

Thesis Portfolio

PowerShare App Development Technical Report

(Technical Report)

Analyzing the Impact of Voting Technology on United States Election Integrity

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Jeremy Nathan
Spring, 2020

Department of Computer Science

Table of Contents

Sociotechnical Synthesis

PowerShare App Development Technical Report

Analyzing the Impact of Voting Technology on United States Election Integrity

Thesis Prospectus

Sociotechnical Synthesis

Introduction

To maximize the effectiveness of a democracy, widespread citizen engagement is required. In the United States, two major factors that influence the confidence of the citizens in the government are security and transparency of the voting system, and the accountability of elected officials. The STS research paper portion of this portfolio examines how voting technology across the United States influences security and integrity of federal elections. The Technical Capstone aims to develop an easier means of communication between communities and their elected representatives; this would enable constituents to prioritize goals for their representatives to achieve and allow representatives to be held accountable for the completion of their community's goals.

PowerShare App Development Technical Report

Currently, there are a limited number of channels available through which elected officials and their constituents communicate with each other. A solution to this problem would need to implement two major features. First, voters need to communicate quickly and intuitively with their representative in a way that will ensure that their voice does not get lost. At the same time, elected officials need a way to easily determine the needs of the community in real time without becoming overwhelmed by a large volume of constituent feedback. PowerShare, the application our team is developing, addresses the two-part requirement by limiting the set of actions that different classes of end users (i.e. constituents and representatives) can perform. For instance, constituents can only create and vote on a single goal within their predetermined communities. Representatives of a community can additionally comment on goals and update the status of the goals that they are working on. As a result, the community produces a prioritized list of goals to which the representative can easily view and respond.

In addition to meeting the problem statement, the application features a straightforward navigation path for users. First, the user creates their account, specifying their name, address, and email address. Their information is then cross-checked against voter registration records to ensure validity, and then they are sorted into their respective communities. After logging in, the voter would be able to view and navigate to each community. Each community consists of a list of constituent-submitted goals which other constituents can vote for, as well as a function that allows users to create new goals. Representatives logging into the application would be able to view the community that they represent as well as each individual goal. By maintaining a real-time line of communication that is convenient for both constituents and their representatives, constituents can more easily judge how well their representative is meeting their needs.

Analyzing the Impact of Voting Technology on United States Election Integrity

Guaranteed by the U.S. Constitution and expanded in the 15th and 19th amendments, the right to vote has always been cherished tenet of U.S Democracy – so much so that many have fought and died over it. The means by which citizens cast their vote, however, has been constantly evolving. One of the more recent changes has been the rise of electronic voting machines (Formally, DRE machines), which surged in popularity in the 2000's (Garner et.al., 2005). Though these new machines have improved voting accessibility, recent governmental studies have demonstrated vulnerabilities which could provide malicious actors a way to unfairly influence the election process. As a result, this paper analyzes how advances in voting technology impacts the integrity of the United States voting process.

This paper uses historical case studies, such as the 2000 and 2016 presidential elections, to frame the background for research. The 2000 election, during which multiple recounts had to be conducted for improperly punched ballots in Florida, gave rise to the widespread adoption of the DRE machine; the 2016 election, on the other hand, demonstrated the

vulnerabilities in these new technologies. To analyze the effect of the diverse human and non-human factors that influence the adoption of new voting technology, this paper uses Actor-Network theory. The research conducted uses this framework to categorize proposed solutions to the problem of securing new voting technologies and compares the advantages of each one's implementation.

Conclusion

In completing the Capstone project, I improved my skills in application development, working as part of a team, and maintaining close contact with a client to create a product that could help communities improve rapidly. Through the STS research paper, I learned the history of voting technology in the United States. Using Actor Network Theory, my research unraveled links that I did not think existed, such as how new blockchain technology could theoretically be used to implement a more secure and robust voting system at small to medium scales. Through working on these projects simultaneously, I engaged more with the electoral process in a non-voting manner and have a new appreciation for our democracy and ways it could be improved.