

Perceptions of the Australian Public Towards Mobile Internet e-Voting: Risks, Choice and Trust

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Abstract: This paper reports on data collected from an anonymous survey on perceptions of the Australian public towards using a mobile internet e-voting platform (N = 295). It is the first such study conducted in an Australian context by an academic institution, which allows this research to be approached with a sense of impartiality. Our society has become rapidly fuelled by the mobilization of interactions and services. As the society becomes increasingly wirelessly connected, these mobile platforms are expected to provide an untapped universal medium by which paper based elections can be complemented or even "upgraded" to digital elections. This research is the first paper in a study which will be focusing on internet e-voting, specifically the utilisation of mobility devices within Australia. As with any research, context shapes the direction and outcome goals. Internet e-Voting (and research pertaining to) has gained momentum over recent years. Though there has been much research done in this field, there was been a gap in findings when dealing with Australian and mobility context, however similarities can be drawn from these related studies. The way the Australian context differentiates itself in one instance is Compulsory Voting. Utilising the findings from this initial study, we intend to provide a baseline from which our research can be further analysed and in turn will allow the derivation of hypotheses leading to creation of a user acceptance model towards utilisation of a mobile internet e-voting platform during an Australian election. Survey respondents were overall more in favour of using mobile internet e-voting (75.25%), with more respondents requiring greater information about the technology (15.93%) rather than being against its use (8.82%). The top appeals of the platform were towards mobility (91.40%), verifiability (72.90%) and speed (72.50%), with the top concerns towards manipulation (75.10%), retrieval (65.30%) and monitoring (63.20%) of casted votes by malicious parties or software. The initial hypothesis that were derived from the conclusion of the survey and post analysis are based on studies that were derived from Davis' (1989) TAM, as it has been identified that there is a correlation between the perceived ease of use and the perceived usefulness of a technology to its acceptance and use.

Keywords: Mobile voting, remote internet e-voting, voting / election technologies, e-government, online voting, electronic voting survey

1. Introduction

The Australian Secret Ballot was an innovation of its time when it was introduced in 1855 in the state of Victoria. Since that time there has been little change or alternatives to the mechanism by which eligible voters can cast a ballot. This is unlike other areas of the Australian government that have adopted a range of internet and e-commerce technologies such as health and welfare services, and the deployment of a range of new channels to deliver e-government services. Australian citizens can now access services such as their personal medical records online and control information pertaining to these records through the eHealth service website (<http://www.ehealth.gov.au/>). Governments around the world have also adopted e-government technologies, with the New Zealand government aiming to have all their new government services offered online by 2017 [UNPAN 2014] while Ethiopia, placed 72nd globally in online service delivery, it has one of the best performing Least Developed Country (LDC) in online service delivery, placing its online service delivery well ahead of other countries, including Malta, Belarus, Cyprus and Indonesia [UNPAN 2014]. In fact the World average E-Government Development Index is 0.4712 as of 2014 [UNPAN 2014].

E-voting has been considered as one way for improving the electoral process. The term "E-Voting" can be viewed as describing an enabling technology or a platform by which an elector casts a ballot via electronic means [Caarls 2010]. Conceptually, the benefits that can be derived from adopting a E-voting platform include verifiability, speed of tallying ballots, reduced administration, reduced wastage of resources and time, and vote casting validation [Goodman et al. 2010; Jordi Barrat i Esteve et al. 2012; R. Michael Alvarez et al. 2012]. The E-voting technology is not without its disadvantages, with potential issues readily identified such as inequality, security, secrecy, and trust [Caarls 2010; Henrik Nore n.d.; Rodney Smith 2009]. Multiple trials of E-voting have occurred across the globe, and the technology has already been deployed in Markham, Canada [Goodman 2014]; New South Wales, Australia [Electoral Council of Australia and New Zealand 2013]; Estonia

[Estonian National Electoral Committee n.d.] and Barcelona, Spain [Riera and Cervelló n.d.], just to name a few.

In Australia, voting is compulsory, meaning that "It shall be the duty of every elector to vote at each election" [Commonwealth Electoral Act 1918]. The iVote Remote Electronic Voting system introduced initially in the March 2011 State General Elections, which was also used in the 2015 NSW State General Election held on 28th March 2015, provided eligible voters the ability to cast their ballots online. Approximately 200,000 votes were captured through iVote during the 2015 State General Election. For enrolled voters in NSW who preferred to use the iVote system to cast their votes online, they were required to satisfy one or more of the following eligibility criteria [Electoral Commission NSW n.d.]:

- real place of living is not within 20 kilometres, by the nearest practicable route, of a polling place;
- have a disability (within the meaning of the Anti-Discrimination Act 1977) and because of that disability have difficulty voting at a polling place or are unable to vote without assistance;
- will not be within New South Wales throughout the hours of polling on election day;
- vision is so impaired, or otherwise are so physically incapacitated or so illiterate, that are unable to vote without assistance.

Our society has become rapidly fuelled by the mobilization of interactions and services. As society becomes more wirelessly connected, these platforms provide an untapped universal medium by which paper based elections can be complemented or even "upgraded" to digital elections. According to the Australia Bureau of Statistics [2015], by the end of December 2014 there were 6 million wireless broadband connections in Australia. This equated to 47.8% of the different ways Australian people connect to the internet, as opposed to 1.6% at the end of June 2006. This trend is not only valid for Australia. In a report conducted by Cisco [2014], the company claimed that the global mobile data traffic had grown by 81% in 2013 with an expected forecast reaching 15.9 Exabytes per month of mobile data traffic by 2018. More specifically, with regards to the smartphone technology, the Deloitte Media Consumer Survey 2014 discovered that 81% of Australian adults (aged 18 to 75 years) own a smartphone device [Deloitte 2014]. An opportunity clearly exists to connect Australian voters to the electoral process by using their smartphone devices.

