Unified Theory of Acceptance and Use of Technology in Evaluating Voters' Intention Towards the Adoption of Electronic Forensic Election Audit System

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ORIGINAL RESEARCH

ABSTRACT: Electronic voting systems have been introduced to improve the efficiency, accuracy, and transparency of the election process in many countries around the world, including Nigeria. However, concerns have been raised about the security and integrity of these systems. One way to address these concerns is through the implementation of electronic forensic election audit systems. This study aims to evaluate voters' intention to the adoption of electronic forensic election audit systems using the Unified Theory of Acceptance and Use of Technology (UTAUT) model which is a robust and reasonable theory for technology acceptance. In the study, the UTAUT model which is a widely used model in the field of information systems to explain the factors that influence individuals' intention to use a technology by integrating performance expectancy, effort expectancy, social influence, facilitating conditions, cost factor and privacy factor to voters' behavioural intention was proposed. A total of 294 sample data were collected from a selected population of electorates who had at one time or the other participated in at least an electioneering process in Nigeria. The data was then analyzed statistically using Partial Least Square Structural Equation Modeling (PLS-SEM). The results obtained show that all variables have significant effect on the electorates' behavioral intention to adopt the development and implementation of electronic forensic election audit system in Nigeria.

Keywords: Election audit; Voters; UTAUT; Behavioural intention.

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1 INTRODUCTION

T he use of electronic voting systems has gained popularity in many countries around the world due to its potential to improve the efficiency and accuracy of the election process. However, electronic voting systems have also raised concerns about the security and integrity of the election process (Okediran, Omidiora, Olabiyisi and Ganiyu, 2013; Okediran and Ganiyu, 2015; Igwe, 2019). Electronic forensic election audit systems have been proposed as a way to address these concerns by providing a reliable means of ensuring and verifying the accuracy and integrity of the election process and also provide an independent verification of the election results. The Unified Theory of Acceptance and Use of Technology (UTAUT) model is a widely used model in the field of information systems that seeks to explain the factors that influence individuals' intention to use a technology (Carter, 2005).

The UTAUT model identifies four key constructs that influence individuals' intention to use a technology: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to the degree to which an individual believes that using the technology will help them perform better. Effort expectancy refers to the degree to which an individual believes that using the technology will be easy. Social influence refers to the degree to which an individual is influenced by the opinions of others. Facilitating conditions states the degree to which an individual believes that the necessary resources and support are available to use the technology (Cheng, 2017). Several studies have applied the UTAUT model to examine individuals' intention to adopt various forms of technology, such as online banking, mobile payment, and e-government services (Davis, 1989). However, there is a limited amount of research that has applied the UTAUT model to examine individuals' intention to adopt electronic forensic election audit systems, especially in the context of developing countries like Nigeria.

The aim of this study is to evaluate the voters' intention to the adoption of electronic forensic election audit systems using the UTAUT model. Specifically,

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the study will investigate the influence of the six UTAUT constructs on voters' behavioral intention to adopt electronic forensic election audit systems in Nigeria.

2. REVIEWS OF UTAUT MODEL IN THE ADOPTION OF ELECTRONIC FORENSIC ELECTION AUDIT SYSTEM

Electronic forensic election audit systems have gained attention as a means to enhance the transparency, integrity, and trustworthiness of electoral processes. These systems utilize technology to facilitate the auditing of election results, ensuring accuracy and detecting any anomalies or irregularities. However, the successful implementation and adoption of such systems rely heavily on the acceptance and support of the voters. This literature review aims to explore the factors influencing voters' disposition towards the adoption of electronic forensic election audit systems, utilizing the UTAUT as the theoretical framework.

The Technology Acceptance Model, originally proposed by Davis (Davis, 1989), serves as the foundation for understanding individuals' acceptance and use of technology. TAM focuses on two key determinants: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). PU refers to the extent to which an individual believes that utilizing a technology system would enhance their performance, while PEOU measures the perceived ease or difficulty of using the system. TAM has been widely used in various domains to investigate technology adoption behavior.

Building upon TAM, Venkatesh (Yogesh and Dennis, 1999), developed the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT integrates several constructs that influence technology acceptance, including Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Performance Expectancy is akin to TAM's Perceived Usefulness, while Effort Expectancy aligns with PEOU. Social Influence considers the impact of social factors on individuals' attitudes and intentions to use technology, and Facilitating Conditions address the availability of necessary resources and support for technology usage.

