Frequent	No prediction
8	Not often	Veryfreq	None	No prediction
9	Often	Veryfreq	Veryfreq	No prediction
10	Often	Veryfreq	None	No prediction

Table 4: Prediction results (Google, Twitter, SMS, Whatsapp)

PersonID	Google classification output	Twitter classification output	SMS classification output	Whatsappclassification output
1	None	None	No	None
2	Veryfreq	Notfrequ	No	Veryfreq
3	Veryfreq	None	No	Veryfreq
4	Veryfreq	Frequent	Yes	Veryfreq
5	Veryfreq	Veryfreq	Yes	Veryfreq
6	Veryfreq	Nevervis	No	Veryfreq
7	Veryfreq	Veryfreq	Yes	Veryfreq
8	Veryfreq	None	Yes	Veryfreq
9	Veryfreq	Veryfreq	Yes	Veryfreq
10	Veryfreq	Veryfreq	Yes	Veryfreq

Table 5: Prediction evaluation

PersonID	Email prediction evaluation	Facebook prediction evaluation	PersonalBlogs prediction evaluation	Youtube prediction evaluation
1	Correct	Correct	Correct	Correct
2	Correct	Correct	Correct	Not correct
3	Correct	Correct	Not correct	Correct
4	Correct	Correct	Correct	Correct
5	Correct	Correct	Correct	Not correct
6	Correct	Correct	Correct	Correct
7	Correct	Correct	Correct	Not evaluated
8	Correct	Correct	Correct	Not evaluated
9	Not correct	Correct	Correct	Not evaluated
10	Correct	Not correct	Not correct	Not evaluated
Correctly predicted (%)	90%	90%	80%	67%

Table 6: Prediction evaluation (Google, Twitter, Sms, Whatsapp)

PersonID	Google prediction evaluation	Twitter prediction evaluation	SMS prediction evaluation	Whatsapp prediction evaluation
1	Correct	Correct	Correct	Correct
2	Correct	Correct	Correct	Correct
3	Correct	Not correct	Correct	Correct
4	Correct	Correct	Correct	Correct
5	Correct	Correct	Correct	Correct
6	Correct	Not correct	Correct	Correct
7	Correct	Correct	Correct	Correct
8	Correct	Correct	Correct	Correct
9	Correct	Correct	Correct	Correct
10	Correct	Not correct	Correct	Correct
Correctly predicted (%)	100%	70%	100%	100%

Table 7: Correlation analysis

Parameters	TS	EU	C	CB	SP
TS					
Pearson correlation	1	0.307**	0.480**	0.093	0.383**
Sig. (2-tailed)		0.000	0.000	0.000	0.000
N	548	548	548	548	548
EU					
Pearson correlation	0.0480**	1	0.081	0.357**	0.591**
Sig. (2-tailed)	0.000		0.270	0.064	0.000
N	548	548	548	548	548
C					
Pearson correlation	0.307**	0.081	1	0.357**	0.591**
Sig. (2-tailed)	0.000	0.270		0.000	0.000
N	548	548	548	548	548

Table 7: Continue

Parameters	TS	EU	C	CB	SP
CE					
Pearson correlation	0.093	0.135	0.35**	1	0.419**
Sig. (2-tailed)	0.204	0.064	0.000		0.000
N	548	548	548	548	548
SP					
Pearson correlation	0.383**	0.399	0.591**	0.419**	1
Sig. (2-tailed)	0.000	0.000	0.000	0.000	
N	548	548	548	548	548

efficiently adopted ($M = 1.13$) than the internet marketing channel ($M = 1.97$) as the transaction time, ease of use and network availability in mobile channel is less than that of internet channel as indicated by a significant t-test, $t(9) = -4.27$, $t_{crit} = 2.26$, $p < 0.05$. The null hypothesis is therefore, rejected.

CONCLUSION

In conclusion, this study has been able to develop a model for predicting customer behaviour as regards the marketing channels studied will form the foundation for marketing decision making in small and medium businesses. Such models can be embedded in decision supports systems for marketing purposes. As already established, small and medium business do not have enough funds to engage in general marketing campaigns. Most SMEs don't even have a marketing budget, but if systems like this are available for them to make marketing decisions, they able to acquire more customers through limited resources. This research has been able to make predictions from the structured data gathered using questionnaires. The result obtained from the correlation analysis showed that customers have found mobile marketing enjoyable, convenient and easy to use; however, there is low level of reliability in the security measure of mobile marketing technology than the internet. Similarly, the modality evaluation showed that mobile marketing channel is most preferred to the internet channel.

RECOMMENDATIONS

Our further research will be on predicting customer behaviour using the unstructured data which is assumed to be tailored toward technology acceptance.

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