AN EMPIRICAL INVESTIGATION OF THE MODERATING EFFECTS OF WORK EXPERIENCE AND POSITION ON THE E-VOTING ADOPTION

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ABSTRACT: Advances in technologies and devices have made the use of electronic voting increasingly important in the conduct of elections, especially in the developing countries where vote rigging and manipulations are some of the challenges affecting the conduct of free, fair, and credible elections. Evidences have shown that electronic voting technology can deliver credible, fraud free-elections in Nigeria. This study examines the moderating effects of *work experience* and *position* on the perception of staff of the Independent National Electoral Commission of Nigeria based on a survey of 380 participants (managerial and operational cadre) using multi-group analysis (*non-parametric*) of partial least square-structural equation modelling. The results found that the attitude of the participants on the benefits of E-voting adoption by the electoral organization differs between the managerial and operational cadre. The implications for research, practice, and future research directions are discussed.
KEYWORDS: E-Voting, Adoption, Moderating effect, Work experience, Position, INEC, Nigeria

1. Introduction

The main aim of public organisation's adoption of IT innovations is to improve the quality of life, build better and stronger communities in which services would be delivered to the users and citizens [WDD10]. One of such IT innovations is the E-voting technology that enables registered voters cast a ballot during elections. [Rog95] Suggests that, the capabilities of the IT innovations largely depend on: (1) the characteristics of the organisation (2) its work systems (3) its people (4) its development and implementation methodologies. All these determine the extent to which the aims of IT innovations could be achieved.

The adoption and implementation of E-voting technology into the conduct of elections in some developed democracies such as United States of America, India and Brazil has reduced voter's apathy, improved voters turnout during elections, and ensured, largely, the accuracy of vote count [A+09a]. The adoption of E-voting technology by developing democratic countries is not only expected to prevent, but also eliminate problems of ballot stuffing, ballot snatching, votes and voters records manipulations, among others [Umo06, A+09b, ACE11]. E-voting technology innovation must ensure that the right to cast a vote is restricted to only those who are eligible. Votes are counted only once, voter's opinions are expressed without undue influence, protection of vote secrecy at every voting stage, accessibility of voting to all voters, particularly to persons with disabilities, and maximization of information transparency in order to increase voter's confidence [ACE11].

Therefore, E-voting technology is a tool for advancing democracy, building trust in electoral management, increasing credibility in election results and generally improving the totality of the electoral process. Some of the world's largest democracies use E-voting in polling stations. Internet voting as used in some countries today was originally used by smaller and historically conflict-free countries such as Estonia [IDE11]. Many countries are currently considering the introduction of E-voting technology and are running a variety of pilot projects [ACE11, IDE11]. Several studies support the need to adopt, implement and use E-voting technology in Nigeria in order to achieve transparent, efficient, accurate and credible electoral system [Ite06, Umo06, AAF08, AO09, F+10].

Among factors influencing the adoption of IT innovations in organizational context, are the technological readiness, organisational readiness, environmental factors, perceived benefits, users participation in system development and ICT training and skills of adopting such innovation [TF90, BH94, Rog95, IBD95, Fol04]. Studies have established a positive direct relationship between these factors and the adoption of an IT innovation in the organizational context [BOI86, LS00, CBD01, MB01, LGF02, GK04, TS04, B+05, ML05, TTM07, Has07, KFR08, HW08, D+08, T+09, AN09a, AN09b, Gib10, Alv11, Men11, I+11, Bak12, ME12,

Zou13]. Findings equally, suggest that, the assumption that these factors (independent variables) directly affect the adoption of an IT innovation (dependant variable) within the organisational context without the influence or moderating effect of other variables cannot hold because respondents may likely differ (heterogeneous) in their perception and evaluation of research variables, resulting in significant differences in path model coefficients across two or more groups of respondents [H+14]. Therefore, this study examine the moderating effect of work experience and position on the relationship between these independent factors and E-voting technology adoption in the conduct of future elections in Nigeria by the electoral organisation.