Perceived Usefulness is a crucial factor in the adoption of electronic forensic election audit systems. Studies have highlighted the significance of perceived usefulness in fostering trust, ensuring election integrity, and enhancing transparency in the electoral process (Venkatesh, Thong and Xu, 2012). Voters are more likely to embrace these systems when they perceive them as valuable tools for accurate and reliable election auditing. The ease of use of electronic forensic election audit systems influences voters' adoption decisions. If the systems are user-friendly, intuitive, and require minimal effort to operate, voters are more likely to accept and utilize them (Richard and Ben-Tzion, 2010). Ensuring that the systems are accessible to individuals with varying levels of technological proficiency is vital for widespread adoption.

Social influence plays a significant role in shaping voters' attitudes towards electronic forensic election audit systems. Studies have shown that the opinions, recommendations, and experiences of influential individuals or groups, such as political leaders, election officials, and trusted community members, can significantly impact voters' acceptance (Venkatesh, Morris, Davis and Davis, 2003; Moon and Kim, 2001). Positive social influence, coupled with effective communication strategies, can foster trust and credibility in the technology. The availability of necessary resources and support for the adoption of electronic forensic election audit systems is crucial. Studies have highlighted the importance of infrastructure, such as reliable internet connectivity, secure data storage, and technical support, in facilitating system adoption (Al-Gahtani, 2016; Marie-Pierre, Patrice, Julie and Marie, 2016). Ensuring that the required infrastructure and resources are in place is essential for voters to feel confident in using the technology.

The perceived privacy and security of electronic forensic election audit systems are critical factors in voters' acceptance. Voters must have confidence that their personal information and voting choices are secure and protected from unauthorized access (Rho, Kim, Chung and Choi, 2015; Mi, Hun, Kyungyong and In, 2015). Addressing privacy concerns and implementing robust security measures can enhance trust and encourage adoption while Perceived price value encompasses the cost associated with the adoption and use of electronic forensic election audit systems (Davis, Bagozzi, and Warshaw, 1989). Voters consider the financial implications of adopting the systems, including the initial acquisition cost of devices, subscription fees, and any additional expenses. Perceived value for the price paid is a significant factor influencing adoption decisions (Rolf, Maarten and Mary, 2007.

3 METHODOLOGY

In the demographic information, 294 returned questionnaires by voters were used to evaluate the acceptance of forensic election audit system using UTAUT model, A descriptive analysis was applied for the demographic information collected in the survey. Statistics for the general questions in the survey were calculated. From Table 1; it was indicated that 59.5% (175) of the respondents were male while 40.5% (119) of the respondents were female. It also showed that 18.7% (55) of the respondents were within the age of 18-25 years, 39.1% (115) of them were within the age range 26-40 years, 38.8% (114) of them were within the age range 41-60 years and 3.4% (10) of the respondents were above 60 years of age.

Furthermore, in terms of academic qualification, 0.3% (1) of the respondents had primary education, 7.5% (22) of them had secondary education, 77.9% (229) were of tertiary education level while 14.3% (42) of the respondents had other qualifications. From Table 1, with respect to years of participation in election; 12.9% (30) of the respondents participated not more than 1 year, 23.8% (70) of them had participated for 5 years, 35.4% (104) for 10 years while 27.9% (82) of the respondents participated for more than 20 years. Moreover, with respect to category of participants in an election, about 52.0% (153) of the respondents were voters, 17.7% (52) were electoral officials, 14.3% (42) categorized as legal practitioners while 16.0% (47) were politicians.

Table 1: Descriptive Statistics of Demographic Information

FACTOR	GROUP	FREQ	PERCENT
GENDER	Male	175	59.5
	Female	64	40.5
	Total	294	100.0
AGE	18-25	55	18.7
	26-40	115	39.1
	41-60	114	38.8
	Over 60	10	3.4
	Total	294	100.0
EDUCATION	Primary	1	0.3
	Secondary	22	7.5
	Tertiary	229	77.9
	Other	42	14.3
	Total	294	100.0

ELECTION PARTAKING	1 Year	38	12.9
	5 Years	70	23.8
	10 Years	104	35.4
	Over 20 Years	82	27.9
	Total	294	100.0
PARTAKERS CATEGORY	Voter	153	52.0
	Electoral	52	17.7
	Legal	42	14.3
	Politician	47	16.0
	Total	294	100.0

4   RESULTS

4.1   RESULTS OBTAINED BASED ON RELIABILITY ANALYSIS

Reliability analysis of collected data from the distributed questionnaire through assessment the level of internal consistency among the factors of the UTAUT model used in this study was carried out. Consequently, Cronbach's Alpha was used to examine the reliability among the factors of UTAUT. Responses from various individuals to the questionnaire and Cronbach's values showed that all the factors in the UTAUT are reliable and suitable for this study. Performance Expectancy(PE) (0.860), Effort Expectancy(EE) (0.803) have Cronbach's Alpha Coefficient greater than 0.7 This means high reliability while Social Influence(SI) (0.535), Facilitating Conditions(FC) (0.671), Behavioural Intention(BI) (0.666), Cost Factor(CF) (0.575) and Privacy Factor(PF) (0.559) had Cronbach's Alpha Coefficient greater than 0.5 which indicated moderate reliability.

