An Exploratory Study of the Critical Factors Affecting the Acceptability of Automated Teller Machine (ATM) in Nigeria

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ABSTRACT: This paper uses the Technology Acceptance Model (TAM) as a basis for studying critical factors that affects the acceptability of Automated Teller Machine (ATM) in Nigeria. Questionnaire approach was used with the respondents predominantly between 20-29 years old. Factor analysis was used to test which of the factors are the main factors affecting the adoption of the technology in Nigeria. It was discovered that the major factors affecting people's intention to accept ATM are the security issues and poor internet connectivity.

Introduction

The business of banking is basically about efficient service delivery [Sod05]. Consequently, the introduction of facilities that enhance the delivery of banking services in a cost-effective manner is always a welcome development. This is what Information Technology (IT) is all about. As competition in the market place increases, and several modes of delivery for banking products and services, Automated Teller Machine (ATM) has become an important issue, not only in retaining customers but also gaining a competitive advantage while maintaining and growing overall profitability. The introduction and implementation of new technologies in the Nigerian economy has always been known to come along various

degrees of difficulties. Hence the introduction of the (ATM) in the Banking sector of the economy could not have been an entirely different situation.

Consequently, the study of the factors affecting the successful adoption of this technology coupled with the technological, contextual and implementation process is very necessary in order to achieve optimum use of the opportunities presented by this innovation. This paper therefore uses the Technology Acceptance Model (TAM) [Dav89] as the theoretical basis for analyzing the critical factors affecting the acceptance of ATM in Nigeria. TAM has been used primarily to explain the usage of information technology [ML04]. However, recent research has supported its use for investigating IT decision-making [BR02].

1. Literature Review

Information Technology in summary refers to any activity that uses information to fulfill its mission such as those activities whose primary job tasks involve acquiring, building, maintaining, operating and supporting the systems that collect and process information [Uwa00]. Communication technology comprises the physical devices and software that link (connect) various computer hardware components and transfer data from one physical location to another [LL01]. Connectivity has facilitated the use of electronic delivery channels. Distances and geographical locations are no longer barriers to financial transactions. Concerning new technologies and performance enhancement in the banking industry, [Ovi97] states that the new technologies have created an unparalleled wired economy.

The transfer of money from point to point has resulted in turning the actual money into bits and bytes through satellite transponders, fiber optic cables or regular telephone lines. [Bil96] noted that for banks, the new technologies present not only a challenge to adapt but also many opportunities to utilize. In the Nigerian banking sector, Information technology came to the fore as a result of calls for rapid economic development and the need to be at par with major world banking standards for easier international trade and exchange. In line with this goal in mind, various banking technologies were introduced. Amongst these were Electronic banking systems such as Automated Teller Machines, Point of Sales Terminals, Electronic Funds Transfer, and Tele-banking. The Automated Teller Machine (ATM) had the most significant impact on the common man out of all these technologies.

ATM like other technologies usually comes along with some limiting factors and individual problems. Despite these problems, it is universally agreed that the benefits derived from electronic payment cannot be over emphasized. Numerous studies have shown that electronic payment brings many benefits to users – convenience, security, record-keeping, low cost, etc. Nigeria is largely a cash-based economy with over 90% of funds residing outside the banking sector as against the developed world where the money in circulation is 4% and 9% in the UK and US respectively [Ovi02]. The cash-based economy is characterized by the psychology to physically hold and touch cash: a culture informed by ignorance, illiteracy, and lack of security consciousness and appreciation of merits digital payment. In this case, TAM is proposed to study the critical factors affecting the acceptability of ATM in Nigeria. Similar work was carried out by [FA06] on factors affecting the adoption of e-Commerce in Nigeria.

2. Technology Acceptance Model

In studying user acceptance and use of technology, the TAM is one of the most cited models. The Technology Acceptance Model (TAM) was developed by Davis to explain computer-usage behavior. The theoretical basis of the model was Fishbein and Ajzen's Theory of Reasoned Action (TRA). The Technology Acceptance Model (TAM) is an information systems (System consisting of the network of all communication channels used within an organization) theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new software package or technology, a number of factors influence their decision about if, how and when they will use it. TAM posits that perceived ease of use and perceived usefulness predicts attitude toward use of a technology. Then, attitude toward use predicts the behavioral intention to use.

Finally, intention predicts the actual use of that technology [Dav89]. A variety of applications have been used to validate the model [ML04]. For example, it was employed to study user acceptance of microcomputers [IGD95], the World Wide Web [LMSZ00], software, and decision support systems [MD97]. Figure 1 describes the model.