2. Theoretical background and research model

Recent studies have identified differential effects (heterogeneity) of age, gender, experience, education level, voluntariness and managers tenure (Position) of adopters on structural path relationships of an IT adoption in the organisational context [PYL07, Lin11, WL11]. [H+14] conduct a Structural Equation Modelling (SEM) multi-group analysis that indicates a significant moderating effect of gender and educational level on the adoption of mobile technologies by the Chinese consumers. The study of [Lin11] on mobile banking adoption confirmed a difference of attitude towards mobile banking between potential and repeat customers in Taiwan using multi-group analysis with t-statistics. Similarly, the results of [WL11] multi-group analysis reveal the differences between blog readers and writers perception based on the blog platform qualities and the intensity of path coefficients among factors in the research model.

However, empirical studies of heterogeneous effects in E-voting technology adoption in the organisational setting are sparse. Therefore, the need to investigate heterogeneity in the cause-effect relationships between the determinants and E-voting adoption from the perspectives of employees of an electoral management organization becomes necessary in order to fill a research gap and to better the understanding of the domain of this study. The following hypothesized research model is proposed.

H1: *The established structural model relationships of E-voting technology adoption may be moderated by staff position and work experience.*

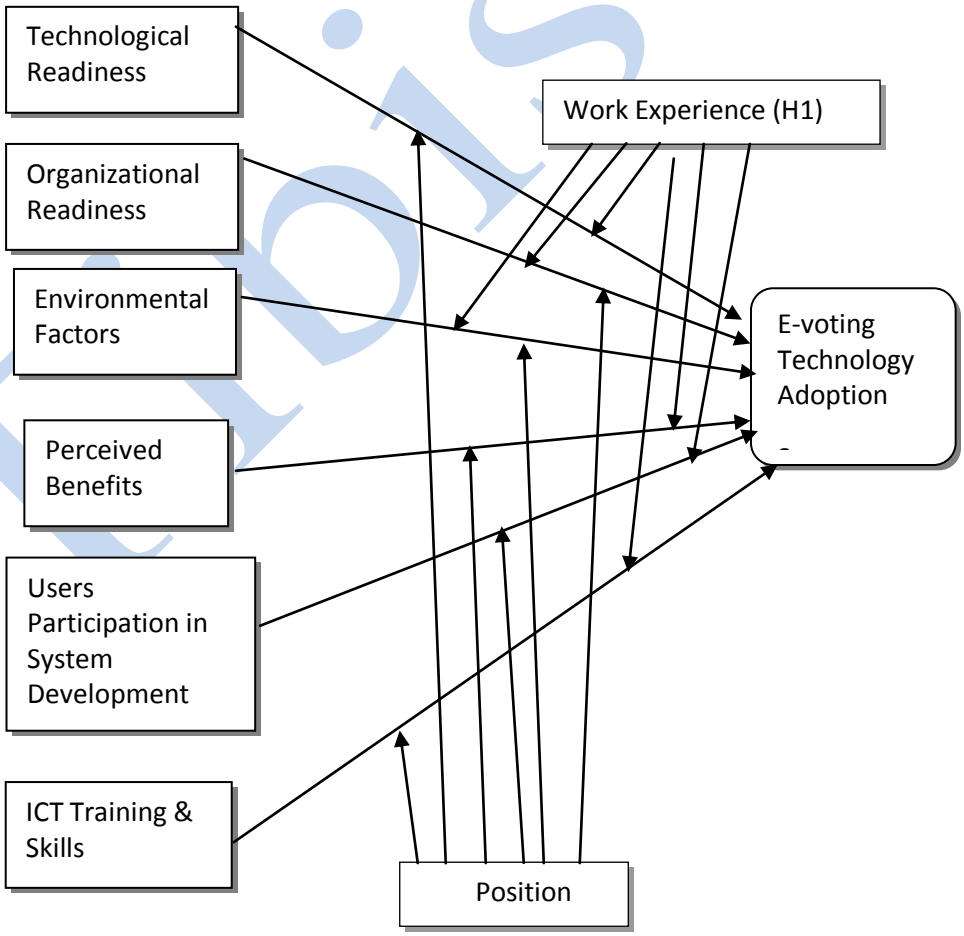

Fig. 1. Hypothesized Research Model

3. Research method

Data collection

Data for this study was collected by the means of a survey conducted at Independent National Electoral Commission of Nigeria, Nigeria between October 2012 and February 2013. The paper-based questionnaires were distributed to 500 participants using *disproportionate stratified random sampling* techniques out of which 380 usable respondents were obtained. The 380 respondents were drawn from two main populations. The first sample was selected from the managerial staff (top managers, directors, deputy directors and assistant directors) of the commission. The second sample consisted of operational staff (senior and junior staff) of the commission.

Table 1. Questionnaire Distribution Pattern

Category of Staff	Number of Questionnaires Distributed	Number Returned
Managerial	130	105
Operational	370	275

Out of 130 managerial staff, 105 respondents were obtained (81% response rate). Out of 370 operational staff, 275 were obtained (74% response rate). Table 1 shows the distribution pattern.

Measurement