There has been some research examining how an internet e-voting platform would function and what principles it would need to follow to ensure a safe, secure and trustworthy election. Esteve, Goldsmith and Turner [2012] further clarifies why trust is an essential part for an internet e-voting system. When trust is lacking, the integrity of the overall electoral process may be called into question, which in turn undermines the legitimacy of elected institutions and the authority of the elected government. Fouard, Duclos and Lafourcade [2007] surveyed over 15 different e-voting schemes and identified a set of security properties and cryptographic primitives of each scheme. This provided a solid comparison of the different schemes and how (and if) they implemented the identified security properties and cryptographic primitives. The security properties and cryptographic primitives analysed by Fouard, Duclos and Lafourcade [2007] have relevant applications in mobile internet e-voting as they are supposed to be applicable to any form of e-voting and not directly depend on a particular medium used to cast an e-vote.

Presumably, these principles can be applied towards a mobile internet e-voting platform. Though research has been conducted on the usefulness and perceptions of internet e-voting [Carter and Campbell 2012; Christian Schaupp and Carter 2005; Carter 2008], public perceptions (specifically Australian public perceptions) on mobile internet e-voting have been lacking.

This research is the first paper in a study which will be focusing on internet e-voting platforms, specifically utilising a mobile platform within Australia. As with any research, context shapes the direction and outcome goals. Internet e-voting (and research pertaining to) has gained momentum over recent years. Though there has been much research done in this field overseas, there exists a gap in findings when dealing with the Australian and mobility context, however similarities can be drawn from these related studies. The way the Australian context differentiates itself in one instance is Compulsory Voting. Utilising the findings from this initial study, we intend to provide a baseline from which our research can be analysed and in turn will allow the derivation of hypotheses leading to creation of a user acceptance model towards utilisation of a mobile internet e-voting platform during an Australian election.

Davis' [1989] Technology Acceptance Model (TAM) is widely used in studying the adoption and acceptance of technology. TAM has two primary constructs, perceived usefulness (PU) and perceived ease of use (PEOU). According to Davis [1989], PU is defined as the user's perception of the system to improve one's job performance. PEOU, on the other hand, is defined as the perception of the amount of effort required by the user to use the system. PU and PEOU influence a user's behavioural intention to use a system, which in turn determines actual system usage [Carter and Bélanger 2005].

Carter and Campbell [2012] presented a parsimonious model based on eight behavioural models including TAM, of US citizens' perceptions of I-voting usefulness. As with many studies conducted on internet e-voting [Carter and Campbell 2012; Riera and Cervelló n.d.; Carter and Campbell 2011; Carter 2008], there are constraints and parameters which vary when applying the findings of these studies to the context such as Australia.

In particular, when comparing the Australian to the United States contexts one key difference is that in Australia, voting is compulsory, whilst in the United States it is not [Parliamentary Education Office n.d.]. One of the main considerations with research into internet e-voting conducted in the context of countries where voting is not compulsory (such as the United States) is how to address voter turnout [Carter and Campbell 2011; Carter and Campbell 2012; Spada et al. 2015; Bochsler 2010]? Countries which implement compulsory voting also try to address the issue of voter turnout but it has a different focus and priority.

Recently the Australian Broadcast Corporation (ABC) published an article in relation to an obtained internal report by the Australian Electoral Commission (AEC) that showed more than 1 million people are currently not on the electoral roll [Ashlyne McGhee 2016]. Though compulsory voting is a law in Australia [Commonwealth Electoral Act 1918], the report states that the AEC "does not impose fines for non-enrolment".

The Electoral Council of Australia and New Zealand [2013] has identified three different ways in which internet e-voting might impact on voter engagement;

- It may directly increase the likelihood of voting by persons who are already engaged with the electoral process and wish to vote;
- It may motivate people who currently are disengaged from the political and electoral processes, and who do not turn out to vote, to do so in future; and
- Arguably the availability of internet e-voting will not necessarily increase turnout, but it could prevent a potential disengagement from the electoral processes among younger voters which is postulated to flow from a foreshadowed growing sense of alienation not from electoral processes per se, but from the use of antiquated voting mechanisms.

Differences between government structure and electoral processes also need to be considered when comparing the results of e-voting studies.

The United States is a republic, whereas in contrast Australia is a constitutional monarchy. The Australian Prime Minister is selected by the elected members of the party/parties that have won a majority of seats in the House of Representatives, whereas the US President is directly elected by the people and must appoint non-members of the Congress to fill ministerial posts. Elections for the House of Representatives use a preferential voting system to elect one member for each electorate. Elections for the Australian Senate use a proportional voting system to fill multiple vacancies in each state and territory. In comparison, elections in the United States use the simple majority or 'first past the post' system for both houses [Parliamentary Education Office n.d.]. These large differences in government structure and electoral processes likely influence how a voter might utilise a mobile internet e-voting system. They might be voting for the US President or alternatively their local Australian House of Representatives member, their electorate might use preferential voting or instead 'first past the post' voting. Ease of use, security and urgency to cast vote might be of different importance to voters in these different electoral systems.

Finally, cultural differences between the Australian context and the others (i.e. United States) needs to be considered when gauging public perceptions and developing the acceptance models. Significant socio-economic and cultural differences exist between countries such as the United States and Australia, for instance

Cross-cultural research (which involves empirical studies across members of various cultural groups) has found that different cultural groups have had different experiences which lead to a predictable and significant difference in cultural behaviour [Brislin 1976]. Such differences could lead to cultural specific perceptions on the value of mobile e-voting.

It is important to point out that public perception needs to be understood in order to determine the likelihood of adoption. Carter and Belanger [2005] states that the adoption of e-government services is contingent upon citizens' confidence in both the enabling technologies and the agency offering the service. The rollout of a mobile internet e-voting platform is likely to be both expensive and resource intensive. As a result, confidence that such a system will be adopted by their citizens is critical to the government's support for the technology.