The results of the Cronbach Alpha Coefficient of all items showed a coefficient of 0.907. The reliability result showed high consistency. Consequently, there were high reliability and internal consistency among those different factors in the UTAUT model. Therefore, the UTAUT model built for this research is suitable for the purpose as depicted in Table 2.

4.2   Results Obtained Based on The UTAUT Model for Election Audit System

Figure 1 showed the research model for the election audit system. Correlation and regression analysis were carried out between the factors of the modified UTAUT model

and intention to use the forensic election audit system with respect to stakeholders in any election.

Since election audit system is not in use in this part of the world, reference could not be made to any existing system that could produce an initial value as constant. Hence, constant was not included in the UTAUT model because it is insignificant (P> .05) with respect to the various factors that influenced the adoption of the need for a forensic audit framework. The analyses were thus carried out based on the sample of eligible voters who had taken part in at least one recent election as stakeholders in an election.

Table 2: Reliability Analysis of the UTAUT Model for Forensic Election Audit

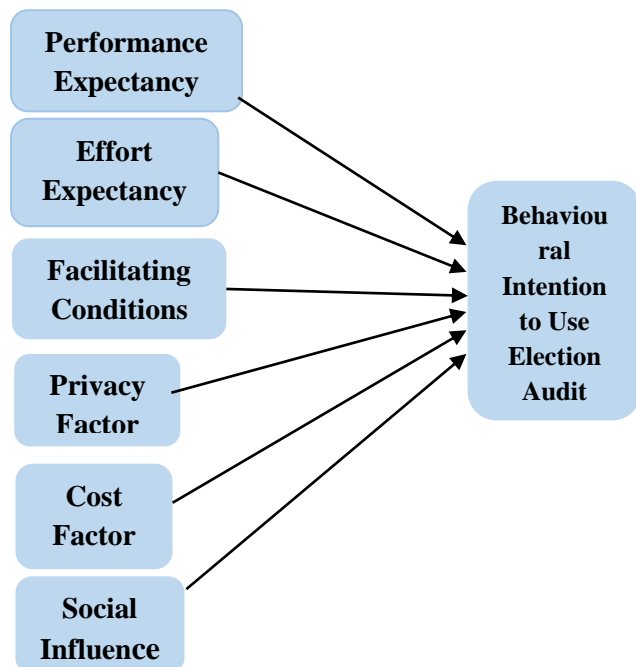| UTAUT Indicators	Cronbach's Alpha	Number of Items
PE	0.860	4
EE	0.803	3
SI	0.535	3
FC	0.671	3
BI	0.666	3
CF	0.575	2
PF	0.559	2
All items	0.907	20

Fig. 1: The Election Audit Model

4.3 OBTAINED RESULTS BASED ON CORRELATION AND REGRESSION ANALYSIS

A correlation analysis of the research model was performed and the result of the calculation of Spearman's correlation coefficient measuring the strength of association between two variables is as shown in Table 3 for the sample of voters used. From the table, all of the factors are correlated to each other. According to correlation coefficient, it showed the strong correlation between cost factor and behavioral intention to use the election audit system while other factors are moderately correlated among these relationships. It was revealed that PE ($r = 0.508$**, $P < 0.01$), EE ($r = 0.541$**, $P < 0.01$), SI ($r = 0.404$**, $P < 0.01$), FC ($r = 0.549$**, $P < 0.01$), CF ($r = 0.781$**, $P < 0.01$) and PF ($r = 0.440$**, $P < 0.01$) have significance level of positive interaction with (BI) to use election audit system. The implication of the results presented is that voters have high discernment for forensic election audit to be an essential component of voting process.

Table 4 revealed that the linear combination of performance expectancy, effort expectancy, social influence, facilitating conditions, cost factor, privacy factor and behavioural intention to use the election audit system was significant $F = 131.047$; $R = 0.856$, $R^2 = 0.733$, Adj. $R^2 = 0.727$; $P < 0.01$. The independent/predictor variables jointly accounted for a variation of about 73.3% in behavioural intention to use the election audit system. The values in the table also showed the various relative contributions and levels of significance of the independent variables: PE ($\beta = 0.114$, $P < 0.05$), EE ($\beta = 0.236$, $P < 0.01$), SI ($\beta = 0.089$, $P < 0.05$), FC ($\beta = 0.093$, $P < 0.01$), CF ($\beta = 0.845$, $P < 0.01$), PF ($\beta = 0.098$, $P < 0.05$) respectively.