A five (5) point Likert scale questionnaire, with 1 indicating "Strongly Disagree" and 5 indicating "Strongly Agree" was administered to the two categories of respondents. Research variables were measured using multiple-item scales and adapted from previous studies with minor wording changes to tailor them to the E-voting adoption context. The survey was pilot tested with 47 respondents (Managerial and Operational) in January 2012 to validate the instrument. Therefore, the instrument has confirmed content validity (see Appendix I).

Data analysis and results

The study used the Henseler ([Hen12]) *non-parametric* approach of analyzing the observed heterogeneity in data since: (a) it is distribution free and does not make distribution assumption compared with the *parametric* approach developed by Chin [Chi00] and Keil et al. [K+00]; (b) implemented using Partial Least Square-Structural Equation Modeling (PLS-SEM) because it is a distribution free method of data analysis [H+14].

A cross-sectional study was conducted among the staff of the electoral organization (INEC, Nigeria) to test the research hypotheses. Out of the 380 valid respondent's data collected, 81 was removed for bad outliers, the remaining 299 was used for the PLS-SEM analysis. Out of the 299, 177 have less than or 10 years of working experience and the remaining 122 have more than 10 years of working experience, while 193 of the 299 belong to managerial cadre and the remaining 106 belong to the operational cadre.

We create two PLS path models as shown in Figures 2 and 3 with the standardized path coefficient per group as estimated by means of SmartPLS software [RWW05, Rin06].

These models capture six direct relationships of the independent variables Ennvironmental Factors(EF), ICT Training and Skills (ICTSKILL), Organisational Readiness (OR), Perceived Benefits (PB), and Technological Readiness (TR) on E-Vote Adoption (EAD). In order to determine the moderating effect of position and work experience, the researcher separately estimated the two models; One for management cadre group and one for the operational cadre group of the position MGA on one hand, and one for group with less than or equal 10 years working experience and one for group with more than 10 years working experience MGA on the other.

Thereafter, we carried out bootstrap re-sampling analyses with 500 samples per group, using each group path coefficients (path estimates) derived from the PLS-Algorithm procedures and estimates from the bootstrapping and using the PLS-Bootstrapping procedures. We used the non-parametric Excel Template to count how often the first group's bootstrap estimates are greater than the bootstrap estimates of the second group (i.e. $\theta(1) > \theta(2)$), and divided it by the number of bootstrap samples N which is 500 in this case (N = 500) as suggested by Henseler (2012). Then the researcher calculated the values for the group difference and the p-Values for each group differences in the effects of EF, ICTSKILL, OR, PB, TR, and UPSD independent variables on EAD the dependent variable as shown in Tables 2 and 3.