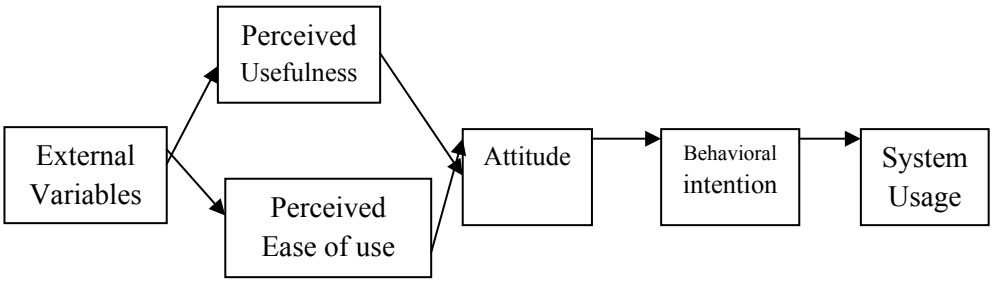

Figure 1: Technology Acceptance Model

Perceived usefulness (PU) - This was defined by Fred Davis [Dav89] as "the degree to which a person believes that using a particular system would enhance his or her job performance". That is, the prospective adopter's subjective probability that applying the new technology from outside sources will be beneficial to his personal and/or the adopting company's or user's well being.

Perceived ease-of-use (PEOU): Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" [Dav89]. It is the degree to which the prospective adopter expects the new technology adopted to be free of effort regarding its transfer and utilization.

Attitude: Attitudes are made up of beliefs that a person accumulates over his lifetime. Some beliefs are formed from direct experience, some are from outside information and others are inferred or self generated. These beliefs are called salient beliefs and they are said to be the intermediate determinant of a person's altitude. An attitude therefore is a person's salient belief about whether the outcome of his action will be positive or negative.

Intention: intention(s) are the probability that a person will perform a behavior; it is made up of the attitudes and the subjective norms.

3. Proposed Research Model

Using the TAM described in section 2, we then formulated our model to suit the purpose of this study. The model is shown in figure 2.

Here in the model, our external variables are security, cost and internet connectivity.

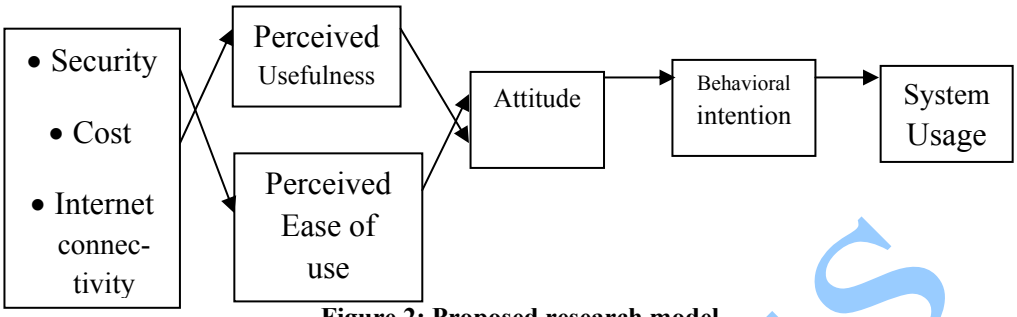

Figure 2: Proposed research model

4. Data Collection and Analysis

The respondent population was composed of individuals from different educational and occupational backgrounds, age groups, genders and locations in Nigeria. The questionnaires administered went through several tests to check the validity of the constructs used and the standard. It was first pre-tested among convenience colleagues who has understanding about the study to comment on the relevance and wordings of the questionnaire items, length of survey and time taken to complete the questions and it was also reviewed carefully by professionals with extensive international experience who critically evaluate the questions formulated relating to Technological Acceptance Model constructs. The comments and suggestions of these professionals regarding the clarity, validity and consistency of the questions were incorporated into the survey instrument, some of these questionnaire items were eventually dropped, its layout was modified and the wordings of some of the questions were modified to improve its quality. Three hundred and fifty questionnaires were finally distributed and the total of 200 responses were received which showed a response a response rate of 57.1% and out of the 200 received, 50 were found to be incomplete and therefore invalid. Hence, a total of 150 questionnaires were received and used. The variables used in this study were measured on a 5 point likert scale anchored by 1(Strongly Disagree), 2(Disagree), 3(Neutral), 4(Agree), 5(Strongly Agree). It also had a series of non-scaled questions. The questionnaires returned were considered for analysis and the results were reported in the next section.