In order to clarify the factors that might hinder the adoption of a mobile internet e-voting platform in Australia, we believe that the voice of the Australian public must be heard so that their concerns can be analysed and addressed. Unfortunately, there is no publicly available data that we could reference for such purpose. The search for an answer to our enquiry led to the launch of a month long awareness campaign spanning March and April 2014 that, coupled with an online survey, has enabled us to collect feedback from the public.

Our goal for the survey was that it could provide an opportunity for the Australian public to help shape how they would like their mobile e-voting platform to be designed. The findings of this survey might also be useful to other countries that are considering the deployment of a mobile E-voting solution. Through the survey instrument, we have attempted to discover what the public finds appealing and likewise concerning about the technology as well as their perceptions of the current election process. Utilising the collected data, we intend to develop hypotheses for further investigations through qualitative analysis. We anticipate that these hypotheses will help us determine the PU and PEOU of a mobile internet e-voting solution, which as per Davis' [1989] TAM, will determine the likelihood of adoption. We believe that these results will benefit the academic community and government bodies alike in understanding the public perception on e-voting.

The remainder of this article is organised as follow. In section 2, the methodology used to design the survey, completed with a description on the breakdown of the survey sections, will be given. Measures that are derived through the survey are also discussed, while a brief overview of the questions (A complete list of survey questions can be found in the electronic appendix) is also included. Section 3 presents the initial findings of the survey. Sections 4 and 5 discuss the [limitations](#) of the survey and the implications and findings of this study, respectively. Lastly, in section 6 we conclude and summarise future work.

2. Methods

2.1 Survey design

The anonymous public survey was made available online and in paper based mail format for eligible Australian voters between 16th of March and 30th of April 2015. This survey was the first of its kind that specifically aimed to derive a baseline data set from which the Australian public's perceptions and trust in mobile e-voting could be established. In addition, the data can be used to assist in identifying key issues for future research projects that are aimed at understanding the adoption of mobile e-Voting technology. The Mobile Voting website (<http://mobilevoting.com.au>) was launched in February 2015 as part of a public awareness campaign to inform about the existence of mobile e-voting technology. The site was not meant to promote the argument for or against mobile e-voting technology. It was primarily used to promote the survey in conjunction with various social media pages on Facebook, Google Plus and Twitter.

The survey was split into seven sections, including:

1. *Information Sheet*: Provide the potential respondent with information relating to the research, the survey and ethics committee approvals.
2. *Eligibility*: Confirm if the respondent was eligible to undertake the survey or not. The criteria were set to mirror the current Australian eligibility criteria for an election.

3. *Demographics*: Provided information that will be used as dimensions to the results. This included questions about gender, age, income, locality, internet accessibility, education, and disabilities.
4. *Connectivity*: Provide information on the internet and technological access, internet device and service preferences of the respondent. This information will also allow the research team to apply an additional level of categorisation on the results.
5. *Elections*: Allow respondents to indicate what they like and do not like about the current voting process.
6. *Mobile Voting*: Allow respondents to indicate what properties of mobile internet e-voting that they find of appeal and concern. This include finding out if the respondent would utilise mobile internet e-voting if it was made available at the next election. Preferences and trust towards online systems was also captured.
7. *Feedback*: Capture open ended response to any additional comments the respondent might want to make.

These sections were designed to provide classifications and identified relationships (if any) between various responses. These relationships will allow the research team to shape hypotheses based on the findings of the survey. A statistical power analysis revealed that $N = 276$ ($\alpha = 0.05$, $\beta = 0.80$) would be a sufficient number of respondents for the survey to detect a moderately sized effect on a normalised scale ($\Delta = 0.30$) in favour or against mobile e-voting.

This survey is the first of its kind conducted by an Australian academic institution, which allows this research to be approached with a sense of impartiality. The research team attempted to capture as much information as possible from the respondents without directing answers or generating questions of bias. The survey was designed to be an anonymous and self-completing [Brace 2004] survey. By adopting this design, we aimed to remove any potential bias in the responses while making it easier for the respondents to be honest about sensitive subjects [Brace 2004]. Survey fatigue was another area that required our attention in that too many questions could cause the respondents to rush through the survey in order to get it completed quickly [Brace 2004; Porter et al. 2004]. Sharp and Frankel [1983] found that longer surveys result in lower response rates. To address survey fatigue, multiple techniques were applied and tested. The survey length and content were tested against a pilot group prior to public release, where the average completion time was approximately 10 minutes. Another technique utilised was attaching pre-coded responses and explanations to applicable questions. For example, respondents were given pre-coded response like "I'd prefer not to say" or "Other" to indicate that they did not want to answer the question or their preferred response was not listed.

The survey design also ensured that questions were ordered to prevent unintended bias of responses to later questions. Behavioural questions that are arguably easier to answer and ones which require recall were asked prior to attitudinal questions which are meant to solicit a respondent's position towards a subject or matter. This allows us to assess the respondent's behaviour in light of their attitudes [Brace 2004]. This was used in conjunction with the technique of "funneling" [Brace 2004], which attempted to order questions from the general to more specific questions.

2.2 Measures

The survey was designed to be an anonymous survey and respondents had to satisfy a set of eligibility requirements. These requirements are the eligibility to cast a vote in an Australian election and the condition that the respondent cannot be a direct relative of a member of the research team. If a respondent met these conditions, they would be eligible to continue with the survey; otherwise, they would be redirected to a disqualification page and the survey would be terminated.

In order to determine what factors influence user acceptance in the adoption of a mobile internet e-voting platform, we resorted to Davis' TAM [1989] to measure the PU and the PEOU by means of our survey. The survey asked what the respondent Liked and Disliked about the current electoral voting process, what the respondent thought was appealing and concerning for a mobile internet e-voting platform, what devices the respondent prefers to use to access the internet, what tasks they have previously completed using the internet, etc.