Before the examination of the results of the MGA analysis, we examined the *reliability* and *validity* of the measurement model for each group-specific model for compliance. The internal consistency reliability showed that the *composite reliability* (CR) was above the recommended threshold and not greater than 0.90, while the indicators reliability (indicator loadings) was also above the threshold of 0.5. The convergent validity for the constructs of each group model was assessed using the *Average Variance Extracted* (AVE), which was above the threshold value of 0.50 while the discriminant validity was assessed using the *Fornell-Larcker* criterion (Appendix II). The results for each group

showed that the square root of AVE for each constructs was higher than its correlation with any other (off-diagonals elements) as shown in the Appendix II.

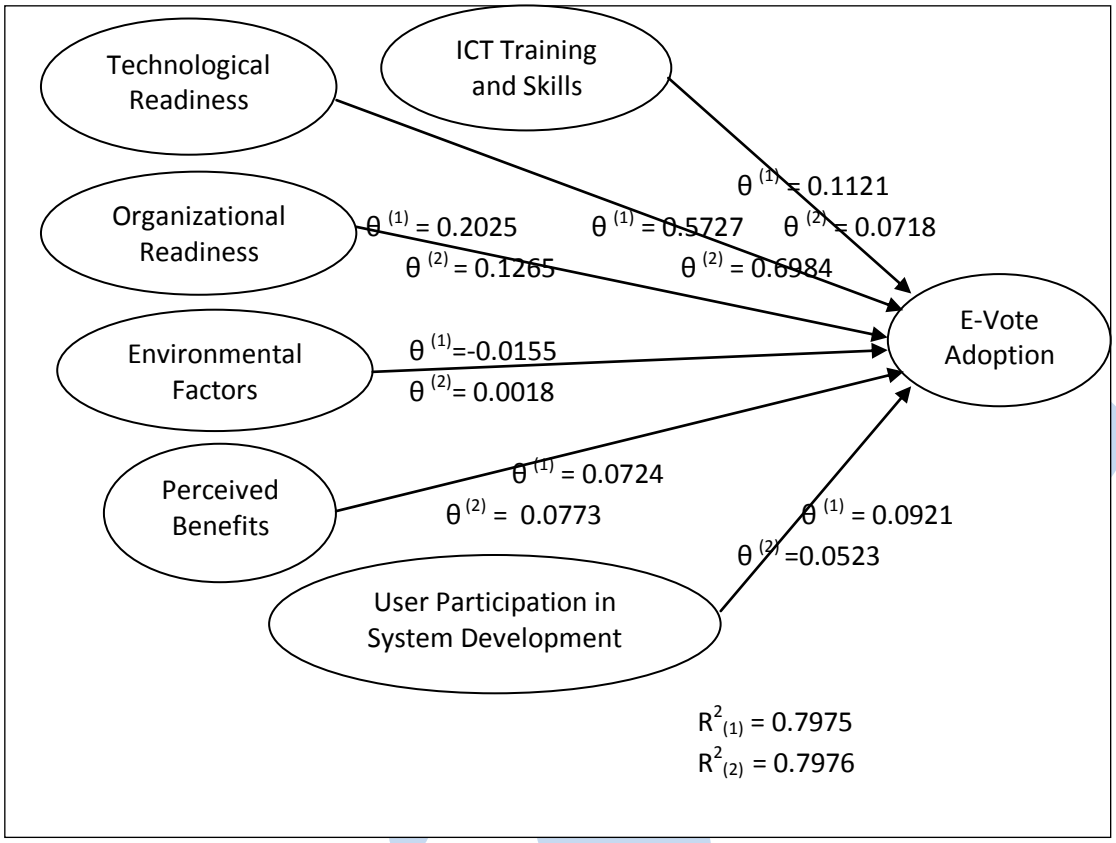

Fig. 2. Structural model (standardized PLS path coefficients) with group (Position) parameter estimates