5. Results and Discussion

From the exploratory data analysis, it was observed that 95 of the respondents were male representing 63.3% of the total population studied while 55 respondents were female representing 36.7%. Also from table 2, it was observed that respondents falling within the age range 15 – 19 years represented only 15 (10%), 20 – 29 years were observed to use the ATM more with 104 (69.3%) respondents. 30 – 39 years represented 17.3%, 40 – 49 years represented only 2% of the total respondents, while respondents with ages above 50 years were observed to use less of the ATM owing to their representation in the study of 1.3% alone. The educational background also reveals that a larger proportion of the respondents are B.Sc/HND holders, forming a total percentage of 48.7% (73 respondents). 48 (32.0%) of the respondents are OND holders, 19(12.7%) of the respondents had only secondary level education, while holders of primary level education were 2(1.3%). Respondents categorized as having an educational level tagged as others represents 8(5.3%) of the total respondents. This statistics showed that a greater proportion of the respondents are "highly" educated, and is assumed as literate enough. For clarity, frequency distribution of respondents on demographics issues is presented in Table 1.

Table 1: Frequency distribution for respondent's demographics

	Nos of respondents	Percentage(%)
Sex		
Male	95	63.3
Female	55	36.7
Age		
15-19	15	10
20-29	104	69.3
30-39	26	17.3
40-49	3	2
50 and above	2	1.4
Educational background		
Primary	2	1.3
Secondary	19	12.7
OND	48	32
Bsc/HND	73	48.7
Others	8	5.3
TOTAL	150	100

The next output from the analysis is the correlation coefficient. A correlation matrix is simply a rectangular array of numbers which gives the correlation coefficients between a single variable and every other variable in the investigation. The correlation coefficient between a variable and itself is always 1; hence the principal diagonal of the correlation matrix contains 1's. The correlation coefficients above and below the principal diagonal are the same. The determinant of the correlation matrix is shown at the foot of the table 2.

Table 2: Correlation Matrix Output

Correlation Matrix[a]

		PU1	PU2	PEOU 1	PEOU 2	PEOU 3	BITU1	BITU2	BITU3	SECURITY 1	SECURITY 2	ATTITUDE 1	ATTITUDE 2	COST 1	COST 2	PIC1	PIC2
Correlation	PU1	1.000	.294	.270	.092	.232	.056	.068	.237	-.069	-.099	.056	.052	.123	.245	.059	.008
	PU2	.294	1.000	.346	.350	.040	.179	.215	.163	.129	.166	.168	.110	.149	.106	.166	.259
	PEOU1	.270	.346	1.000	.467	.350	.236	.309	.274	.083	.144	.268	.093	.252	.158	.149	.175
	PEOU2	.092	.350	.467	1.000	.298	.247	.277	.271	.141	.219	.253	.124	.192	.248	.213	.237
	PEOU3	.232	.040	.350	.298	1.000	.135	.126	.074	.100	.051	.206	-.010	.087	.213	.130	.086
	BITU1	.056	.179	.236	.247	.135	1.000	.352	.153	.490	.286	.345	.127	.121	.110	.299	.319
	BITU2	.068	.215	.309	.277	.126	.352	1.000	.293	.342	.365	.351	-.014	.121	.247	.418	.429
	BITU3	.237	.163	.274	.271	.074	.153	.293	1.000	.196	.171	.196	.210	.297	.249	.045	.165
	SECURITY1	-.069	.129	.083	.141	.100	.490	.342	.196	1.000	.334	.286	-.039	.106	.093	.251	.417
	SECURITY2	-.099	.166	.144	.219	.051	.286	.365	.171	.334	1.000	.424	.228	.176	.098	.430	.465
	ATTITUDE1	.056	.168	.268	.253	.206	.345	.351	.196	.286	.424	1.000	.461	.215	.295	.327	.404
	ATTITUDE2	.052	.110	.093	.124	-.010	.127	-.014	.210	-.039	.228	.461	1.000	.286	.175	.081	.097
	COST1	.123	.149	.252	.192	.087	.121	.121	.297	.106	.176	.215	.286	1.000	.277	.117	.111
	COST2	.245	.106	.158	.248	.213	.110	.247	.249	.093	.098	.295	.175	.277	1.000	.311	.287
	PIC1	.059	.166	.149	.213	.130	.299	.418	.045	.251	.430	.327	.081	.117	.311	1.000	.638
	PIC2	.008	.259	.175	.237	.086	.319	.429	.165	.417	.465	.404	.097	.111	.287	.638	1.000

a. Determinant = 1.328E-02

The result showed that all the variables correlated fairly well and none of the correlation coefficient is particularly large. Therefore, there is no need to eliminate any variable at this point. Also, it can be noticed from the table that SECURITY1 variable has the highest positive relationship with BITU1 (Behavioral Intention to Use) with a correlation coefficient of 0.490 followed by PIC2 with a correlation coefficient of 0.429. Also, Both SECURITY2 and PIC2 have the highest positive relationship with ATTITUDE1 after ATTITUDE2. We can make some inferences here that both security issues and poor internet connectivity affect the attitude of ATM users which directly or indirectly now influence their intention negatively towards the use of the technology. The determinant was used to

test for multicollinearity and since this is greater than 0.0001 (specifically, it is 0.01328), which then implies that multicollinearity is not the problem of these data.