All the independent variables jointly and independently predict voters' behavioural intention to use the election audit system. The result indicated that 5% increase in performance expectancy increased the behavioural intention to use the election audit system by 11.4%, 1% rise in effort expectancy increased the behavioural intention to use the election audit system by 23.6%, 5% increase in social influence raised the behavioural intention to use the election audit system by 8.9%, 1% rise in facilitating conditions increased the behavioural intention to use the election audit system by 9.3%,

1% increase in cost factor increased the behavioural intention to use the election audit system by 84.5% and 5% increase in privacy factor raised the behavioural intention to use the election audit system by 9.8%.

Table 3: Correlation Coefficients Analysis of the UTAUT Model for Voters

		Behavioural Intention
Behavioural Intention (BI)	Correlation Coefficient Sig. (2-tailed) N	1.000 294
Performance Expectancy (PE)	Correlation Coefficient Sig. (2-tailed) N	0.508** 0.000 294
Effort Expectancy (EE)	Correlation Coefficient Sig. (2-tailed) N	0.541** 0.000 294
Social Influence (SI)	Correlation Coefficient Sig. (2-tailed) N	0.404** 0.000 294
Facilitating Conditions (FC)	Correlation Coefficient Sig. (2-tailed) N	0.549** 0.000 294
Cost Factor (CF)	Correlation Coefficient Sig. (2-tailed) N	0.781** 0.000 294
Privacy Factor (PF)	Correlation Coefficient Sig. (2-tailed) N	0.440** 0.000 294

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4: Regression Analysis of the UTAUT Model for Voters

Variables	PE	EE	SI	FC	CF	PF
F Ratio	131.047					
Sig of P	0.000					
R	0.856					
R^2	0.733					
Adj R^2	0.727					
B	0.114	0.236	0.089	0.093	0.845	0.098
t	1.997	3.926	2.089	2.949	13.636	2.185
P	0.047	0.000	0.038	0.003	0.000	0.030

On the average, the result predicted that the behavioural intention to use the election audit system is supported by 1.475 (0.114+0.236+0.089+0.093+0.845+0.098) for each unit in the six factors of the UTAUT model. The regression model is presented in the equation below while the structural model result could be seen in Figure 2.

$$BI_{EAS} = 0.114P_E + 0.236E_E + 0.089S_I + 0.093F_C + 0.845C_F + 0.098P_F \qquad (1)$$

where:

BI_{EAS} = Behavioural intention to use the election audit system

P_E = Performance expectancy

E_E = Effort Expectancy

S_I = Social influence

F_C = Facilitating Conditions

C_F = Cost factor

P_F = Privacy Factor

Therefore, the regression model showed the acceptance of behavioural intention to use the election audit system and the attitude of the voters based on UTAUT model showed significant positive acceptance of the election audit system.
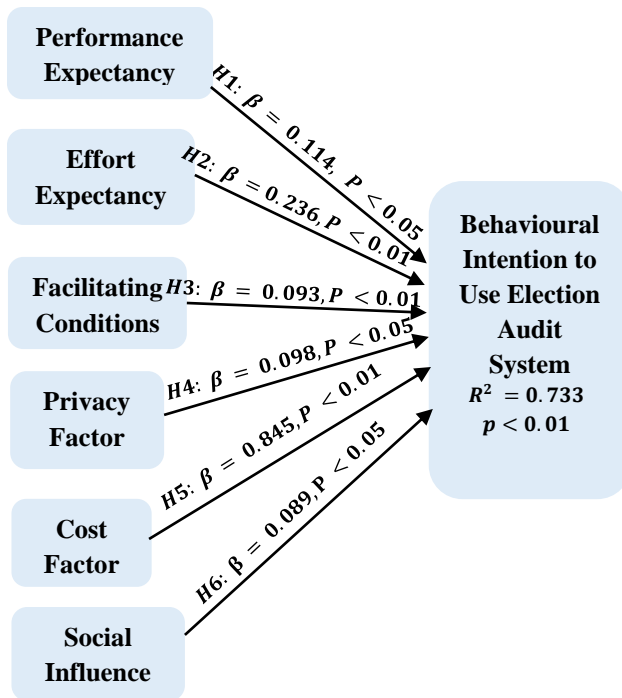
Fig. 2: Structural Model Results for Voters

4.4   HYPOTHESIS RESULT

Hypotheses were tested one by one based on the result of regression analysis. The tested hypotheses were accepted with the summary result presented in Table 5 and the implications of accepting these hypotheses were discussed further.

