Research Paper

WEB 2.0 AND ELECTIONS: A STUDY OF FACTORS INFLUENCING DIASPORA VOTERS ADOPTION OF E-VOTING SYSTEM

Kinn Abass Bakon  
FTMS Global College  
Technology Park  
Bukit Jalil, WP  
Malaysia  
kinn@ftms.edu.my

Trevor Ward  
FTMS Global College  
Technology Park  
Bukit Jalil, WP  
Malaysia  
trevor@ftms.edu.my

Abstract

The ever growing number of Ghanaians living abroad and their contribution to the nation’s GDP has propelled the political debate of their voting rights. After formulating policies to enable them to exercise their franchise during elections, E-Voting/Internet Voting was one of the methods proposed to be used by diaspora Ghanaians to effectively exercise their right to vote. This research investigates and identifies the main determinants of E-Voting Adoption by eligible voters living abroad. A sample of 71 respondents from Malaysia, Singapore and USA has been used to collect the data. Regression and correlation analysis was conducted using SPSS 20. Regression beta coefficient and correlation coefficients were generated to test the hypotheses and to ascertain the effect of Information & Communication Technology, Political and Socio-demographical factors on adopting E-Voting System. The result shows strong linear relationship between some of the factors and E-Voting Adoption.

Key Terms: Elections, Internet Voting, E-voting, ICT, Political, Socio-Demography, Adoption
1. Introduction

Ghana, a beacon of democracy in Africa, undertook several measures to deepen their democratic process and governance. One of those key measures was to repeal Section 8(1) of PNDCL 284, with section 1(b) of the Representation of the People (Amendment) Act, 2006 (Act 699) to allow all eligible Ghanaians abroad the right to vote remotely. However, since this new law was enacted Ghanaians living abroad could not franchise their voting right on the basis that the resources required to implement voting facilities for Ghanaians living abroad are far within the resources of the Election Commission (Ghanaweb, 2012).

Bakon, (2008) suggested implementing Internet Voting System for eligible Ghanaians living abroad as a viable, secured and cost effective alternative to the traditional voting system and without regard to the geographical location. Similar systems are currently being used nationwide for local, parliamentary and presidential elections in Estonia while in Switzerland, it is used for municipal, cantonal and federal referenda (Esteve, Goldsmith and Turner, 2012).

The overall aim of this paper is to conduct an empirical study of factors influencing the adoption of Internet Voting System among overseas citizens by monitoring the effects of socio-economic, political and Information Communication and Technology impact on acceptance or adoption of Internet Voting System.

The first section of this paper will discuss the extant literature regarding Internet Voting/E-Voting, the second section, will describe the methodology used for this study while the third section will present the results and findings of the research, the conclusion and future research.

2. Literature Review

The Association of Computing Machinery (2010) defined Internet Voting or E-voting as “returning an electronic form of a voted ballot over the internet using email, a web application, or an internet-based fax or phone (e.g. the iPhone)”. James (2011) too, defined it as “ a voting method that transmits voted ballots via the public Internet through a web browser or client application accessed through an Internet connected personal computer, Smartphone or tablet”.

There are two types of Internet Voting: The first type is known as on-site Internet voting which is conducted at controlled settings, such as voting places or kiosks established in a particular location where voters have to go and election officials may be available to authenticate voters to ensure the integrity of the device and software used and voters can vote in private. While the second type is known as remote Internet voting. Remote Internet voting allows voters to transmit their voted ballot from any Internet connection to which they have access (James, 2011). This study is about the later form of Internet voting: Remote Internet Voting.

Some relevant extant literature associated with Internet Voting are as follows: The implementation of Internet Voting System for Ghanaians living abroad (Bakon, 2008), the Estonian experience of successfully deploying Internet voting in general elections (Alvarez, Hall and Tretchel, 2008), the research on experiences of countries which are currently using or have experimented Internet Voting during elections (Esteve et all, 2012), the Use of Internet Voting to increase voting participation in Swizerland (Tretchel 2007; Christin and Tretchel, 2005), the personality related mechanism that affects the probability of Internet Voting among eligible voters (Tretchel and Vassil, 2011), the socio - political profiles of e-voters and success factors of Geneva’s E-Voting(Chevallier, Warynski and Sandoz, 2006), the use of Internet voting to realize the voting right of Swiss Abroad(Driza-Maurer et all, 2011), the impact of Internet voting on other voting channels (Christin and Tretchel, 2005), the regular vote abstainers preference of Internet Voting (Christin and Tretchel, 2005), hackers successful intrusion of Washington DC Internet Voting System (Wolchok et al, 2012), the technical security concerns of e-voting systems and measures to secure them (Ansper et al,
2010), the debunking of technical security concern normally associated with Internet Voting of Swiss Voting System (Gerlach and Gasser, 2009). Other relevant literature associated with Web 2.0 are the effect of digital divide on individual, organization and the globe (Dewan and Riggins, 2005), Web 2.0 technologies influence on election campaigning (Wattal, et all, 2010), adoption of e-government services (Carter and Bellanger ,2005)

While all these extant literature have been very useful, they failed to address the following.

