Inadequacy of UI/UX Design in Voting

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Since the beginning of democracy, the way ballots are formatted has always been changing. Over the last 50 years, ballots have taken a major step forward with the introduction of Direct-Recording Electronic Voting Systems (DREs). Starting with the Video Voter by Frank Thornber Company in 1973, many ballots started to switch from paper to screen, and brought along with it many new challenges. Electronic ballots have faced a lot of complications, but a common problem is their user interface and user experience (UI/UX). Programming a smooth and comprehensible UI/UX can be difficult in itself, but when you have to produce an interface that is clear to any citizen, it adds a whole new level of complexity. As DREs continue to modernize, figuring out what works in the realm of UI/UX is a learning process. This project aims to dive into the progression of the interfaces of voting systems and what is the ultimate cause of the flaws in our voting interfaces.

The progression of the user interface on voting machines has its roots in ballot design. Ballot design has been a constant issue even before the widespread use of DREs. Candidates for the same office split into different parts of the ballot, published sample ballots being different from the actual ballot, difficult to understand absentee ballots, the list goes on. A lot of the issues listed have resulted in historic under-votes and voter confusion. After what happened in Palm Beach County, Florida in 2000 when thousands of votes were unaccounted for in a Presidential Election, many states opted to switch to DREs for accuracy. DREs were turned to, in order to make the voting process better, but the history of ballot design shows the interfaces of these machines will yield many issues.

It is important to look back at the history of DRE interfaces to know what their issues are over the years. Starting with the aforementioned Video Voter, this voting machine had a screen that the ballot was projected onto and push buttons at each candidate. Once a push button was pressed the candidate was selected and a light next to the push button would light up. This interface, though simple, was a breakthrough for the time, being the first DRE that was used in a true government election. A few machines continued to build on the ideas expressed by the Video Voter, like the Danaher Shouptronic 1242 (1984), a touch-sensitive matrix with a plastic sheet cover that showed the ballot, and the Microvote MV-464 (1985) that was very similar to the Video Voter with the push button on the side of the screen adjacent to each candidate. These machines saw more significant use, and this brought to light two problems with DRE interfaces,

fleeing voters and premature voting. According to VerfiedVoting.org's research on Shouptronic 1242:

> "Fleeing voters/premature voting: Some voters can be easily confused in that they press the large 'VOTE' button too early or not at all. If a voter complains that they only were able to vote on the first few races, they probably pressed the 'VOTE' button before they were finished voting their ballot."

Blame was attributed to voters or election officials but ultimately this shows how the voting interface failed to instruct users of the ballot's design and the vote casting mechanism. As we approach the infamous 2000 election in Palm Beach County and the Help America Vote Act, DREs were starting to venture into using touch screens, with the exception of the Hart Intercivic eSlate (a voting machine where users used a scroll wheel to select what was on screen). The AccuVote TS was the first predominantly used touch screen voting machine and along with the iVotronic (another well-known touch screen DRE), the AccuVote TS provided the user with a paper trail and a review screen before casting their vote. These late 90s devices experienced a lot of problems especially with security, but touch screens, paper trails, and review pages were great additions for users. These developments were certainly a step in the right direction to solve fleeing voters, premature voting, and voter confusion. In 2002, the Help America Vote Act was implemented to improve the situation of elections, and one of the main pillars that this act emphasized was upgrading voting equipment. Gregory Rogers' research into electronic voting systems showed that massive amounts of Americans were voting electronically by 2006:

> "Touch screens had been widely used in many domains from banking applications to public information displays, but not until 2006 had they seen wide use in elections. Now over 66 million registered voters use DRE voting systems. As of the 2006 elections, jurisdictions with 63% of the nation's registered voters had changed their voting system, marking the largest shift in voting equipment in history."

Many new voting systems came from this time period, but most of these machines did not introduce anything new in terms of their interfaces. Even the AVC Edge,which is the most used touch screen DRE to date, did not expand on what AccuVote and iVotronic had already done. A lot of counties continue to use the AccuVote, iVotronic, and AVC Edge voting machines even as

they become antiquated. The recent shift in electronic voting machines is the ImageCast X (2015). The ImageCast X provides a lot of familiarity to the user; the full system has devices common to most users such as a tablet and a printer, and the user interface is designed like a phone or tablet. As of late many states are switching over to the ImageCast X, and it marks a time of modernization in DREs.

As we can see from the history of UI/UX in electronic voting machines, we are at a point where we have a lot of software capabilities, but design is something that needs to be improved. Whitney Quesenbery said it best in *Voting for Usability: Background on the Issues* when she said:

> "**voting is the ultimate usability problem**. There is a huge, and diverse, user population who must be able to use the interface. The system is used infrequently, and the interface is never exactly the same. There are different candidates, different offices, and even the relative position of the political parties' changes from time to time. To top this off, the context of use is stressful. Users have only one chance to get it right and are working in an unfamiliar environment."

There are so many factors that contribute to the difficulty of designing a clear and concise interface for voting. Along with all of this, voting interfaces also encounter the same issue one sees with the common "putting together new furniture" problem. Someone with a technical background and high familiarity with the product wrote the manual on how to build the product, which, at the end of the day, may be bearable with building your dresser, but when it comes to the voting instructions it becomes a huge concern. Many of these voting interfaces contain such verbose language that even the brightest of voters are left confused. The Center for Civic Design has written many volumes about how to conduct elections and ballot design. In their *Vol.1 Designing Usable Ballots* they showed examples of bad ballot instructions: "If an overvoted ballot is encountered, the voter is entitled to another blank ballot after surrendering the spoiled ballot". The use of terms like "overvoted ballot" and "surrendering the spoiled ballot" can severely lose the voter as they read the ballot instructions. The Center for Civic Design would go on to better these instructions by providing "If you make a mistake, ask a poll worker for another ballot", and you can see from a sentence like this that ballot design is not rocket science, designing an interface that uses familiar and non-technical language can seriously improve a

ballot. Other design flaws include taking your attention away from what is important on the ballot. Whether this means taking the attention away from the flow of the ballot or failing to draw attention to important voter instructions, many ballots fail with keeping the user's attention. Remedying most of these problems can come down to a ballot's navigation. The ballot should be designed in a way that instructions are in a place for a reason, for example, instructions to continue the ballot right should be immediately after the last race on the page. All these examples of bad ballot design ultimately show what needs to be done to fix voting interfaces. Elections revolve around the voter; therefore, you should be designing an interface that is made for the voter.

　　　As we continue into the future of voting machines, comprehensible interface design is necessary to maintain democracy. The UI/UX of DREs face two unique challenges, ballots have to be accessible by all people which means different education levels, generations, possible disabilities, etc. and ballots are what make sure that your vote is counted. These challenges demand that the development of these interfaces start from the user's perspective. From ballot instructions, to showing voters how to progress through the ballot, all the way down to text formatting and color contrast, these DRE interfaces must be user-centered and simple. Now that we are at a point in history when technology is booming and is becoming more user-friendly, it's time that we create voting interfaces that are effective and accurate.

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