Table 3 also showed the Kaiser-Meyer-Olkin (KMO) and Bartlett's test. It showed the sample is adequate since the value of KMO is 0.770 which confirmed the appropriateness of proceeding in the analysis since it is greater than 0.5. That is, the number of respondents is sufficient to generalize result.

Table 3: KMO test result

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.770
Bartlett's Test of Sphericity	Approx. Chi-Square	604.317
	df	120
	Sig.	.000

Table 4 shows all the factors extractable from analysis along with their eigenvalues, the percentage of variance attributed to each factors and also shows the cumulative variance of the factors and previous factors. In the final part of table 4, the eigenvalues of the factors after rotation are displayed and thus has effect of optimizing the factor structure and one consequence for these data is that the relative importance of the five factors are equalized. Before rotation, factor 1 accounted for considerably more variance than the other factors (26.998, 11.545, 8.613, 6.865, 6.372) compared to after rotation (16.031, 11.712, 11.451, 11.116, 10.083).

Table 5 shows the component matrix after varimax rotation and all the loadings less than 0.6 were suppressed in the output so there are blank spaces for many of the loadings less than 0.6. It can be observed from the table that SECURITY1, BITU1 and SECURITY2 load on factor 1, PIC1, COST2 and PIC2 load on factor 2 etc. According to Nunnually's recommendation, the entire primary factor loading should be greater than 0.5 but for these test, all factor loadings were greater than 0.6 which demonstrates a good match between each factor and related variables.

Table 4: Principal Component Analysis

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.320	26.998	26.998	4.320	26.998	26.998	2.565	16.031	16.031
2	1.847	11.545	38.543	1.847	11.545	38.543	1.874	11.712	27.744
3	1.378	8.613	47.156	1.378	8.613	47.156	1.832	11.451	39.194
4	1.098	6.865	54.022	1.098	6.865	54.022	1.779	11.116	50.310
5	1.019	6.372	60.393	1.019	6.372	60.393	1.613	10.083	60.393
6	.990	6.185	66.578						
7	.864	5.397	71.975						
8	.738	4.613	76.588						
9	.676	4.228	80.816						
10	.615	3.842	84.658						
11	.541	3.379	88.037						
12	.485	3.029	91.066						
13	.425	2.653	93.719						
14	.378	2.363	96.083						
15	.335	2.094	98.177						
16	.292	1.823	100.000						

Extraction Method: Principal Component Analysis.

Table 5: Rotated Component Matrix

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
SECURITY1	.741				
BITU1	.677				
SECURITY2	.607				
BITU2					
PIC1		.767			
COST2		.666			
PIC2		.650			
PU2			.724		
PU1					
BITU3					
ATTITUDE2				.862	
ATTITUDE1					
COST1					
PEOU3					.881
PEOU1					
PEOU2					

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 8 iterations.

Since the two security constructs loaded on factor 1 and the two PIC constructs loaded on factor two, this shows their level of importance to this study, and due to the consistency of this factors in the previous results of this analysis, we can conclude that among all other factors affecting the

acceptance of ATM technology, security and internet connectivity are the most significant factors that influence people's intention to its actual usage. Even though Perceived Ease of Use has the highest factor loading, it was loaded on the last extractable factor, so it cannot be referenced as critical factor.

Conclusions

Many factors were tested to be influencing the acceptance of Automated Teller Machine in Nigeria i.e. influencing the willingness of people to use this method of transaction in the banking sector. It can be stressed that all the factors: the perceived usefulness, the perceived ease of use, poor internet facilities and network, cost, attitude and intention directly and indirectly influence the actual usage which makes TAM a suitable framework for this study.

However, security and poor internet and network connectivity were found to be the most significant factors that affect the full acceptance of the technology in Nigeria. Also, surprisingly our result differs a little bit from the model adapted from Davies [Dav89], which depicted that external variables can only have an indirect relationship with peoples intention and attitude, our result showed that these two significant factors have direct effect on people attitude and intention about the use of ATM, so this model can be extended through their relationships reformulation for further studies.

Also, though perceived usefulness and ease of use were seen to affect behavioral intention to use being the only factor loading on component three and the other having the highest factor loading, they cannot be classified as critical factors because of their inconsistencies in our formal results. Therefore, this study will serve as an eye-opener for administrators of the banking sector, indicating to them that much improvement should be made in the area of customer's information and other security issues relating to the use of ATM. Also that efficient internet and network connectivity that exist between banks should be considered of high priority so as to meet up with people's expectation about the technology and also change people's negative intention which eventually increases the actual usage of ATM technology in the country.

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