1. Empirical study on factors that could determine the acceptance of Internet voting of overseas citizens and by conducting the survey overseas.

2. To apply Socio- Economic model, Political model and Information and Communication and Technology model to study factors that could influence the Internet Voting Adoption among overseas citizens.

3. The Use of statistical analysis to provide multiple simultaneous testing and modeling of multiple independent variables, which allows measuring the impact of each tool.

The foundation of this study is similar to most earlier e- government studies derived from theoretical frameworks of Rogers’ (1983) Diffusion of Innovation (DOI) theory; Fishbein and Ajzen’s (1975) Theory of Reasoned action (TRA); Ajzen’s (1985) Theory of planned Behaviour (TPB), Davis’ (1989) technology acceptance model (TAM) (Carter and Belanger 2005; Dimitrova and Chen 2006; Gilbert et al. 2004;Horst et al. 2007). Models based on these theories and Individual socio-political and economic factors and trust in politicians and government authorities were used by Christian and Trechsel(2005) and Trechel and Vasssil (2011).

Figure 1: Conceptual Framework
<table>
<thead>
<tr>
<th>HYPOTHESIS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td>Socio demographic factor has positive and significant impact on E-voting adoption</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>Political Factor has a positive and significant impact on E-voting adoption</td>
</tr>
<tr>
<td>Hypothesis 3</td>
<td>Information and Communication Technology factors have impact on E-voting adoption</td>
</tr>
<tr>
<td>Hypothesis 4</td>
<td>All these factors combined have positive and significant impact on E-voting adoption</td>
</tr>
</tbody>
</table>

Table 1: Hypothesis

\[
\text{Dev.Beh}= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \tag{1}
\]

3. Research Design and Methodology

Methodology
Ghanaians living overseas who are eligible to vote in Ghanaian elections were chosen. Since the researchers are living in Malaysia, the Ghanaian living in Malaysia were prime target. 90 questionnaires were distributed by hand to Ghanaians Living in Malaysia while 35 questionnaires were sent to Ghanaians in Singapore and USA via emails within a period of two Months. 90 questionnaires were returned (the response rate was 72%). Some questionnaires were excluded due to the its incompleteness. The total number of questionnaires used for this study was 71.

Questionnaire
The questionnaire used in the quantitative study consisted of 5-point Likert scale, statement. The questionnaire designed for this study consist of four parts which are as follows:

Part 1: Socio demographic data which consists of age, education, gender, profession, income, etc.
Part 2: 5 Statements to measure the political factors influence on adoption
Part 3: 6 Statements to measure Information and Communication Technology factors influence on adoption
Part 4: 3 Statements to measure overseas Ghanaians acceptance or adoption of E-Voting.

The total number of statements were 16.

4. Results and Discussion

This paper will examine the frequency analysis based on the respondent’s feedback, Statistical Mean and Standard Deviations, Correlations and Regression analysis are presented.
Figure. 1 Socio-demographic and economic analysis of respondents

The graph above shows that 73% of the respondents are males while 23% are female; this is consistent with findings in a recent census that found majority of Ghanaians residing abroad to be male (Population & Housing Census, 2012). 75% of the respondents are between the age of 18-39.84%. 36% of the sample members stem from individuals whose monthly income is below US $1000.00. These individual are largely students studying in tertiary institutes. 43% of the respondents are living in Malaysia.

Reliability
To apply statistical tools in this research, reliability of the scale has to be tested to show the extent of the consistency of scale when measurement are done repeatedly. Cronbach's alpha, the most popular method used today was applied to determine that, the satisfactory value is more than 0.6 for the scale to be reliable (Malhotra, 2002; Cronbach, 1951). If we compare our reliability value with Cronbach (1951) and Bagozzi and Yi's (1988) standard value of 0.6, except the ICT factor which is 0.59, the scales used by us are more than 0.6. and we can conclude that there is good degree of reliability. Cronbach’s alpha was also used by Bakon and Hassan (2013) to determine the reliability of their study.

