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Research paper

The Evaluation of the Electronic Voting System: a Review

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Abstract

Electronic voting a ballot or e-casting a ballot alludes to the utilization of electronic methods in the decision procedure. It very well may be remotely done over the web or physically in surveying stations. Numerous nations have received this innovation for casting a ballot. The utilization of the e-casting a ballot framework is vital to improve the casting a ballot procedure. Specialists in e-casting a ballot ease of use assessment process have recommended three normal measurements for ease of use testing, which are viability, effectiveness and fulfillment.After the review of e-voting usability evaluation, it has been seen that researchers have concentrated on three main methodologies, which are review from experts, laboratory experiments and natural experiments. Among the 50 articles reviewed, about 50% of the e-voting system use touch screen interface; 17% use paper ballots and an optional scanner; another 17% use dial and buttons to pull the vote; while the rest, which is 16%, provide the whole ballot and request for the voter to press the button only once.

Index Terms: *Electronic Voting, Usability, Review.*

1. Introduction

Of late, electronic casting a ballot (e-casting a ballot) has pulled in light of a legitimate concern for such huge numbers of nations on the planet. Decisions allow to the residents to choose their pioneers for the different positions. Casting a ballot is an intriguing perspective for individuals to consider. It is essentially the way toward choosing k individuals from n add up to individuals. Imperative contemplations in making an e-casting a ballot framework are speed of the casting a ballot procedure, precision and security [1]. Casting a ballot innovation and ticket configuration can impact decision results, influence how voters feel about their capacity to practice their entitlement to cast a ballot and impact voters' eagerness to acknowledge the consequences of a race as authentic [2].

E-voting always promises fast voting in the elections, accuracy in voting and counting of votes/tallying of ballots [1]. It is therefore important to test the voting device interface and its main features. According to the International Standards Organization (ISO), the term, 'usability', means the level of efficiency, effectiveness and satisfaction attained by the user in using a product [3].

Usability has been evaluated using different methods by taking into account the users' satisfaction. This article describes all methods that have been used to evaluate the usability of the e-voting system. The study reviews different interfaces used in e-voting, whereby the common ones are touch panel interface, press button devices and mobile smart phones. The security analysis and verifiability is also discussed due to its importance in the voting process.

The study depicts that researchers in e-voting usability analysis have concentrated on three main methodologies, which are review from experts on Human Computer Interaction (HCI), laboratory experiments and natural experiments in different areas.

2. Electronic Voting Procedures And Protocol

E-casting a ballot alludes to traditional casting a ballot with the assistance of some electronic methods and it tends to be connected either remotely over the web or physically in surveying stations [4]. In the e-voting process, there are three phases which are taking place. These are pre-voting, voting and post-voting [5]. In the pre-voting phase, all preparations for voting are made and thoroughly accomplished. In the voting process, communication of various parts involved in the elections is secured. This means that the security between voters and the system; and the security between election officials and the system, is maintained. In post voting the election officials close the election and access the data base for further procedures.

The protocol of the elections can be simply explained as follows: The voter enters the website of the e-system and verifies its certification. If the user is verified, the system allows him or her to vote and all actions are recorded securely. After that, the voter logs-out and the system will not allow him or her to vote again.

The framework works generally as pursues: The voter gives his or her poll to a PC, which scrambles the ticket and submits it to a voting station. When the polling station shuts, the submitted figure writings are decoded in some unscrambling administration, in view of scrambling blend net. An examiner administers the whole procedure [6].

The piece of the framework not normally found in other sent web casting a ballot frameworks is distinguishing when a bargained PC has changed the poll. The polling booth and receipt generator

coordinate to register a grouping of receipt codes for the submitted tally. These codes are sent to the voter through a free channel (in all probability SMS messages to cell phones). The voter confirms the receipt codes against a rundown of recomputed receipt codes imprinted on his or her casting a ballot card.

3. About This Review

In this review, the ISO standards for usability metrics are applied. These metrics are: Effectiveness, Efficiency and Satisfaction. The main task of this study is to explain clearly the. About 50 articles on e-voting are reviewed.

A. Objectives

Clarifying the research objectives is the most crucial aspect when conducting a review. Generally, in this study, the objective is to study usability issues in e-voting of different researchers. The specific objectives are as follows:

1. To study the metrics used by researchers to evaluate the e-voting systems;
2. To study and evaluate the e-voting devices and interfaces used in e-voting systems to enhance security and reduce errors; and
3. To determine how the e-voting organism can assure the refuge of the voters.

B. Limitations of the study

This study is limited to the usability issues in the e-voting systems; hence, the e-voting machinery or devices together with the interfaces are reviewed. The study does not consider other factors of election like managerial, political or infrastructure.

4. Usability Criteria for E-Voting Systems

The ISO and the 9204NIST have proposed three usability metrics for any e-voting system. These metrics are effectiveness, efficiency and satisfaction [7].

Effectiveness is considered as the connection between the point of the item and the fulfillment of the undertaking. In the case of e-voting, the term, 'effectiveness', implies that a vote is directed to the candidate that an individual planned to vote for with no mistakes. This metric is measured mainly in two ways. The first way is to collect the number of errors; while the second way is by considering the interval of completion of tasks and number of assistances required.

Efficiency means users can meet their goals without using an inordinate number of resources [8]. This then refers to the time spent to complete the task.

Satisfaction means the subjective response of the user to the working of the system [7]. Is the user satisfied with the system? Has his or her vote been clearly recorded?