The survey also included questions that are related to the current electoral process and mobile internet e-voting platform. Answers to these questions allow the research team to establish the PU of a mobile internet e-voting platform. By understanding the likes and dislikes of the current electoral process, we want to uncover

what the perceived disadvantages of the current process are and how they can be addressed. At the same time, we want to ascertain what the perceived advantages are and how they might be reapplied (or enhanced) in order for the e-voting platform to be perceived as useful.

Moreover, the survey has questions that asked what devices the respondent had previously used and what tasks he or she had completed online. These data give us a baseline from which to establish the perceived ease-of-use of a potential e-voting platform. Through capturing the types of device used and the tasks respondents had undertaken to do online, we are able to establish the requirements that are needed to ensure compatibility across devices when the user interface and the interactivity (e.g. it should be as simple and intuitive as an online shopping store) of the e-voting platform are designed.

Furthermore, the demographics of the survey respondents were also recorded. These data include age group, gender, average yearly income range, current living locality, highest education level, and disabilities. By incorporating these information in our research, we attempt to achieve "universalism" [Hammer 2011] in our findings. Universalism is defined as the principle that a given value, behaviour, theory, or treatment will be the same across all groups independent of culture, race, ethnicity, gender, and other social identities (Reynolds 2008; Beins, 2009, p. 356). Hammer [2011] states that thorough description of participants allows readers and researchers to determine for whom the findings can be generalised and how they can be compared. Demographic questions will also allow the sample characteristics to be compared with the national characteristics (e.g. percentage of males to females between the age of 18 and 95 nationwide).

Direct questions were asked towards the end of the survey. These include three key questions:

- "From past experiences using secured online systems, both government and commercial, how would you best rate your trust of these systems? Examples of such systems are Online Banking systems or Welfare and Human Services systems."
- "If a mobile e-voting platform was made available during the next election, would you use it to cast your vote?"
- "Rank your preference on how you would cast your vote, if a mobile e-voting platform was made available during the next election."

By asking these questions in the survey, we attempt to objectively assess these demographical, PU and PEOU factors in coming up with a set of hypotheses that we can test to establish the Intended Use [Davis 1989] of a mobile internet e-voting platform and the levels of trust that the respondents might have towards using the platform.

3. Results

3.1 Sample

In this study there were 335 respondents, the results of 40 respondents were disqualified from further analysis due to not having completed the survey. As this was a voluntary survey, item non-response bias can be inferred, implying that these samples can be excluded (Sherman, 2000) and the results derived from the remaining N = 295 samples can be presented. Note that the original statistical power test required N be greater than or equal to 276. As such, the remaining sample is still within study parameters.

Survey respondents were given the pre-coded response of "I'd prefer not to say" (PNTS) for all demographics questions. Table 1 contains a summary of the primary characteristics of the sample. The ages of the sample ranged from 18 years and older; females accounted for 43.73% of the sample, with 2.04% PNTS. The mode average income was \$0-\$24,999 AUD, with 65.00% of the sample currently living in an urban location; 63.71% of respondents have undertaken or completed a tertiary university education; 8.83% had a physical or mental disability; and 3.38% were blind or vision impaired.

Table 1: Primary Characteristics of Sample (N = 295).

	%		%
Gender		Locality	
Female	43.73	Internationally	1.70
Male	54.23	Urban	65.42
PNTS	2.04	Rural/Remote	32.20
Age Group		PNTS	
18-24 years	13.23	0.68	
25-34 years	24.39	Education	
35-44 years	15.58	Didn't attend	0.00
45-54 years	16.28	Home School	0.00
55-64 years	17.30	Primary School	0.00
65-74 years	11.53	High School	15.26
75-84 years	0.68	TAFE	21.03
85-94 years	0.00	University	63.71
95 year or above	0.34	Physical or Mental Disability	
PNTS	0.68	No	90.15
Average Income		Yes	8.83
\$0-\$24,999	20.35	PNTS	1.02
\$25,000-\$49,999	17.97	Blind or Vision Impaired	
\$50,000-\$74,999	16.93	No	96.28
\$75,000-\$99,999	16.27	Yes	3.38
\$100,000-\$124,999	9.15	PNTS	0.34
\$125,000-\$149,999	3.39		
\$150,000-\$174,999	1.36		
\$175,000-\$199,999	1.02		
\$200,000 and up	2.71		
PNTS	10.85		

3.2 Connectivity to the Internet, devices and online services

For the respondent connectivity section (i.e. section 4) of the survey, 98.98% of the sample had access to the internet, with 70.85% of respondents having access to mobile internet; 88.81% of the sample are utilising a Smartphone; 10.85% have voted for an election online; and 82.37% have used social media services, online shopping and online banking (see Table 2). Table 3 ranks the usage of devices by the respondents to access the internet. As can be observed, PC/Laptop is the most preferred device, followed closely by Smartphones.

Table 2: Internet access, devices and experience with online services (N = 295).

	%		%
Types of Internet Access		Devices Owned	
Home Broadband	78.31	PC or Laptop	97.63
Mobile Internet	70.85	Smartphone	88.81
Work Broadband	41.02	Tablet	70.85
Work Not Sure	5.42	Smart TV	34.58
Other	5.08	Feature Phone	17.63
Home Not Sure	4.75	Other	4.41
Home Dial-up	1.02		
Work Dial-up	0.68		
Online Services			
Sending/Receiving Email		98.64	
Social Media (e.g. Facebook, Twitter, LinkedIn)		94.56	
BPay, PayPal or other payment facilities		92.86	
Online Banking		91.16	
Online Shopping (e.g. eBay, Alibaba, Woolworths Online)		89.12	
Reading/Watching News		88.44	
Voting Online for an Election		10.88	