The Cronbach's Alpha results listed in Table 3 below were based on the retained items and they offered strong support for reliability.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Driver</th>
<th>N of Items</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political Factors</td>
<td>Political</td>
<td>5</td>
<td>.790</td>
</tr>
<tr>
<td>ICT Factors</td>
<td>ICT</td>
<td>5</td>
<td>.591</td>
</tr>
<tr>
<td>Adoption Factors</td>
<td>Adoption</td>
<td>4</td>
<td>.938</td>
</tr>
</tbody>
</table>

Table 2: Cronbach's Alpha
<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>N</th>
<th>Minimum Statistic</th>
<th>Maximum Statistic</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>71</td>
<td>1.00</td>
<td>4.00</td>
<td>1.86</td>
<td>0.90</td>
<td>0.65</td>
<td>-0.62</td>
</tr>
<tr>
<td>Gender</td>
<td>71</td>
<td>0.00</td>
<td>1.00</td>
<td>0.73</td>
<td>0.45</td>
<td>-1.07</td>
<td>-0.87</td>
</tr>
<tr>
<td>Education</td>
<td>71</td>
<td>1.00</td>
<td>4.00</td>
<td>3.72</td>
<td>0.80</td>
<td>-2.94</td>
<td>7.51</td>
</tr>
<tr>
<td>Profession</td>
<td>71</td>
<td>1.00</td>
<td>4.00</td>
<td>1.99</td>
<td>1.22</td>
<td>0.84</td>
<td>-0.95</td>
</tr>
<tr>
<td>Income</td>
<td>71</td>
<td>1.00</td>
<td>5.00</td>
<td>2.45</td>
<td>1.68</td>
<td>0.55</td>
<td>-1.43</td>
</tr>
<tr>
<td>Political</td>
<td>71</td>
<td>1.00</td>
<td>4.75</td>
<td>3.15</td>
<td>0.75</td>
<td>-0.44</td>
<td>1.94</td>
</tr>
<tr>
<td>ICT</td>
<td>71</td>
<td>2.67</td>
<td>5.00</td>
<td>4.33</td>
<td>0.57</td>
<td>-0.71</td>
<td>0.24</td>
</tr>
<tr>
<td>Adoption</td>
<td>71</td>
<td>1.00</td>
<td>5.00</td>
<td>3.67</td>
<td>1.06</td>
<td>-0.81</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table 3: Descriptive Statistics

To determine the shape of the data distribution, Kurtosis is primarily used to find out if the curve is peaked or flat (Hair et al, 2010). By using Kurtosis, the normality of the dataset for the main dimensions of (ICT, POLITICAL and Adoption) falls between -0.24 to 1.94 which indicates that the range is within acceptable range.

The table above shows the Kurtosis, Skewness, Statistical Mean and Standard Deviation for each variable. The table indicate Information Technology (M=4.33), Political (M=3.15), Education (M=3.72), Gender are associated with Online Voting Technology adoption among Ghanaians living abroad while Income (M=2.45) shows a moderate level of association. However, Age (M=1.86) and Profession (M=1.99) do not exert any significant effect on Online Voting Technology Adoption. The average mean of all the dimensions suggest a strong association of these dimensions to Online Voting System Adoption among.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Correlation With Adoption</th>
<th>P&lt;0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.033</td>
<td>Not significant</td>
</tr>
<tr>
<td>Education</td>
<td>-.297*</td>
<td>Significant</td>
</tr>
<tr>
<td>Income</td>
<td>.059</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Political</td>
<td>.349**</td>
<td>Significant</td>
</tr>
<tr>
<td>ICT</td>
<td>-.157</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

Table 4: Inter correlation between variables

As depicted in Table 3, the strongest linear relationship is found between Political factors and Adoption (r = .349 p <0.05). The correlation coefficient value of .349 indicates that there was a positive and statistically significant relationship between Political factors and adoption. In other words, the degree of a person's political involvement is positively correlated to their adoption of E-voting.

The second highest correlation was found between Education and Adoption. (r = -.297 p <0.05). The negative correlation coefficient of -.297 indicates that there was negative and statistically significant correlation. Which means that the one’s level of education does not correlate with adoption of E-Voting.
Regression Analysis: Hypothesis Testing

We performed regression analysis to predict the Adoption of E-Voting by Ghanaians based on independent factors such as Socio-demography, Politics and Information Communication Technology.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.449(^a)</td>
<td>.202</td>
<td>.113</td>
<td>4.008</td>
</tr>
</tbody>
</table>

\(^a\) Predictors: (Constant), Income, Education, Gender, POLITICAL, IT, Age, Profession

Table 5: Summary of Regression Analysis

For this study, regression analysis was performed to predict the E-Voting Adoption based on overall combination of factors as a single independent factor.