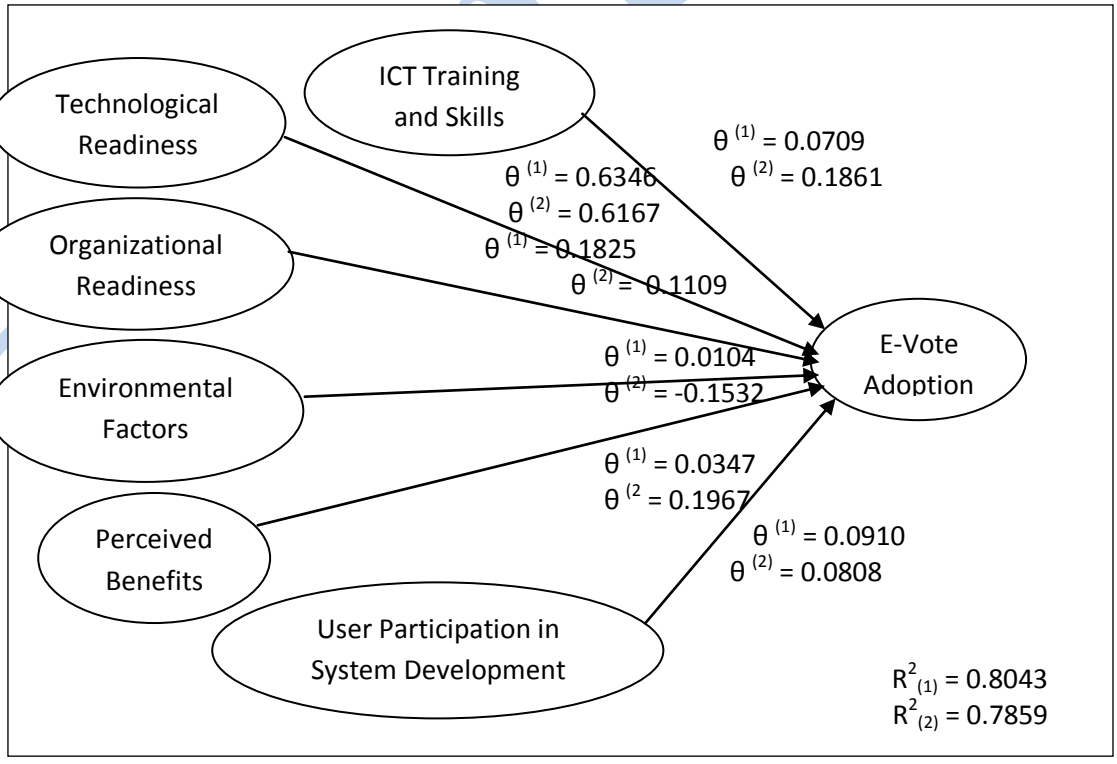

Fig. 3. Structural model (standardized PLS path coefficients) with group (Work Experience) parameter estimates

The examination of the results of the MGA analysis indicated a significant difference in the effect of Perceived Benefits (PB) on the E-Vote Adoption (EAD) with work experience (WkExperience)

variable as the moderator (α = .05). This means, for staff with more than 10 years of working experience, the level of perceived benefits is a stronger predictor of E-Vote Adoption compared to the staff with less than 10 years working experience. Others rejected group effects of the remaining construct on E-Vote Adoption based the on working experience as shown in the Table 2.

Table 2. Parameter Estimates (Path Coefficients) For Groups Based on Work Experience

	Group 1 : (≤ 10 Years)	Group 2 : (> 10 Years)		
Path(s)	**$\theta^{(1)}$**	**$\theta^{(2)}$**	**Group Difference**	**P-Value**
EnvironFactors(EF) -> E-VoteAdoption(EAD)	0.0104	-0.1532	0.1636	0.9564
ICT-Training(ICTSKILL) -> E-VoteAdoption(EAD)	0.0709	0.1861	0.1152	0.1341
OrganReadiness(OR)->E-VoteAdoption(EAD)	0.1825	0.1109	0.0716	0.797
PerceivedBenefits(PB)-> E-VoteAdoption(EAD)	0.0347	0.1967	0.162	0.0571
TechReadiness(TR) -> E-VoteAdoption(EAD)	0.6346	0.6167	0.0179	0.5684
UserParticipation(UPSD)->E-VoteAdoption(EAD)	0.0910	0.0808	0.0102	0.5589
N	177	122		