Table 3: Ranked order of device used to access the internet (N = 295).¹

Rank \ Device	1	2	3	4	5	6	N/A	Score ²
PC or Laptop	46.78	32.20	15.25	0.68	0.68	0.68	3.73	5.26
Smartphone	40.34	32.20	12.20	1.69	1.36	1.69	10.51	5.16
Tablet	8.16	21.09	34.69	8.50	3.06	1.02	23.47	4.26
Smart TV	0.34	3.05	8.14	20.68	10.51	5.08	52.20	2.89
Other Devices	0.34	3.39	7.80	21.36	15.93	5.08	46.10	2.81
Feature Phone	3.73	3.73	5.42	4.75	5.76	13.22	63.39	2.78

3.3 Likes and Don't Likes about current voting process

Table 4 shows the reasons behind sample Likes and Dislikes for the current electoral process. The top 3 likes are "Ability to cast a vote anonymously" (67.03%), "Ability to send my vote in via mail (postal voting)" (33.33%) and "Sausage Sizzle"³ (30.43%). On the other hand, the top 3 dislikes are "Lining up to vote / Time taken to cast a vote" (70.73%), "Having only one day to cast a vote physically" (57.84%), and "Travelling to the polling station" (56.10%).

Table 4: Likes and Don't Likes of the current voting process (N=295)⁴

Don't Like	%
Lining up to vote / Time taken to cast a vote	70.73
Having only one day to cast a vote physically	57.84
Travelling to the polling station	56.10
Taking time out of my day to vote	55.40
Party volunteers providing how to vote cards	52.26
Size and time to fill in a ballot paper	45.99
Security of ballot papers once cast	33.10
Compulsory voting	25.09
Name and address available to voting officials when signing in	21.60
Other	14.98
Like	
Ability to cast a vote anonymously	67.03
Ability to send my vote in via mail (postal voting)	33.33
Sausage Sizzle	30.43
How to vote information cards	18.48
Other	14.49
Being able to catchup with friends at the voting station	8.33
Being able to discuss political policy with party volunteers	6.88
Getting help to cast a vote from a friend or family member	5.80

3.4 Appeals and Concerns of a mobile internet e-voting platform

Table 5 shows the selections of sample appeals and concerns for use of a mobile internet e-voting platform. The top 3 appeals are "Able to cast a vote from anywhere online" (91.40%), "Getting a receipt confirming vote was cast" (72.90%) and "Speed to cast a ballot" (72.50%). On the other hand, the top 3 concerns are "Hackers,

¹ Values are presented as percentages.

² Score is the representation of the ranking average. Rankings are weighed in reverse order (Rank 1 = Weight 6, Rank 2 = Weight 5, etc.)

and calculated using $\frac{x_1 \cdot w_1 + x_2 \cdot w_2 + \dots + x_n \cdot w_n}{t}$, where w = weight of ranked position; x = response count for answer choice; t = total.

N/A responses are not factored into the ranking average

³ Sausage sizzles are charity fundraising and community events that are held at various polling stations during Election Day, where volunteers cook barbecue sausages and serve on a slice of bread or on a bread roll, accompanied by onions and sauces.

⁴ Results presented in this table are not mutually exclusive categories and therefore do not add to 100%.

malware or virus changing my vote" (75.10%), "Hackers, malware or virus being able to retrieve my vote" (65.30%), and "Hackers, malware or virus monitoring my vote" (63.20%).

Table 5: Appeals and Concerns of a mobile internet e-voting platform (N=295)⁵

Concerns	%
Hackers, malware or virus changing my vote	75.10
Hackers, malware or virus being able to retrieve my vote	65.30
Hackers, malware or virus monitoring my vote	63.20
Secrecy/Privacy of my vote. Being able to link my vote back to me	55.60
Lack of independent oversight of the system	44.80
System built and maintained by a contracted commercial company	44.40
Users of the system having the ability to sell their votes	41.90
The voting system not being 100% compatible with my device	27.40
Lack of government oversight of the system	26.70
Other	14.10
Complexity of cast a vote	11.90
Being influenced to vote one way by someone other than an immediate family member	6.10
The time it takes to cast a vote	4.70
Being influenced to vote one way by an immediate family member	4.00
The color scheme of the voting system	2.50
Appeals	
Able to cast a vote from anywhere online	91.40
Getting a receipt confirming vote was cast	72.90
Speed to cast a ballot	72.50
Being able to confirm cast vote is counted as cast	69.40
Speed to obtain election result count after polls are closed	58.40
Voting system being thoroughly tested prior to an election by independent bodies	58.10
The voting system used to complement not replace the current system	51.90
Being able to SMS ⁶ my vote	44.70
Being able to see party policies information prior to casting a vote	44.70
Having an online tutorial to help understand how to cast a vote	40.50
Being able to phone in my vote to a computer system	31.60
Being able to change my vote, prior to polls closing	27.10
Being able to cast a vote with multiple language support	17.50
Being able to attend a polling station to cast my vote that overrides my online vote	14.10
Other	10.00
Being able to share my preferred vote (via social media sites)	8.20

3.5 Trust in government and commercial online systems and preference towards a mobile e-voting platform

Table 6 reveals that a majority of the respondents (72.88%) either Completely trusted or Slightly Trusted government and commercial systems as opposed to (15.93%) who either Completely Distrusted or Slightly Distrusted government and commercial systems. A total of 75.26% of the respondents would use a mobile internet e-voting platform if it was made available during the next election; 15.93% were unsure and required more information; and 8.81% would not use the platform. Out of the respondents who Completely Distrusted or Slightly Distrusted government and commercial systems, 42.55% of them would still use a mobile internet e-voting platform.

⁵ Results presented in this table are not mutually exclusive categories and therefore do not add to 100%.

⁶ Short Message Service.

In relation to the preference of the voting mechanism, Table 7 makes known to us that “Use my smartphone or tablet to vote using an app” was ranked first, followed by “Use my own connected device to cast a voting on a website - such as PC or Laptop” and “Send an SMS with my vote”. The current main mechanism of casting a vote in Australia by using a paper ballot was ranked as the 2nd last preference.