As could be seen in Table 4, when all the Independent factors were used against the dependable factors, R is .449 R Square is 0.202 and adjusted R square is 0.113, meaning that 11.3% of the variance in Adoption of E-Voting can be predicted by independent variables of Socio-demography, Politics and Information Communication Technology. This suggest that the model is not a good fit to predict E-Voting adoption.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>18.159</td>
<td>5.677</td>
<td>.3199</td>
</tr>
<tr>
<td></td>
<td>POLITICAL</td>
<td>.371</td>
<td>.170</td>
<td>.285</td>
</tr>
<tr>
<td></td>
<td>IT</td>
<td>-.223</td>
<td>.257</td>
<td>-.111</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>.498</td>
<td>.787</td>
<td>.105</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>-.443</td>
<td>1.181</td>
<td>-.046</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>-1.255</td>
<td>.717</td>
<td>-.235</td>
</tr>
<tr>
<td></td>
<td>Profession</td>
<td>.207</td>
<td>.649</td>
<td>.059</td>
</tr>
<tr>
<td></td>
<td>Income</td>
<td>-.066</td>
<td>.413</td>
<td>-.026</td>
</tr>
</tbody>
</table>

Dependant Variable: Adopt

Table 6: Coefficients\(^a\)

The result of the regression analysis shows that out of seven indicators, only two are significant. The two significant factors are Political with P value of 0.033 and Education with P value = 0.85 at 5% significant level.

As shown in Table 6, Education is the most significant predictor of E-Voting Adoption with the largest standardised beta obtained was 0.285 for political and this corresponds with the highest t-statistic of 2.179. This means that Political factors make the strongest contribution.
in explaining the dependent variable Adoption, when the variance explained by all other predictor variables in the model are controlled. It suggests that one point increase in Political factors is followed by 0.285 increase in adoption.

The second most significant predictor of E-Voting Adoption is Education with its standardized beta value for of , with a t-statistic of -1.751, indicating that it made a unique contribution in explaining Adoption. It means that one increase in Education was followed by a -0.235 increase in Adoption.

Therefore, the equation of the proposed Adoption multiple regression (MLR) is as follows;

\[ \text{Adopt} = 0.371 + (-0.223) + 0.498 + (-0.443) + (-1.255) + 0.207 + (-0.066) + 18.159 \]

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>255.495</td>
<td>7</td>
<td>36.499</td>
<td>2.272</td>
<td>.040b</td>
</tr>
<tr>
<td>Residual</td>
<td>1012.054</td>
<td>63</td>
<td>16.064</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1267.549</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7: ANOVA

Regarding the f-test of the analysis, the ANOVA results depicted in Table 5 shows that the model as a whole is significant: F (7, 63) = 2.279, p < 0.001. This tests the null hypothesis that multiple R in the population equals 0. The model in this study reaches statistical significance, Sig. = .040, suggesting that p <.0005). Thus, the hypothesis that there is no linear relationship between the predictor and dependent variable is not accepted.

4. Conclusion

The findings reveal that Socio-demographic, Political and Information Technology Factors were significant in explaining overseas citizens adoption of E-Voting, suggesting that the proposed model was fully supported by research data. It is reasonable to conclude that the projected multiple linear regression model used is a stable model since there was no notable violation of normality and the variance equality was noted t. Among the factors studied, political factor is the strongest contributor of variation of Adoption and Education was the second most contributed variance while Information & Communication factors followed was the smallest.

The evidence relationship between Socio –demography, Political and Information & Communication Technology is empirically presented in this study. The model for measuring E-Voting Adoption among diaspora citizens is also proposed by this study.

This study has found out that Ghanaian citizens in diaspora have access to computer and internet connection, and they would adopt the E-Voting System if the technology was implemented. And the implementation of E-Voting Systems would greatly foster voting equality.

Limitation

Perhaps, the biggest limitation of this study is that the quantity of the samples used is small and the fact that majority of the respondents are currently living in Malaysia. Testing research relationship of eligible Ghanaians voters residing in various countries by approaching equal number of respondents in those countries would improve generalization of E-voting Adoption by Ghanaians in diaspora. It is our hope that this study helps to provide some answers and a foundation for future investigations.

Reference


Christin T. & Trechsel, A. H.(2005) Analysis of the 26th September 2004 ballot as held in four Geneva municipalities. E-Democracy Center Geneva University-Law Faculty


Bakon (2008) *Online Voting System For Ghanaians Living Abroad. BSc Thesis. De Montfort University, Leicester, UK*


Representation of the People (Amendment) Act, 2006 (Act 699) Constitution Of The Republic Of Ghana

Davis F.(1989) “*Perceived Usefulness, perceived ease of use and user acceptance of information technology*” MIS Quarterly 13, (3) 319-40