Table 5: Result of Hypotheses Test

Hypotheses	Results
H1: Voter's performance expectancy positively affects the behavioural intention to use election audit system.	Accepted
H2: Election audit system's effort expectancy positively affects the behavioural intention to use Election audit system.	Accepted
H3: Voter's social influence positively affects the behavioural intention to use election audit system.	Accepted

H4: Election audit system's facilitating conditions positively affects the use behavior of Election audit system.	Accepted
H5: The cost of Election audit system positively affects the behavioural intention to use Election audit system.	Accepted
H6: The privacy condition of Election audit system positively affects the behavioural intention to use Election audit system.	Accepted

H1: Voter's performance expectancy positively affects the behavioural intention to use electronic forensic election audit system. The relative contribution of voter's Performance expectancy to behavioural intention to use the election audit system was significant at $\beta = 0.114$, P <.05. The result showed that voters believed that using the forensic election audit system will help them perform better or make the election process smoother, they are more likely to want to adopt the use of the system because 5% increase in voter's performance expectancy will increase the behavioural intention to use the election audit system by 11.4%. This hypothesis was thus accepted.

H2: Election audit system's effort expectancy positively affects the behavioural intention to use electronic forensic election audit system. When the election audit system is easy to use and doesn't require a lot of effort, people are more likely disposed to its usability. This reflected in the relative contribution of the forensic election audit system's effort expectancy to behavioural intention to use the election audit system as it was significant at $\beta = 0.236$, P < 0.01. The result showed that 1% increase in effort expectancy will increase the behavioural intention to use the election audit system by 23.6%. This hypothesis was thus accepted.

H3: Voter's social influence positively affects the behavioural intention to use the electronic forensic election audit system because they feel that their friends, family, or others they trust reflect using the

forensic election audit system is a good idea and they are more likely to want to use it. The relative contribution of voter's social influence to behavioural intention to use the election audit system was significant at $\beta = 0.089$, $P < 0.05$, The result revealed that 5% increase in social influence will increase the behavioural intention to use the election audit system by 8.9%. This hypothesis was thus accepted.

H4: When the election audit system provides favorable conditions, like having the necessary resources and support available, people are more likely to actually use the electronic forensic election audit system. This is because facilitating conditions positively affects the use behavioral use of Election audit system. The relative contribution of election audit system's facilitating conditions to behavioural intention to use the election audit system was significant at $\beta = 0.093$, $P < 0.01$. The result shows that 11% increase in facilitating conditions will increase the behavioural intention to use the election audit system by 9.3%. This hypothesis was thus accepted.

H5: The cost of Election audit system positively affects the behavioural intention to use the electronic forensic Election audit system. If the cost associated with using the election audit system is seen as reasonable and worthwhile, people are more likely to support the use of this system. This is because the relative contribution of election audit system's cost to behavioural intention to use the election audit system was significant at $\beta = 0.845$, $P < 0.01$, 1% increase in cost factor will increase the behavioural intention to use the election audit system by 84.5%. This hypothesis was thus accepted.

H6: People's believe that using the election audit system won't compromise their privacy and that their personal information will be handled securely, will make more people likely want to use the electronic forensic election audit system. The privacy condition of Election audit system positively affects the behavioural intention to use Election audit system. The relative contribution of election audit system's privacy condition to behavioural intention to use the election audit system was significant at $\beta = 0.098$, $P < 0.05$. The result showed that 5% increase in privacy factor will increase the behavioural intention to use the election audit system by 9.8%.

5 CONCLUSION

Understanding the factors influencing voters' disposition towards the adoption of electronic forensic election audit systems is crucial for successful implementation and utilization. The Technology Acceptance Model, particularly the Unified Theory of Acceptance and Use of Technology, provides a comprehensive framework for investigating these factors. Perceived Usefulness, Perceived Ease of Use, Social Influence, and Facilitating Conditions are core constructs that influence adoption decisions. Additionally, extended constructs such as Subjective Norms, Perceived Compatibility, Perceived Privacy, Perceived Security, Perceived Price Value, and Perceived Trust provide further insights into voters' acceptance behavior. Addressing these factors and promoting positive attitudes towards electronic forensic election audit systems can contribute to transparent, reliable, and trusted electoral processes.

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