Table 6: Trust in online systems (government and commercial) (N = 295)

Completely Distrust	Slightly Distrust	Neither Distrust or Trust	Slightly Trust	Completely Trust	Median
1	2	3	4	5	
4.07%	11.86%	11.19%	37.63%	35.25%	4

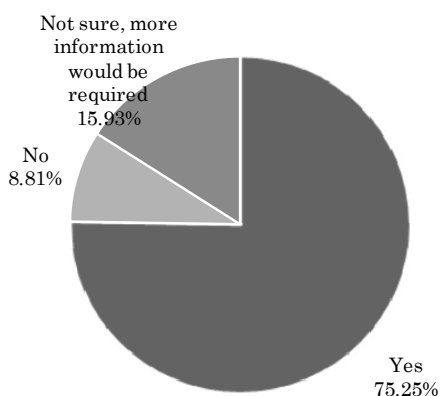


Figure 1: Use of a mobile internet e-voting platform if available in the next election (N = 295)

Table 7: Ranked order of preference on how to cast vote if a mobile internet e-voting platform if available in the next election (N = 295).⁷

Method \ Rank	1	2	3	4	5	6	N/A	Score ⁸
A	41.02	29.83	8.81	6.44	3.05	2.37	8.47	5.01
B	36.95	29.15	13.56	8.14	4.07	2.03	6.10	4.86
C	4.57	15.25	33.22	14.92	9.49	8.14	14.24	3.61
D	4.07	11.86	14.58	18.98	23.39	11.53	15.59	3.05
E	12.54	5.42	8.81	17.63	17.63	28.81	9.15	2.80
F	0.34	4.41	13.90	21.69	20.68	17.63	21.36	2.59

- Use my smartphone or tablet to vote using an app
- Use my own connected device to cast a vote on a website - such as PC or Laptop
- Send an SMS with my vote
- Use a computer setup at a polling place that is owned and maintained by the Electoral Commission to cast a vote on a website
- Paper vote in a polling place
- Telephone - Call into a digital touch tone service (similar to telephone banking)

⁷ Values are presented as percentages.

⁸ Score is the representation of the ranking average. Rankings are weighed in reverse order (Rank 1 = Weight 6, Rank 2 = Weight 5, etc.) and calculated using $\frac{\sum_{i=1}^n x_i w_i}{\sum_{i=1}^n w_i}$, where w = weight of ranked position; x = response count for answer choice; t = total. N/A responses do not factor into the ranking average

4. Limitations

This study is not without its limitations. Firstly, even though it meets the size requirement of the statistical power analysis, the sample size of 295 respondents is still significantly small relative to the number of eligible Australian voters (16,405,465 as at 31 December 2015 [Australian Electoral Commission 2015]). However, this study is still able to sample a diverse range of respondents in terms of age, gender, income and locality, thereby increasing the generalisability of the findings [Carter and Bélanger 2005] by pushing the research towards “universalism” [Hammer 2011]. Future studies should seek a greater number of responses with more diversity in education and more focused research on groups identifying as having a disability that will allow more complex model testing. The survey was presented to the public via internet and paper mail out, yet all responses to the survey were submitted online. This is not necessarily a limitation but can be seen as a bias. Future studies should attempt to get responses from members of public who have limited computer skills or internet access. Although great effort was spent on the survey question design it cannot be guaranteed that some questions might be considered leading or otherwise misinterpreted by respondents. Such issues could themselves be a result of cultural or linguistic mismatches between the study authors and the general Australian public at large.

5. Discussions

Based on the primary findings of this survey, we have developed with several hypotheses that we will examine and test in later studies. From the survey data, we are able to identify a correlation between the trust levels of online government and commercial systems and the adoption of mobile internet e-voting technology (H1 and H4). This is also apparent in the concerns of a mobile internet e-voting platform as per the findings. Based on studies that were derived from Davis’ (1989) TAM, it has been identified that there is a correlation between the perceived ease of use and the perceived usefulness of a technology to its acceptance and use (H2 and H3). In relation to mobile internet e-voting, this survey has additionally identified an area of further study, and that is whether or not the allure of a new technology that makes voting simpler, faster and more convenient (PU & PEOU) will outweigh some traditional concerns of security. Verifiability and anonymity have been identified as one of the key appeals and likes of the current voting system and therefore must be retained with any implementation of a mobile internet e-voting platform (H5).

Table 8: Hypotheses relating to the adoption of mobile e-voting in Australia.

Hypothesis
H1. Trust is critical to mobile internet e-voting adoption.
H2. Greater perceived ease of use will contribute to a greater likelihood of mobile internet e-voting adoption.
H3. Greater perceived usefulness will contribute to a greater likelihood of mobile internet e-voting adoption.
H4. Significant levels of trust in the government and commercial agencies contribute to the likelihood of mobile internet e-voting adoption.
H5. Verifiability and anonymity must be proven for the likelihood of mobile internet e-voting adoption.

6. Conclusion

This paper, and the survey it described, has provided a set of baseline hypotheses which can be further tested in relation to the adoption of mobile internet e-voting in Australian elections. Survey respondents were overall more in favour of using mobile internet e-voting (75.25%), with more respondents requiring greater information about the technology (15.93%) than being against the use of the technology (8.82%). The top appeals of the platform were mobility (91.40%), verifiability (72.90%) and speed (72.50%) with the top concerns being manipulation (75.10%), retrieval (65.30%) and monitoring (63.20%) of votes by malicious parties or software. This study also provided an insight into the current voting platform. The top 3 likes of the current voting platform were found to be anonymity (67.03%), postal voting (33.33%) and sausage sizzle

(30.43%) with the top 3 dislikes being time taken to vote (70.73%), having only one day to vote (57.84%) and travelling time to vote (56.10%). Incidentally, the like of postal voting as a mechanism of the current platform is of particular interest as it can be seen as a form of remote voting that can be used to overcome the top 3 dislikes.