5. Literature Review

The examination by [1] has demonstrated that the e-casting a ballot framework program must be founded on security, to guarantee that programmers can't meddle with the framework. Ease of use specialists and political theory specialists have embraced considers on clients' communication with the framework. They center around lessening blunders in the casting a ballot procedure [9]. Likewise, they notice four fundamental perspectives, which are fulfillment, convenience, negligible help and trust in the casting a ballot framework. With regards to casting a ballot, precision implies that a vote is thrown for the competitor the voter has expected to vote in favor of, without mistake. Viability is generally estimated by gathering mistake rates, however it could likewise be estimated by culmination rates and number of helps [10].

C. Touch panel interface

The touch board interface has supplanted the utilization of console and mouse amid the e-casting a ballot procedure. The principle preferred standpoint of the touch board interface is that it causes the machine to offer different framework interfaces proficiently in an easy to use condition.

In this examination [11], an extraordinary touch screen, known as Haptic touch screen is talked about. This gadget serves those with extraordinary necessities.

The examination clarifies e-casting a ballot framework in three stages, which are: (I) Confirmation; (ii) Selection; and (iii) Voting. These three phases are called model of the e-casting a ballot framework [12].

The investigation by [13] prescribes the interface plan and movement stream are planned by considering the ebb and flow convenience inquire about. The convenience depends on security, straightforwardness, auditability and unwavering quality of the e-casting a ballot framework.

As far as the structure thought in a similar report, it depends on three ISO9241 measurements of ease of use, which are adequacy, proficiency and fulfillment, as portrayed previously.

Fig.1: Polling station e-voting device

Fig.2: One pressing e-voting device

D. Direct-recording electronic (DRE) voting system:

Fig.3: DRE Voting system

Electronic voting machine by Premier Election Solutions, formerly Diebold Election Systems, is used in all Brazilian elections.

E. Mobile device in e-voting

Mobile devices, like mobile phones, have been used in some elections as e-voting device. It replaces the polling stations.

Fig.4: Mobile voting device

The study by [14] depicts that in comparing between mobile voting system and non-mobile voting system, the mobile voting system is slower than the non-mobile devices.

F. Security analysis

To clarify security for any convention, it is vital to decide the sort of dangers confronting the framework and how fundamentally it might influence the races. In this article, e-casting a ballot security necessities are talked about. The fundamental part of security considered is trustworthiness. The four fundamental viewpoints that can irritate the respectability of an e-casting a ballot framework are: voters' gadget, the system, the race server and the vote tallying segment [5].

The examination by [15] demonstrates the ease of use of six casting a ballot frameworks has been evaluated by master surveys, a research center test and a field think about. The fundamental issues found from those six frameworks are signing in, exploring the vote, stamping write-in-applicants and ultimately, throwing the vote. In the field contemplate, most voters overlooked the paper trails given by the machines.

So as to react to casting a ballot security prerequisites, specialists on framework security and in addition scientists have created alter safe, voter undeniable casting a ballot techniques [8].

Albeit most voters are commonly ready to cast a ballot as proposed both inside and outside the research center, certain exercises have ended up being dangerous, including evolving cast a ballot, recognizing mistakes and making a straight-party vote. The kinds of blunders that happen most as often as possible contrast over the casting a ballot machines.

G. Error analysis

So as to all the more straightforwardly measure blunder, specialists have led mimicked races, where voters' plan is clear and unambiguous. Past work around there has analyzed pattern ease of use information for a few conventional casting a ballot frameworks, for example, paper votes, punch cards and switch machines [16].

Scientists have discovered that while there are no critical contrasts in the measure of time required to finish the tallies, the four techniques do fluctuate in blunder rates with clients making the least mistakes when utilizing paper tickets [1].

H. Verifiability

Different investigations have taken a gander at the certainty of the casting a ballot framework from two angles: as far as individual undeniable nature and all inclusive unquestionable status.

In individual undeniable nature, the principle perspective is to ensure that the voter confirms that the vote has been sent to the server and it can't be adjusted.

In all inclusive undeniable nature, the principle perspective is to ensure that all votes are gathered and put away well in the best possible casting a ballot boxes and are appropriately counted. The investigation by [17] clarifies the qualification undeniable nature. In this examination, the term, 'qualification unquestionable status' implies that the voter ought to be qualified and he should cast a ballot just once [18].

6. Results

According to our review, about 50% of the e-voting system is based on touch screen devices; 17% use paper ballot and an optional scanner; another 17% use dial and buttons to pull the ballot and voting process; and 16% provide the whole ballot and request for the voter to press the button only once [19].

Also, in our study we find that most researchers have applied the following methodologies: firstly, the review from experts of HCI [20]; secondly, laboratory experiments; thirdly, field experiments; and lastly, natural experiments in different areas. The first case has been applied in Florida and Michigan.

Our review also shows that some have used mobile phones and others have maintained polling stations (non-mobile). The portable casting a ballot framework [21] is slower than the non-versatile casting a ballot framework (DRE and air pocket style paper) by roughly 90 seconds all things considered. The measurements connected [22] in e-casting a ballot in all articles audited, are proficiency, adequacy and fulfillment [23].

7. Conclusion

The e-voting system promises speed of elections, accuracy in voting and counting of votes/tallying of ballots. The three usability metrics to evaluate the usability of any e-voting are effectiveness, efficiency

and satisfaction. Security and undeniable nature are imperative perspectives in the e-casting a ballot framework to guarantee classification and validation of the casting a ballot framework. Blunder examination ought to likewise be viewed as while assessing the e-casting a ballot framework. By utilizing the e-casting a ballot framework, the speed and exactness of races can be guaranteed.

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