Thesis Project Portfolio

CS 4501 Cybersecurity in Elections Curriculum Redesign

(Technical Report)

A Case Against Florida's Election Technology in the 2000 United States Presidential Election

(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

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Sociotechnical Synthesis

Many technologies and their consequences from being introduced into society benefit from social and political analysis. My technical work and STS research both analyze election machine technology and the shortcomings of not viewing it through a sociotechnical lens. In my technical work, I critique and expand upon the CS 4501 Cybersecurity and Elections curriculum to focus more heavily on developing students' critical thinking and social analysis skills. It could be improved by asking students to think beyond the technical reasons of its content and consider the driving social and political factors. My STS research closely examines an electoral event that is introduced in CS 4501's curriculum. In CS 4501, the technical mishaps behind the 2000 United States presidential election are explained, and my STS research builds upon it by performing a sociotechnical analysis on the controversy through the lens of technological politics.

In my technical work, I argue that the current CS 4501 Cybersecurity and Elections curriculum is missing an opportunity to educate students on the connection between the historical events taught and how they continue to shape our voting technologies. By teaching election phenomena alongside its social and political effects, students are better prepared to evaluate design consequences and become more considerate and effective designers. I achieve this by implementing Diane Halpern's Four-part model which was designed to help adults transfer the critical thinking skills to new knowledge. By utilizing the skills students have already learned in their STS courses, my goal is to implement Halpern's model to push students to consider the background and dangers of election technologies, and as a result, equip them with the ability to do the same about their own designs.

My STS project focuses in on a specific historical event taught in CS 4501: the 2000 United States presidential election. Scholars have analyzed the election and mostly hold the

poorly designed election machines and lack of legal precedent responsible for the controversy. My research shows that both of these conclusions—absent of sociotechnical analysis—leave the event partially explained, at best. I use Langdon Winner's concept of technological politics to prove that the election technology used in Florida wielded social and political power, and the protection of votes of white people and simultaneous disenfranchisement of votes of black people went far beyond claims of functional work. My goal is to show that election technologies in this case had the ability to empower some groups and marginalize others, and subsequently, designers have the power to shape privilege and representation.

By working on my technical piece and STS project together, I was able to experience firsthand how necessary my technical work is and how beneficial it will be to future students of UVA. While I was initially intrigued by the 2000 United States presidential election after learning about its controversial election machines in CS 4501, as I discovered and further developed my answer to my STS research question, I was floored at the social and political implications of the otherwise blatantly technical machine. Not only am I now more educated on my STS project beyond what was taught in CS 4501, I am more broadly informed on how the design decisions I make as a software developer have the potential to make impacts far beyond the obvious technical ones. This type of education is a necessity when considering engineering ethics and what I would like to bring to a new CS 4501 curriculum.