Note: $\theta^{(1)}$ and $\theta^{(2)}$ are the parameter estimate (path coefficients) of Group 1 and Group 2; α = .05, is the probability that $\theta^{(1)} \leq \theta^{(2)}$, n = population

Table 3 indicates that the approach rejected group effect in the impact of all the constructs (independent variables – EF, ICTSKILL, OR, PB, TR, and UPSD) on the E-Vote Adoption (EAD). This means that position of the staff within the two group (i.e. Management and Operational) does not moderate their perceptions of the relationships between the independent variables and the dependant variable of the research; therefore, the researcher's initial assumption that $\theta^{(1)} > \theta^{(2)}$ (non-parametric procedures) as proposed by Henseler (2012) still holds since there was no group difference.

Table 3. Parameter Estimates (Path Coefficients) For Groups Based on Position

	Group 1 : Management	Group 2 : Operational		
Path(s)	**$\theta^{(1)}$**	**$\theta^{(2)}$**	**Group Difference**	**P-Value**
EnvironFactors(EF)->E-VoteAdoption(EAD)	-0.0155	0.0018	0.0173	0.4315
ICT-Training(ICTSKILL)->E-VoteAdoption(EAD)	0.1121	0.0718	0.0403	0.6589
OrganReadiness(OR)->E-VoteAdoption(EAD)	0.2025	0.1265	0.076	0.7917
PerceivedBenefits(PB)->EVoteAdoption(EAD)	0.0724	0.0773	0.0049	0.4908
TechReadiness(TR)->E-VoteAdoption(EAD)	0.5727	0.6984	0.1257	0.1
UserParticipation(UPSD)->E-VoteAdoption(EAD)	0.0921	0.0523	0.0398	0.6856
n	193	106		

Note: $\theta^{(1)}$ and $\theta^{(2)}$ are the parameter estimate (path coefficients) of Group 1 and Group 2; α = .05, is the probability that $\theta^{(1)} \leq \theta^{(2)}$, n = population

4. Conclusion

Findings and implications

Modeling heterogeneity (difference) in structural equation model could be based on observable characteristics of the population such as the demographic variables. Using demographic variables provides a means of segmenting or dividing the observed difference in the population under study into groups based on age, gender, income, religion, occupation etc. for easy multi-group analysis. Multi-group analysis in this study examines the moderating effects or influence of demographic variables of *work experience* and *position* as observed variables of the study. The results suggested that position did not moderate or influence the path relationships of model of the study and therefore not supported.

The results, however, indicated that *work experience* moderate or have influence on the relationship between Perceived Benefits and E-voting adoption. It is stronger for staff with more than ten years working experience than for staff with less than ten years of working experience. The difference obtained from work experience could be attributed to staff who had more experience in the conduct of elections in the organization and who believed that adoption of E-voting technology by the commission will be beneficial not only to the commission but also to the country in general. Thus, their perceptions of the benefits strongly influence E-voting adoption. This result is similar to ones provided by [49] [44] and [40]. The revised model of E-voting adoption is as shown in Figure 4.