Being the first study of its kind carried out by an Australian academic institution, this research provides insights into both the potential pathways by which e-voting can be successfully adopted and the potential impediments that would prevent successful implementation. This study has proved to be able to sample a diverse range of respondents over an array of demographics, which allowed the findings to push towards a “universalism” that increases the generalisability of the findings.

Future research will continue to utilise the data from this study, as well as additional data gathered from select cohorts of respondents. The results will be analysed statistically and will be used to develop a research model and a survey targeting particular demographics to study current and future hypotheses on the topic of mobile internet e-voting adoption in Australian elections.

7. Acknowledgments

The research team would like to thank the anonymous survey respondents for generously taking their time to complete the survey. They also want to thank various media outlets for their assistance in advertising to the Australian public of this study.

8. Ethics Review

Approval for this study was granted by the Human Research Ethics Committee of the University of New England, Approval No HE15-055 Valid to 13/03/2016. As this survey was anonymous and voluntary, consent was given by the respondents prior to undertaking the survey by continuing through from the information page.

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Online Appendix to: Perceptions of the Australian public towards mobile internet e-voting: risks, choice and trust

A. Survey Instrument

A.1 Information Sheet

The following is some information which needs to be read and understood prior to undertaking this survey.

I wish to invite you to participate in my research project, described below.

My name is Phillip Zada and I am conducting this research as part of my PhD in the School of Science and Technology at the University of New England. My supervisors are Dr Greg Falzon and A/Prof Paul Kwan.

Research Project

A vulnerability analysis on the adoption of mobile Internet e-Voting in Australia

Aim of the research

This project aims to identify the challenges that arise or are found to hinder the implementation of a mobile e-voting platform in Australia. This research utilises scholarly literature, past case studies and public surveys as sources of information and data for detailed analyses. Identified challenges will be addressed through a vulnerability analysis that will propose potential solutions.

Survey

As part of this research we will be conducting an anonymous survey to determine public perception, interests and concerns about mobile e-voting (using your mobile phone to cast a vote). The survey consists of 21 questions which you can complete either on line or via a supplied return post form. The survey will take approximately 15 minutes to complete and all responses obtained will be securely and anonymously stored on an electronic database.

Confidentiality

No personally identifiable information gathered in the course of the study and your identity will remain confidential. No individual will be identified by name in any publication of the results.

Participation is Voluntary

Please understand that your involvement in this study is voluntary and I respect your right to withdraw from the study at any time. You may discontinue the survey at any time without consequence and you do not need to provide any explanation if you decide not to participate or withdraw at any time.

Questions

The survey questions will not be of a sensitive nature: rather they are general or demographic in nature, aiming to enable you to enhance my knowledge of the issues associated with the implementation of mobile e-voting in Australia.

Use of information

I will use information from the survey as part of my doctoral thesis, which I expect to complete in August 2016. Information from the survey may also be used in journal articles and conference presentations before and after this date. At all times, I will safeguard your identity by presenting the information in way that will not allow you to be identified.

Upsetting issues

It is unlikely that this research will raise any personal or upsetting issues but if it does you may wish to contact Lifeline 13 11 14.

Storage of Information

Any electronic data collected during the survey will be kept on a password protected on line database. Only the research team will have access to the data.

Disposal of information

All the data collected in this research will be kept for a minimum of five years after successful submission of my thesis, after which it will be stored in a data curation service.

Approval

This project has been approved by the Human Research Ethics Committee of the University of New England, Approval No HE15-055 Valid to 13th March 2016.

Contact Details

Feel free to contact me with any questions about this research by email at pzada@une.edu.au. You may also contact my supervisors. My Principal supervisors name is Dr Greg Falzon and he can be contacted at gfalzon2@une.edu.au or 02 6773 2387 and my Co-supervisors name is A/Prof Paul Kwan and he can be at wkwan2@une.edu.au or 02 6773 2034.

Complaints

Should you have any complaints concerning the manner in which this research is conducted, please contact the Research Ethics Officer at:

Research Services
University of New England
Armidale, NSW 2351
Tel: (02) 6773 3449 Fax: (02) 6773 3543
Email: ethics@une.edu.au

Consent

- I have read the information contained in the Information Sheet for Participants and any questions I have asked have been answered to my satisfaction.
- I agree to participate in this activity, realising that I may withdraw at any time.
- I agree that research data gathered for the study may be published, and my identity will be unidentifiable due to the strict confidentiality explained in the information sheet.
- I am over 18 years of age.
- In preservation of anonymity, I understand that no name or signature is required of me to give consent. I understand that my completion of this survey implies my consent to participate in this research

A.2 Eligibility

1. To undertake this survey, you need to meet all these conditions:

- 18 years or above
- Of sound mind and body
- An Australian Citizen, or a permanent resident registered to vote (as a British subject) prior to 1984
- Do not have any relation to the research team

0 = No

1 = Yes

A.3 Demographics

2. What is your age group?

1 = 18-24 years

2 = 25-34 years

3 = 35-44 years

4 = 45-54 years

5 = 55-64 years

6 = 65-74 years

7 = 75-84 years

8 = 85-94 years

9 = 95 year or above

0 = I'd prefer not to say

3. What is your gender?

1 = Female

2 = Male

0 = I'd prefer not to say

4. What is your approximate average income?

1 = \$0-\$24,999

2 = \$25,000-\$49,999

3 = \$50,000-\$74,999

4 = \$75,000-\$99,999

5 = \$100,000-\$124,999

6 = \$125,000-\$149,999

7 = \$150,000-\$174,999

8 = \$175,000-\$199,999

9 = \$200,000 and up

0 = I'd prefer not to say

5. What best describes your current location?

1 = I currently live in a urban location

2 = I currently live in a rural or remote location

3 = I currently live outside Australia (International)