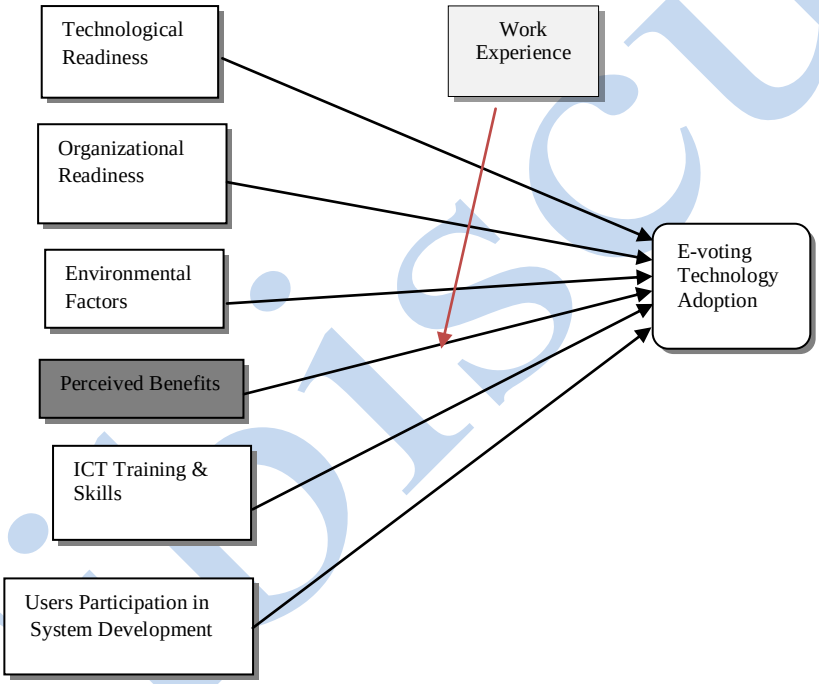

Fig. 4. The revised model relationships

In the context of organizational adoption of E-voting, this study fills a theoretical gap by developing the research model and evaluating it using an empirical data set comprising managerial and operational staff of an electoral organization. The result of multi-group analysis suggests a moderating effect of work experience on the relationship between perceived benefits and E-voting adoption. Therefore, the practical implication is that, there is the need for the management of the electoral organization to educate more, staff with less than ten years work experience at the commission on the benefits (direct and indirect) derivable from adopting E-voting technology in the conduct of future elections in the country in order for the adoption to be considered successful.

Limitations and suggestions for further research

The finding of this study recognizes possible limitations. First, a bias may exist due to the selected sample. Second, this study categorized the sample into two subgroups, i.e. management and operational staff. The results suggested that these two groups differ in their perception of benefits of adopting E-voting technology by the commission. However, staff may be categorized into types other than management and operational, researchers are recommended to investigate the interplay between junior, senior, top managers, directors, deputy directors and assistant directors and their perceptions toward E-voting adoption to achieve a more comprehensive view. Third, this study does not

include all relevant variables. Therefore, it is suggested that future study incorporate other important variables for better understanding of factors that influence E-voting adoption. Finally, paper based survey to collect empirical data. Future research could use experimental approach to further clarify the effects of moderating factors on the adoption of technology.

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Appendix I

Summary of Principal Component Analysis

Items	Eigenvalue (>1.0)	Variance Explained (%)	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Component 7
EAD13	2.053	51.321	0.827						
EAD6			0.685						
EAD7			0.674						
EAD8			0.668						
EF1	3.857	55.098		0.791					
EF10				0.776					
EF11				0.760					
EF12				0.751					
EF3				0.732					
EF7				0.704					
EF8				0.676					
ICTSKILL10	2.017	50.437			0.728				
ICTSKILL11					0.722				
ICTSKILL14					0.711				
ICTSKILL16					0.680				
OR2	2.528	50.561				0.786			
OR3						0.753			
OR4						0.676			
OR5						0.674			
OR6						0.657			
PB10	5.095	50.949					0.768		
PB11							0.755		
PB12							0.755		
PB13							0.753		
PB14							0.751		
PB2							0.722		
PB3							0.666		
PB6							0.665		
PB7							0.648		
PB9							0.639		
TR7	1.664	55.460						0.754	
TR8								0.751	
TR9								0.729	
UPSD1	2.707	54.142							0.810
UPSD17									0.798
UPSD2									0.785
UPSD4									0.755
UPSD7									0.677

Appendix II

Reliability and Discriminant Validity (Fornell-Larcker Criterion) for Work Experience Multi-Group Analysis