0 = I'd prefer not to say

6. What is your highest level of Education? *Either as an enrolled or graduated student.*

1 = Didn't attend school Home School

2 = Primary School

3 = Secondary School (High School)

4 = Tertiary education - TAFE

5 = Tertiary education - University

7. Are you considered to have a disability either physical or mental (lasting six months or more)?

1 = No

- 2 = Yes
- 0 = I'd prefer not to say

8. Are you blind or vision impaired?

- 1 = No
- 2 = Yes
- 0 = I'd prefer not to say

A.3 Connectivity

9. Do you have access to the internet?

- 0 = No
- 1 = Yes

10. Which type of internet connections do you have access to?

- 1 = Home Dial-up
- 2 = Home Broadband / NBN
- 3 = Mobile Internet
- 4 = Work Dial-Up
- 5 = Work Broadband
- 6 = Work, not sure what type of internet is being used
- 7 = Home, not sure what type of internet is being used
- 8 = Other (please specify)

11. Which of these devices do you currently own?

- 1 = Mobile Phone – Not a smartphone
- 2 = Smartphone
- 3 = Tablet
- 4 = PC or Laptop
- 5 = Smart TV
- 6 = Other (please specify)

12. Which online services have you used previously?

- 1 = Online Banking
- 2 = BPay, PayPal or other payment facilities
- 3 = Social Media Sites (e.g. Facebook, Twitter, LinkedIn)
- 4 = Online Shopping (e.g. eBay, Alibaba, Woolworths Online)
- 5 = Voting Online for an Election
- 6 = Sending/Receiving Email
- 7 = Reading/Watching News

13. Rank in order of most used to least used device to access the internet. *If you don't use the device select N/A*

- 1 = Mobile Phone (NOT a smartphone)
- 2 = Smartphone
- 3 = Tablet
- 4 = PC or Laptop
- 5 = Smart TV
- 6 = Other Devices

A.4 Elections

14. Indicate what you LIKE about the current voting process. *Select one or more of the following options*

- 1 = Ability to cast a vote anonymously
- 2 = Ability to send my voice in via mail (postal voting)
- 3 = Being able to catchup with friends at the voting station
- 4 = Being able to discuss political policy with party volunteers
- 5 = Getting help to cast a vote from a friend or family member
- 6 = How to Vote information cards

- 7 = Sausage Sizzle
- 8 = Other (please specify)

15. Indicate what you DON'T LIKE about the current voting process. *Select one or more of the following options*

- 1 = Travelling to the polling station
- 2 = Having only one day to cast a vote physically
- 3 = Size and time to fill in a ballot paper
- 4 = Party volunteers providing how to vote cards
- 5 = Taking time out of my day to vote
- 6 = Compulsory Voting
- 7 = Lining up to vote / Time taken to cast a vote
- 8 = Security of ballot papers once cast
- 9 = Name and address available to voting officials when signing in
- 10 = Other (please specify)

A.5 Mobile Voting

16. Which properties of a mobile e-voting platform are of CONCERN to you?

Select one or more of the following options

- 1 = Secrecy/Privacy of my vote. Being able to link my vote back to me
- 2 = Complexity of cast a vote
- 3 = The time it takes to cast a vote
- 4 = The color scheme of the voting system
- 5 = Lack of Government Oversight of the system
- 6 = Lack of Independent Oversight of the system
- 7 = Being influenced to vote one way by someone other than an immediate family member
- 8 = Being influenced to vote one way by a immediate family member
- 9 = Hackers, Malware or Virus monitoring my vote
- 10 = Hackers, Malware or Virus changing my vote
- 11 = Hackers, Malware or Virus being able to retrieve my vote
- 12 = Users of the system having the ability to sell their votes
- 13 = System built and maintained by a contracted commercial company
- 14 = The voting system not being 100% compatible with my device
- 15 = Other (please specify)

17. Which properties of a mobile e-voting platform are APPEALING to you?

Select one or more of the following options

- 1 = Able to cast a vote from anywhere online
- 2 = Getting a receipt confirming vote was cast
- 3 = Being able to confirm cast vote is counted as cast
- 4 = Speed to cast a ballot
- 5 = Speed to obtain election result count after polls are closed
- 6 = Being able to phone in my vote to a computer system
- 7 = Being able to SMS my vote
- 8 = Being able to cast a vote with multiple language support
- 9 = Being able to see party policies information prior to casting a vote
- 10 = Being able to share my preferred vote (via social media sites)
- 11 = Being able to change my vote, prior to polls closing
- 12 = Being able to attend a polling station to cast my vote that overrides my online vote
- 13 = Voting system being thoroughly tested prior to an election by independent bodies
- 14 = Having an online tutorial to help understand how to cast a vote
- 15 = The voting system used to complement not replace the current system
- 16 = Other (please specify)

18. From past experiences using secured online systems, both government and commercial.

How would you best rate your trust of these system?

Examples of these systems are Online Banking systems or Welfare and Human Services systems

- 1 = Completely Distrust

- 2 = Slightly Distrust
- 3 = Neither Distrust nor Trust
- 4 = Slightly Trust
- 5 = Completely Trust

19. If a mobile e-voting platform was made available during the next election, would you use it to cast your vote?

- 0 = No
- 1 = Not sure, more information would be required
- 2 = Yes

20. Rank your preference on how you would cast your vote, if a mobile e-voting platform was made available during the next election.

- 1 = Use my smartphone or tablet to vote using an app
- 2 = Telephone - Call into a digital touch tone service (similar to telephone banking)
- 3 = Paper vote in a polling place
- 4 = Send an SMS with my vote
- 5 = Use my own connected device to cast a voting on a website - such as PC or Laptop
- 6 = Use a computer setup at a polling place that is owned and maintained by the Electoral Commission to cast a voting on a website

A.6 Feedback

21. If you have anything else you would like to add or any other comments please do so below. As this is an anonymous please do not add any identifiable information otherwise the survey response will be deemed invalid.