			Correlation of Constructs						
Model and Constructs	**Composite Reliability (CR)**	**AVE**	**EAD**	**EF**	**ICTSKILL**	**OR**	**PB**	**TR**	**UPSD**
Full Model									
EAD	0.805	0.511	**0.715**						
EF	0.895	0.550	0.543	**0.742**					
ICTSKILL	0.802	0.504	0.577	0.495	**0.710**				
OR	0.835	0.504	0.595	0.533	0.556	**0.797**			
PB	0.900	0.509	0.570	0.493	0.407	0.513	**0.714**		
TR	0.787	0.553	0.580	0.565	0.552	0.552	0.517	**0.744**	
UPSD	0.849	0.531	0.473	0.540	0.515	0.511	0.514	0.438	**0.729**
≤ 10 Years									
EAD	0.823	0.543	**0.737**						
EF	0.900	0.563	0.618	**0.750**					
ICTSKILL	0.743	0.52	0.579	0.715	**0.721**				
OR	0.828	0.591	0.642	0.633	0.574	**0.769**			
PB	0.893	0.558	0.614	0.704	0.688	0.720	**0.747**		
TR	0.811	0.590	0.649	0.632	0.634	0.623	0.596	**0.768**	
UPSD	0.846	0.524	0.493	0.610	0.585	0.514	0.599	0.492	**0.724**
> 10 Years									
EAD	0.717	0.515	**0.718**						
EF	0.883	0.521	0.492	**0.721**					
ICTSKILL	0.797	0.598	0.660	0.703	**0.773**				
OR	0.848	0.527	0.630	0.643	0.663	**0.726**			
PB	0.900	0.583	0.614	0.706	0.714	0.713	**0.764**		
TR	0.729	0.577	0.627	0.420	0.529	0.506	0.461	**0.759**	
UPSD	0.849	0.533	0.470	0.462	0.514	0.516	0.437	0.358	**0.730**

Note: The diagonal elements under the 'correlation of constructs matrix are the square root of the Average Variance Extracted (AVE). For the discriminant validity to hold, the diagonal elements should be greater than the corresponding off-diagonal elements.

Reliability and Discriminant Validity (Fornell-Larcker Criterion) for Position Multi-Group Analysis

		Correlation of Constructs							
Model and Constructs	**Composite Reliability (CR)**	**AVE**	**EAD**	**EF**	**ICTSKILL**	**OR**	**PB**	**TR**	**UPSD**
Full Model									
EAD	0.805	0.511	**0.715**						
EF	0.895	0.550	0.543	**0.742**					
ICTSKILL	0.802	0.504	0.577	0.495	**0.710**				
OR	0.835	0.504	0.595	0.533	0.556	**0.797**			
PB	0.900	0.509	0.570	0.493	0.407	0.513	**0.714**		
TR	0.787	0.553	0.580	0.565	0.552	0.552	0.517	**0.744**	
UPSD	0.849	0.531	0.473	0.540	0.515	0.511	0.514	0.438	**0.729**
Management									
EAD	0.790	0.588	**0.767**						
EF	0.891	0.542	0.631	**0.736**					
ICTSKILL	0.770	0.556	0.663	0.695	**0.746**				
OR	0.837	0.507	0.704	0.606	0.607	**0.712**			
PB	0.813	0.518	0.652	0.683	0.715	0.702	**0.720**		
TR	0.784	0.549	0.643	0.598	0.586	0.616	0.548	**0.741**	
UPSD	0.846	0.524	0.618	0.585	0.551	0.603	0.577	0.541	**0.724**
Operational									
EAD	0.789	0.59	**0.770**						
EF	0.9	0.57	0.609	**0.758**					
ICTSKILL	0.751	0.751	0.653	0.718	**0.729**				
OR	0.845	0.52	0.615	0.683	0.645	**0.723**			
PB	0.821	0.51	0.603	0.708	0.679	0.703	**0.714**		
TR	0.791	0.56	0.865	0.544	0.593	0.520	0.512	**0.748**	
UPSD	0.856	0.54	0.411	0.567	0.608	0.385	0.438	0.331	**0.738**

Note: The diagonal elements under the 'correlation of constructs matrix are the square root of the Average Variance Extracted (AVE). For the discriminant validity to hold, the diagonal elements should be greater than the corresponding off-diagonal elements.